INTERNATIONAL TELECOMMUNICATION UNION

ITU-T X.862

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(11/93)

DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

OSI UPPER-LAYERS-ORIENTED ASPECTS

OPEN SYSTEMS INTERCONNECTION – DISTRIBUTED TRANSACTION PROCESSING: PROTOCOL SPECIFICATION

ITU-T Recommendation X.862
Superseded by a more recent version

(Previously “CCITT Recommendation”)

FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (ITU). The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

ITU-T Recommendation X.862 was prepared by ITU-T Study Group 7 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 16th of November 1993.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Superseded by a more recent version

CONTENTS

Superseded by a more recent version

SUMMARY

This Recommendation describes the application layer protocol for OSI distributed transaction processing. The protocol provides a means to group a set of actions called a «transaction». It also provides a framework for coordination of a transaction across multiple transaction processing resources in separate open systems.

INTRODUCTION

CCITT Recs. X.860, X.861, and ITU-T Rec. X.862, Distributed Transaction Processing (OSI TP), is one of a set of standards produced to facilitate the interconnection of computer systems. It is related to other Recommendations in the set as defined by the Reference Model for Open Systems Interconnection (see Recommendation Rec. X.200). The Reference Model subdivides the area of standardization for interconnection into a series of layers of specification, each of manageable size.

The aim of Open Systems Interconnection (OSI) is to allow, with a minimum of technical agreement outside the interconnection standards, the interconnection of computer systems:

a) from different manufacturers;

b) under different management;

c) of different levels of complexity; and

d) of different technologies.

CCITT Recs. X.860, X.861, and ITU-T Rec. X.862 define an OSI TP Model, an OSI TP Service and specify an OSI TP Protocol available within the Application Layer of the OSI Reference Model.

The OSI TP Service is an Application Layer service. It is concerned with identifiable information which can be related as transactions, which may involve two or more open systems.

CCITT Recs. X.860, X.861, and ITU-T Rec. X.862 provide sufficient facilities to support transaction processing, and establish a framework for coordination across multiple TP resources in separate open systems.

CCITT Recs. X.860, X.861, and ITU-T Rec. X.862 do not specify the interface to local resources, nor do they specify an application programming interface within the local system.

Recommendation X.862

OPEN SYSTEMS INTERCONNECTION – DISTRIBUTED TRANSACTION PROCESSING: PROTOCOL SPECIFICATION[1)]

(Geneva, 1993)

1 Scope

This Recommendation provides

a) a statement (see clauses 6 to 11) of the nature of the automaton giving the necessary behaviour of each of the participating entities which are providing the OSI TP Service, covering

   1) the actions to be taken on receiving request and response primitives issued by a TP Service user invocation;

   2) the actions to be taken on receiving indication and confirm primitives issued by the presentation service-provider;

   3) the actions to be taken as a result of certain events within the local system;

   4) the actions to be taken as a result of interactions with other ASEs;

b) the definition (see clause 12) of the abstract syntax required to convey the TP protocol control information;

c) the conformance requirements to be met by implementations of this protocol (see clause 13).

The scope of this Recommendation is limited to the interconnection of systems; it does not specify or restrict the implementation of possible interfaces within a computer system.

2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation are encouraged to investigate the possibility of applying the most recent editions of the Recommendations and Standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards, the TSB maintains a list of the currently valid ITU-T Recommendations.

– Recommendation X.200 (1988), *Reference Model of Open Systems Interconnections for CCITT application*. (See also ISO 7498.)

– Recommendation X.207 (1993), *Information technology – Open Systems Interconnection – Application Layer Structure.* (See also ISO/IEC 9545.)

– Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1)*. (See also ISO/IEC 8824.)

– Recommendation X.209 (1988), *Specifications of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1)*. (See also ISO/IEC 8825.)

– Recommendation X.210 (1993), *Information technology – Open Systems Interconnection – Conventions for the definitions of OSI services*. (See also ISO/IEC 10731.)

– Recommendation X.215 (1988), *Session service definition for Open Systems Interconnection for CCITT applications*. (See also ISO 8326.)

– Recommendation X.216 (1988), *Presentation service definition for Open Systems Interconnection for CCITT applications*. (See also ISO 8822.)

---

1) This Recommendation and ISO/IEC 10026-3 *(Information Technology – Open Systems Interconnection – Distributed Transaction Processing – Part 3: Protocol specification)* were developed in close collaboration and are technically aligned.

- Recommendation X.217 (1992), *Service definition for the Association Control Service Element*. (See also ISO/IEC 8649.)
- Recommendation X.219 (1988), *Remote Operations: Model, Notation and Service definition*. (See also ISO/IEC 9072-1.)
- Recommendation X.227 (1992), *Connection-oriented protocol specification for the Association Control Service Element*. (See also ISO/IEC 8650.)
- Recommendation X.229 (1988), *Remote Operations – Protocol Specification*. (See also ISO/IEC 9072-2.)
- Recommendation X.290 (1992), *OSI Conformance Testing Methodology and Framework for Protocol Recommendations for CCITT applications – General Concepts*. (See also ISO/IEC 9646-1.)
- Recommendation X.501 (1988), *The Directory – Models*. (See also ISO/IEC 9594-2.)
- Recommendation X.520 (1988), *The Directory – Selected Attribute Types*. (See also ISO/IEC 9594-6.)
- Recommendation X.650 (1992), *Open Systems Interconnection – Reference Model for Naming and Addressing*. (See also ISO 7498-3.)
- Recommendation X.800 (1992), *Security Architecture for Open Systems Interconnection for CCITT applications*. (See also ISO 7498-2.)
- Recommendation X.851 (1993), *Information Technology – Open Systems Interconnection – Service definition for the commitment, congruency and recovery service element*. (See ISO/IEC 9804.)
- Recommendation X.852 (1993), *Information Technology – Open Systems Interconnection – Protocol for the commitment, concurrency and recovery service element: Protocol specifications*. (See also ISO/IEC 9805-1.)
- Recommendation X.860 (1992), *Open Systems Interconnection – Distributed Transaction Processing: Model*. (See also ISO/IEC 10026-1.)
- Recommendation X.861 (1992), *Open Systems Interconnection – Distributed Transaction Processing: Service definition*. (See also ISO/IEC 10026-2.)
- ISO 8326: 1987/Amd 4: …[2)], *Information Technology – Open Systems Interconnection – Connection oriented session service definition – Amendment 4: Additional synchronization functionality*.
- ISO 8327: 1987/Amd 3: …[2)], *Information processing systems – Open Systems Interconnection – Basic connection oriented session protocol specification – Amendment 3: Additional synchronization functionality*.
- ISO 8822: 1988/Amd 5: …[2)], *Information technology – Open Systems Interconnection – Connection oriented presentation service definition – Amendment 5: Additional synchronization functionality*.
- ISO 8823: 1988/Amd 5: …[2)], *Information Technology – Open Systems Interconnection – Connection oriented presentation protocol specification – Amendment 5: Additional synchronization functionality*.
- ISO/IEC 9579-1: …[2)], *Information Technology – Open Systems Interconnection – Remote database access – Part 1: Generic model, service and protocol*.
- ISO/IEC 9579-2: …[2)], *Information Technology – Open Systems Interconnection – Remote database access – Part 2: SQL specialization*.
- ISO/IEC 9804/Amd 2: …[2)], *Information Technology – Open Systems Interconnection – Service definition for the commitment, concurrency and recovery service element – Amendment 2: Session mapping changes*.
- ISO/IEC 9805/Amd 2: …[2)], *Information Technology – Open Systems Interconnection – Protocol specification for the commitment, concurrency and recovery service element – Amendment 2: Session mapping changes*.

2) Presently at the stage of draft.

3 Definitions

For the purposes of this Recommendation, the definitions given in Recommendation X.860 (TP Model) and Recommendation X.861 (TP Service), in addition to those given in 7.3, apply.

Definitions of terms specific to the OSI TP protocol specification are contained in 7.3.

4 Abbreviations

Abbreviations used in the OSI TP protocol specifications are defined in Recommendation X.860 (TP Model), except for the following, which are used in some tables:

cnf confirm primitive

ind indication primitive

req request primitive

rsp response primitive

and for the following, which are used as prefixes to auxiliary facilities services:

AF Auxiliary Facility

CAF Channel Auxiliary Facility

SAF SACF Auxiliary Facility

5 Conventions

Recommendation X.861 defines services for Distributed Transaction Processing guided by the descriptive conventions defined in Recommendation X.210.

However, the terms “request” and “indication” are sometimes used in the following ways:

a) a single request may result in multiple indications (an example is that a single TP-COMMIT request can result in TP-PREPARE indications to each direct subordinate TPSUI);

b) several requests may result in a single indication (an example is that a single TP-COMMIT-COMPLETE indication may be issued to a superior TPSUI only after TP-DONE requests have been issued by the TPSUI and all subordinate TPSUIs in the transaction tree);

c) the convention that a request primitive results in an indication primitive of the same name is not always followed (for example, a TP-COMMIT request will cause a TP-PREPARE indication to be issued).

For a given primitive or APDU, the presence of each parameter or field is described by one of the following values:

Blank Not applicable

M Presence is mandatory

U Presence is a user option

O Presence is a provider option

C Presence is conditional

In addition, the notation (=) indicates that a parameter or field value is semantically equal to the value of the parameter or field of the preceding primitive or APDU in the table. This notation is in some instances combined with another value above, e.g. “(=)/M”, and signifies that in some cases the primitive follows as a result of a preceding primitive or APDU (that is, “(=)” applies) and in other cases (when “M” applies), either

i) there is no preceding primitive or APDU; or

ii) the value from the preceding primitive or APDU can be changed.

6 Model of the PM

6.1 Overview

This subclause provides an overview of those aspects of the TPPM which are specific to this protocol specification. These include association usage and management, the details of dialogue establishment and channel management, the use of the Session synchronize-minor token, concatenation, and embedding.

6.1.1 Principles of association usage

An association is used by a TPPM to support either a

- TP Dialogue; or
- TP Channel.

An association may be established at any time, according to a local decision. The setting up of an association may be done in parallel with the actions of the PM. An association that has been established and is not currently being used is considered to be in a pool of free associations.

On receipt of a dialogue request, the PM needs to be assigned an association to support this dialogue. Any association that is assigned must have attributes compatible with the dialogue it is to be used for, as described in 8.5.2 (dialogues) and 8.5.3 (channels).

An association may be assigned to the PM from the pool of free associations, or attempts may be made to establish a new association for use with this dialogue or channel. If, as a local decision, it is decided that a compatible association cannot be assigned, the begin dialogue request will be rejected.

Associations may be released at any time they are not in use by the TPPM. The point at which an association becomes unused, and therefore may be released, is defined in the SACF procedures in clause 10.

On the establishment of an association, one AEI is assigned to be the “contention-winner” and the other as the “contention-loser”. The assignment of contention-winner and contention-loser remains for the duration of the association. An AEI may be the contention-winner on some associations and contention-loser on others.

The direction from the contention-winner to the contention-loser is the preferred direction of dialogue establishment because the contention-winner has the right of use of the association. The contention-winner may grant to the contention-loser the use of the association for the purpose of establishment of a dialogue, if it is not using or has not reserved this association. The contention-winner may also deny the use of the association by the contention-loser for the purpose of dialogue establishment.

The contention-loser may formally request the rights of the contention-winner temporarily in order to attempt establishment of a single dialogue. This is done using the bid mechanism. The use of the bid mechanism is declared to be either optional or mandatory at association establishment time. This declaration does not change for the life of the association.

6.1.2 Dialogue establishment

When a TPSUI attempts to establish a new dialogue, a compatible association must first be assigned for use with this dialogue as described above in 6.1.1.

Should two TPPMs (at different AEIs) attempt to establish a dialogue over the same association (without using the bid mechanism), the TPPM at the contention-winner AEI will succeed, disrupting the attempt from the contention-loser.

Use of the bid mechanism affects dialogue establishment. The contention-loser may request the right to establish a single dialogue without the possibility of a conflict by issuing a bid request. The contention-winner may accept or reject the bid request. If accepted, the contention-loser issues the dialogue establishment request. If rejected, the contention-loser may not issue a dialogue establishment request until after the receipt of a dialogue establishment request from the contention-winner.

Bidding by the contention-loser before attempting to establish a dialogue is mandatory in either of the following cases:

a) if bidding is mandatory for the association;

b) if the condition exists where an unexpected C-BEGIN indication may appear (see 10.3.1).

A dialogue establishment request may be rejected for the following reasons:

a) the TPPM is unable to select or establish an association which meets the requirements of the dialogue;

b) the TPPM is a contention-loser on the association and its dialogue establishment or bid request collides with a dialogue establishment request from the contention-winner. It is worthwhile to distinguish two types of collisions:

1) the contention-winner is still within a dialogue;

2) the contention-winner is not within a dialogue. This can happen if the contention-winner begins a dialogue and ends it with no response required from the partner;

c) the partner TPPM or TPSUI rejects the dialogue. This can happen for a variety of reasons: TPSU title not found, insufficient resources, etc. The reason for the rejection is carried on a TP APDU.

NOTE — Although this protocol specification specifies that the dialogue establishment is rejected, this does not preclude an implementation from attempting to retry the dialogue establishment.

Because of the use of unconfirmed dialogue or channel termination, it may happen that “stray APDUs” arrive from the partner after a dialogue establishment request. To detect and discard these stray APDUs, a correlator value is sent on the dialogue establishment request, which is returned by the partner at dialogue establishment confirmation time. As dialogue establishment confirmation always precedes any other request issued by the partner, APDUs received before that confirmation are discarded. (The same mechanism is used during channel establishment.)

The mechanism for detecting the dialogue reject situation described in “b) 2)” above is the use of a “last partner identifier” (LPI). When the contention-loser issues a bid request or a dialogue establishment request without a bid request, the request carries the correlator of the previous dialogue establishment indication received from the contention-winner. If the contention-winner receives an LPI with a value different from that of the correlator on the previously issued dialogue establishment request, the bid (or dialogue establishment) request is rejected. The LPI is not provided if there was no previous dialogue establishment indication from the contention-winner.

6.1.3 Channel management

After a node crash or a communications failure, a TPPM may (depending on the transaction state as recorded in a log record found for that transaction) be responsible for recovery. In order to meet this requirement, the TPPM needs a channel for the purpose of recovery. The establishment of channels is in most respects similar to the establishment of dialogues; there is, however, one essential difference: unlike dialogues, channels are not established by the TPPMs themselves, but rather they are established and managed by a channel protocol machine (CPM). There is only a single CPM per AEI and this CPM deals with the channels requested and used by all the TPPMs residing at this AEI.

The interactions between a TPPM and the CPM are modeled by the CAF-service (CAF for Channel Auxiliary Facility). A TPPM uses a CAF service request to request the CPM to establish a channel to a specific partner TPPM. Upon receipt of this request, the CPM either selects an existing channel or establishes a new channel using a procedure similar to that of dialogue establishment (see 6.1.2).

When recovery has been performed, i.e. when a TPPM either has issued a C-RECOVER response or received a C-RECOVER confirm, the TPPM uses another CAF service request in order to inform the CPM that it has no further use for the channel. The CPM then may either terminate the channel or keep it for subsequent use.

Besides satisfying the requests for channels that are issued by TPPMs residing at its AEI, the CPM is also responsible for responding to all channel establishment indications addressed to its AEI and issued by other CPMs. Moreover, the CPM receives all recovery initiating indications on a channel and directs them to the TPPMs to which they are addressed; whenever no such TPPM may be located, the CPM must respond to the recovery initiating indication.

6.1.4 Channel utilization

A channel is established as either a one-way-recovery channel or a two-way-recovery channel. With either type of channel, due to restrictions in ISO/IEC 9804, only a single C-RECOVER request is allowed to be outstanding on a channel until it has been responded to; moreover, the issuer of a C-RECOVER request must own the token unless the C-RECOVER request is issued in response to a C-RECOVER indication [C-RECOVER (commit) request in response to a C-RECOVER (ready) indication] or in some circumstances on a two-way-recovery channel.

On a one-way-recovery channel, only the initiator of the channel has the right to initiate recovery. The token, once owned by the initiator, is never transferred to the partner.

On a two-way-recovery channel, either side of the channel may initiate recovery, provided that it owns the token. The token is transferred to the partner after each C-RECOVER request or AF-RECOVER request; this allows interleaving of recovery exchanges over the channel. When a CPM does not need to initiate recovery any longer, it may transfer the token to its partner; on the other hand, if the side that does not own the token wants to initiate recovery on a channel, it may issue an AF-TOKEN-PLEASE request.

6.1.5 Token control

NOTE 1 – See Annex B for U-ASE use of tokens.

CCR requires the Session Layer synchronize-minor token (hereinafter called the token – see 7.3) to be owned when beginning a transaction, committing a transaction, or initiating recovery. The TPPM guarantees that the token will be available at the appropriate times in the absence of the movement of the token by the TPSUI or U-ASE. The TPPM uses the following rules for moving the token:

a) the token is owned by the contention-winner when an association is established;

b) the token is returned to the contention-winner at the termination of the dialogue;

c) if the token is received by a contention-loser while the association is not assigned to a dialogue, it is returned to the contention-winner. This rule does not hold if the contention-loser is attempting to establish a dialogue and has received a confirmation that a bid request was accepted;

NOTE 2 – This happens when a U-ASE request to move the token collides with an unconfirmed dialogue termination request.

d) the token is moved to the contention-loser upon acceptance of a bid request carrying a parameter requesting the token;

e) the token is moved to the contention-loser upon receipt of a dialogue establishment indication (without prior bidding) selecting the Commit functional unit if the contention-winner owns the token and has not reserved the association for other use. If the token is not owned by the contention-winner, it will eventually arrive and then be sent back to the contention-loser;

NOTE 3 – This mechanism ensures that the token is always at the dialogue superior when the Commit functional unit is selected to enable the dialogue superior to begin a transaction.

f) if the token is owned by the subordinate after the receipt of the prepare request, the token is sent to the superior when sending the commitment offer;

g) on a two-way-recovery channel, the token is sent to the partner after initiating each recover request.

There are some cases where the token may not be immediately available when required for beginning a transaction or initiating recovery due to the movement of tokens by previous dialogues or other factors. In these cases, except for the case when the U-ASE moves the token within the same dialogue and the token is needed for beginning a transaction, the rules guarantee that the token will eventually arrive, so the TPPM simply waits until it does. A U-ASE that moved the token prior to beginning a transaction is responsible for getting it if it does not have it.

6.1.6 Concatenation/separation

Concatenation is an optional feature which allows multiple APDUs generated by the TPPM (this includes TP, CCR, ACSE, and U-ASE APDUs) to be mapped onto a single PSDU, reducing the number of PSDUs and optimizing performance. Concatenation is performed by the concatenator part of the SACF and is not included in action sequences (the remainder of the SACF is included in action sequences – see 7.1.3).

When concatenation is not used, the state of the supporting layers is always synchronized with the state of the TPPM because of the one-to-one correspondence between PSDUs (which affect the state of the supporting layers) and APDUs (which affect the state of the TPPM). When concatenation is used, it is important to maintain this synchronization between the TPPM and the supporting layers. Therefore, the concatenation rules are constructed such that the APDU directly related to the PSDU causing a state change in the supporting layers is always delivered to the TPPM before any other APDUs in the PSDU (which might not be related to the state change in the supporting layers).

NOTE – An example of this is the C-ROLLBACK-RI CCR APDU. If another APDU was concatenated before this APDU, say, a TP-GRANT-CONTROL-RI APDU, then the following scenario would result. The incoming PSDU containing both APDUs would be processed by Session, resulting in a Session state where a P-RESYNCHRONIZE indication was given. The TPPM would, however, process the TP-GRANT-CONTROL-RI APDU first, without seeing the C-ROLLBACK indication. The TPPM could then allow the TPSUI to issue a TP-ROLLBACK request, resulting in an outgoing C-ROLLBACK-RI CCR APDU which is mapped to a P-RESYNCHRONIZE request. This P-RESYNCHRONIZE request is received after the P-RESYNCHRONIZE indication was given previously, resulting in a violation of the Session service-user rules (in some cases). The incoming C-ROLLBACK indication still has not been processed by the TPPM. If nothing could be concatenated before the C-ROLLBACK-RI CCR APDU, then the TPPM would have changed its state to reflect the state change in Session (i.e. process the rollback) before it would accept any other input events from the TPSUI.

Separation involves accepting an incoming PSDU and generating a separate event corresponding to each APDU contained in the PSDU. The entire PSDU is processed before another PSDU is accepted. While concatenation is an optional feature, separation is mandatory; all concatenation sequences that conform to the rules specified in 10.7 shall be supported in incoming PSDUs.

6.1.7 Embedding

Where semantics of a combination of APDUs require that they be interpreted as a single unit in order to determine the required action, these APDUs are embedded one within the other. This might arise, for example, when an APDU of the TP-ASE defines added value to a CCR APDU.

NOTE – An example of the use of this principle includes the embedding of TP-PREPARE-RI APDU in C-PREPARE request.

The SACF contains a “router” component which handles TP APDUs embedded in indications and confirms. The router causes a CCR or ACSE indication or confirm not carrying a TP APDU to be directly passed to the MACF (through the applicable SACF procedures). If the CCR or ACSE indication or confirm contains an embedded TP APDU, the router will cause the indication or confirm to be passed to the TP-ASE. The TP-ASE then decodes the TP APDU and passes an AF indication or confirm to the MACF (through the applicable SACF procedures) which expresses the combined semantics of the CCR or ACSE service and TP APDU.

6.2 OSI TP Protocol structure

6.2.1 Components of the PM

The protocol specified in this Recommendation provides the services defined by the OSI TP Service, CCITT Recommendation X.861.

The protocol specification for TP is presented as a TP Protocol Machine (TPPM), supplemented by a Channel Protocol Machine (CPM). Within an AEI, there is one CPM with which TPPMs of the same AEI interact for the purpose of recovery.

Interactions between a TPPM and the CPM are represented by a service called the Channel Auxiliary Facility (CAF) service. The CAF service, provided by the CPM to TPPMs, models the ability for channels to be dynamically attached to and detached from a particular TPPM.

The TPPM and the CPM comprise a collection of SAOs controlled by an MACF.

The structure of the OSI TP Protocol is shown in Figures 1 and 2.

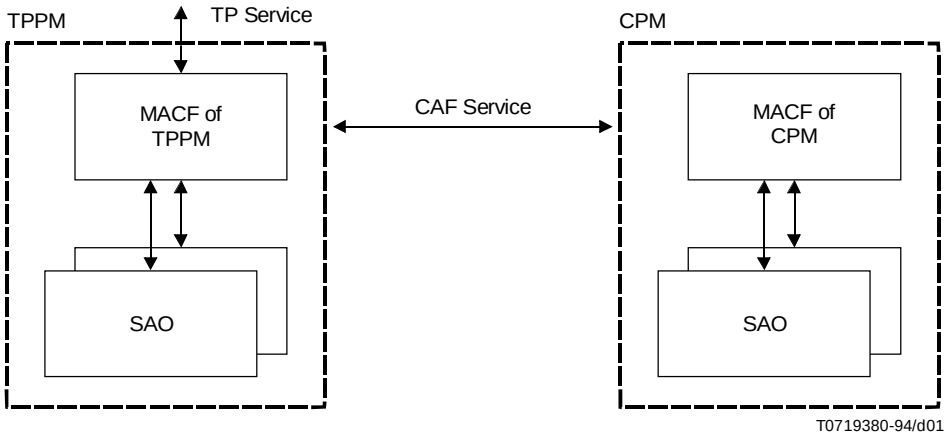
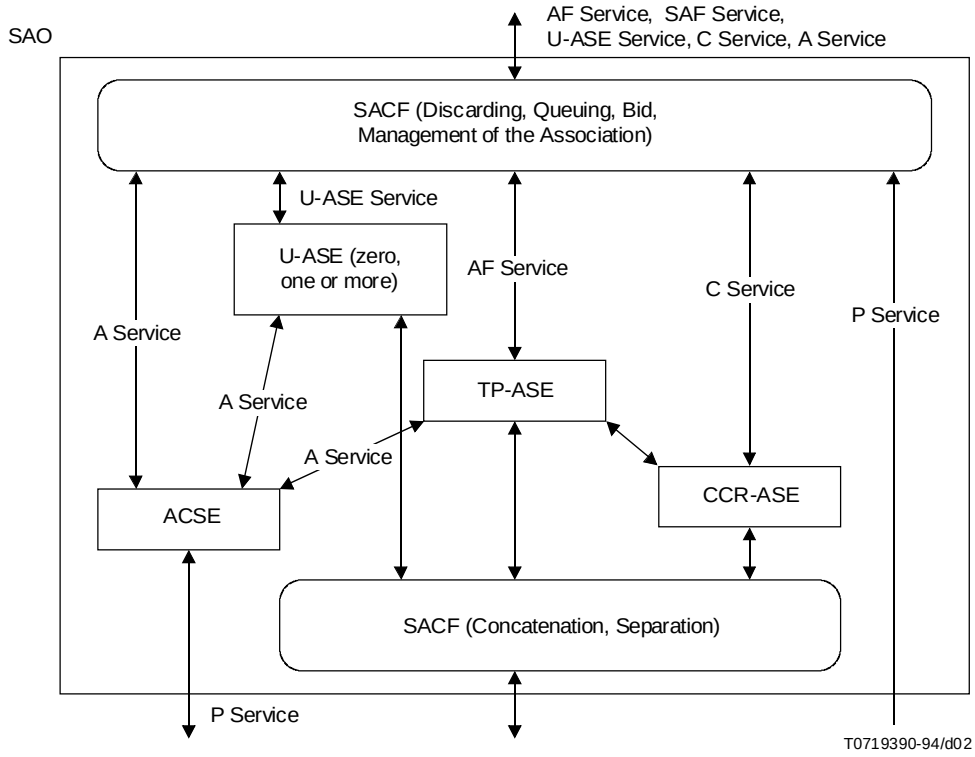


FIGURE 1/X.862

Relationship between the TPPM and the CPM



NOTE – Only SAOs included in the CPM do not include U-ASE.

FIGURE 2/X.862

Structure of the SAO

6.2.1.1 The TPPM

The MACF of the TPPM provides both the TP services over multiple associations and the associated temporal ordering rules. The MACF of the TPPM maps TP services onto the functional capabilities of SAOs included in the TPPM, and onto the CAF service, when appropriate.

Each SAO of a TPPM is composed of

a) ACSE, to establish and terminate associations. The ACSE services are not invoked directly from the TP Service, but are invoked by the MACF of the TPPM (see 6.1.1 and 8.2), or, in some cases, by some source other than the TPPM MACF procedures [see 11.3.21 (11.3.22 in the case of a CPM) and 10.5.59];

b) TP-ASE, to provide for TP APDU generation and reception. Interactions between the TP-ASE and the MACF (through the applicable SACF procedures) of the TPPM are represented by a service called the Auxiliary Facility (AF) service.

   The AF service, provided by the TP-ASE, models the ability for TP APDUs to be exchanged and mapped onto appropriate underlying services;

c) CCR, to provide support for commitment, rollback, and recovery functions, when required. CCR services are used by the MACF of the TPPM either:

   1) directly, when no TP APDUs are conveyed by CCR; or,

   2) indirectly through the TP-ASE, when TP APDUs are conveyed by CCR (see 8.3);

d) one or more U-ASEs, to provide for application specific protocol. U-ASE services are represented by the TP-DATA service to model TP sequencing constraints on application specific protocols. U-ASE APDUs are mapped onto the Presentation Service, directly or indirectly, as specified by the U-ASE standards;

e) SACF, to coordinate the ASEs in the SAO, in order to maintain a consistent behaviour on the association. The SACF consists of the following components:

   1) procedures to examine the services passing between the MACF and SAO and handle actions related to dialogue establishment and managing an association while not in use by a dialogue. These actions can be to allow the service primitive to pass through, discard it, generate additional service primitives, or queue the service primitive. In addition, the procedures provide the SACF Auxiliary Facility (SAF) Service, which represent interactions between the MACF and the SACF;

   2) a router which ensures that indications or confirms carrying TP APDUs are directed to the appropriate component. See 6.1.7 on embedding;

   3) a concatenator which optionally constructs a single PSDU based on multiple APDUs for outgoing APDUs, and separates each APDU contained in a PSDU for incoming PSDUs.

Both the AF and the SAF services are purely internal to the TPPM: they are not visible outside of the TPPM, and thus are not available for use by anything other than the MACF of the TPPM. The MACF of the TPPM is the only “user” of both the AF and the SAF services. There shall be no conformance requirements to either the AF service or the SAF service.

An application context for an association to be used by TPPM to assign dialogues shall include:

a) ACSE;

b) TP-ASE;

c) CCR, when the Commit functional unit is selected;

d) one or more U-ASEs, specifically identified. When multiple U-ASEs are included, the relationships between them shall be specified as part of their specification, or as part of the application context specification; and,

   NOTE 1 – Annex B contains guidelines for writing U-ASEs eligible for inclusion in a TP application context.

e) SACF and MACF procedures.

   NOTE 2 – The provision for an application context proforma is a candidate for further standardization as an amendment.

6.2.1.2 The CPM

The MACF of the CPM includes the necessary provisions to establish and terminate channels, as appropriate. The MACF of the CPM provides the CAF service. The MACF of the TPPM is the only "user" of the CAF services. There shall be no conformance requirements to the CAF service.

SAOs included in the CPM are the same as those of a TPPM except that no U-ASE is required. The AF and SAF services used by the MACF of the CPM are identical in their definitions to those of a TPPM. They are subject to the same restrictions.

An application context for an association to be used by a CPM to assign channels shall include:

a) ACSE;

b) TP-ASE;

c) CCR; and

d) SACF and MACF procedures.

7 Execution Rules

7.1 Operation of the PM

This subclause describes the interactions between the components of the PM.

7.1.1 Relationship of SAO(s) to MACF(s)

ISO/IEC 9545 defines a one-to-one correspondence between an association and an SAO. While a dialogue or channel is in use on the association, this SAO is associated with an MACF (of a PM). This protocol specification provides for the detaching of the SAO from the MACF at the completion of the dialogue or channel such that the association can subsequently be used by an MACF in another PM. In general, when no dialogue or channel exists on an association, the SAO is detached from the MACF. A detached SAO is not considered to be part of any PM. When an incoming request to establish a dialogue or channel is made, the SAO is then attached to an MACF so that the MACF can process the request. When an MACF initiates the establishment of a dialogue or channel, an SAO that is not attached to any other MACF may be attached to the MACF establishing the dialogue or channel. Alternatively, attempts may be made to create a new SAO to attach to the MACF.

All channels that are not in use for recovery are attached to the CPM. When a request is made of the CPM by a TPPM to perform recovery, the CPM satisfies this request by transferring an unused channel (which is associated with the correct AEI) to the TPPM. When an incoming C-RECOVER indication appears on an unused channel, the CPM finds the TPPM corresponding to the transaction being recovered and transfers the channel to that TPPM. As soon as the TPPM completes recovery, the channel is transferred back to the CPM.

7.1.2 Input events to the PM

PM input events occur either as a result of:

– request and response primitives issued by the TPSUI or indication primitives issued by the CPM in the case of the TPPM; a request issued by a TPPM in the case of the CPM;

– events triggered by local conditions (internal events); or

– events caused by APDUs and Presentation indications and confirmations output from the concatenator part of the SACF or directly from Presentation if concatenation is not used.

7.1.3 Action sequences

An action sequence is a contiguous sequence of execution of procedures in clauses 9, 10, and 11 as a result of a single input event to either the TPPM or the CPM. The CPM and each TPPM have separate action sequences, which proceed independently. An action sequence includes all processing of input events by the PM, except that of the concatenator part of the SACF (see 6.1.6).

An SAO that is not attached to any MACF is not part of any PM action sequences. It may therefore act in parallel with the actions of the PM.

NOTE – This allows association management to be performed independently of normal PM processing.

An action sequence executes completely (i.e. has finished all procedures) before the PM becomes available for handling any subsequent input events.

An action sequence is a serial and atomic execution of the procedures (except in the event of a node crash), with a single exception where parallelism is allowed: when a request or response is issued to the SAO using the (S)AF, ACSE, CCR, or Presentation services, the SAO may continue this action sequence in parallel with the action sequence of the MACF. The SAO ensures that requests or responses issued by the MACF are processed in the order issued. The SAO completes its part of the action sequence when its procedures are finished.

Within an SAO an A-ABORT request or an A-RELEASE (Result=affirmative) response may be issued. At most one such an event may occur in an action sequence. Such an event is processed by the MACF in order to handle the loss of the association. The event is processed by the MACF in the action sequence in which it was issued once the MACF and all SAOs have completed execution of their procedures (that is, just before the end of the action sequence).

7.1.4 SACF queuing

Certain TP services sometimes cannot be completed in a single action sequence (for example TP-BEGIN-DIALOGUE request). In order to have the TPPM available to accept input events at the TPSUI boundary at all times, it may be necessary to queue requests within the TPPM. Thus, a request that cannot immediately be handled may trigger queuing in the SACF, but is always accepted from the TPSUI. In order to support this, the TPPM describes explicitly queuing operations when they apply.

An example of the need for queuing is that during dialogue establishment for the contention-loser, a bid may be required before the begin dialogue TP APDU is sent. The begin dialogue AF service is therefore queued by the SACF until the bid is complete. While this queuing is taking place, the TPSUI may make further TP service invocations on this dialogue, which will also be queued.

When it becomes necessary to queue, the queuing takes place within the SACF. Certain AF and CCR services are subject to queuing, in that these services may in certain circumstances be queued for a period of time by the SACF before being issued to the TP or CCR ASE. A queue is established for a single dialogue. This queue may subsequently be fully or partially flushed, which causes all or some of the pending service primitives to be processed in a single action sequence, or it may be discarded, which causes the pending service primitives to be discarded. When a queue is fully flushed, any subsequent service primitives are no longer made pending.

7.1.5 Input event blocking at the PSAP

When completing processing for a transaction, APDUs related to a subsequent transaction may be received on an association. The corresponding service primitives cannot be issued to the TPSUI until the transaction is complete.

When service primitives from an association cannot be processed, the TPPM stops accepting service primitives at the PSAP. When processing can resume, the TPPM resumes accepting service primitives at the PSAP including those previously blocked.

NOTE – The concatenator/separator part of the SACF is not prevented from delivering service primitives to the rest of the SAO while service primitives are blocked at the PSAP. These service primitives would be the result of a PSDU already received by the SACF prior to blocking input events at the PSAP. The concatenation rules are such that these incoming events may be processed correctly in that case.

The TPPM stops accepting input events at the PSAP under the following conditions:

a) when a commit confirm has been received from a subordinate and the dialogue has neither been aborted nor had a deferred end dialogue;

b) when a rollback response is issued to or a rollback confirm is received from a subordinate, the Unchained Transactions functional unit is selected, and the dialogue has not been aborted (by the TPSUI);

c) when a C-BEGIN indication is received in the DECIDED (rollback) state and a TP-DONE request is owed;

d) when a rollback confirm is received from or a rollback response is issued to the superior, the Unchained Transactions functional unit is selected, and a TP-DONE request is owed.

The TPPM resumes accepting input events at the PSAP under the following conditions:

a) when a TP-COMMIT-COMPLETE indication is issued, for each subordinate dialogue with a coordination level of “commitment”;

b) when a TP-ROLLBACK-COMPLETE indication is issued, for each subordinate dialogue with a coordination level of “commitment” on which the Unchained Transactions functional unit is selected;

c) when a TP-ROLLBACK-COMPLETE indication is issued, for the superior dialogue;

d) when a TP-U-ABORT request is received on a dialogue on which a rollback response was issued or a rollback confirm was received, and the Unchained Transactions functional unit is selected.

7.1.6 PM error conditions

This protocol specification defines three types of error conditions which may occur during the operation of a PM:

a) *Protocol error* – A condition as described in 7.2 e). The association is aborted when a protocol error occurs. When a protocol error occurs, the relevant Protocol Error procedure (see 10.5.59, 11.3.21, 11.3.22, or 11.3.23) is invoked.

b) *Internal error* – A condition where a local decision is made that the operation of a particular dialogue or channel cannot continue normally. When an internal error on a dialogue is detected, the procedure “Protocol error, internal error, A[-P]-ABORT indication, AF-ABORT (provider, abortRI) indication, A-ABORT request, A-RELEASE (Result=affirmative) response, or A-RELEASE (Result=affirmative) confirm on a dialogue” (see 11.3.21) is invoked. When an internal error on a channel owned by the TPPM is detected, the procedure “Protocol error, internal error, A[-P]-ABORT indication, AF-ABORT (provider, abortRI) indication, A-ABORT request, A-RELEASE (Result=affirmative) response, or A-RELEASE (Result=affirmative) confirm on a channel” (see 11.3.22) is invoked. When an internal error on a channel owned by the CPM is detected, the procedure “Protocol error, internal error, A[-P]-ABORT indication, AF-ABORT (provider, abortRI) indication, A-RELEASE (Result=affirmative) response, or A-RELEASE (Result=affirmative) confirm (CPM)” (see 11.3.23) is invoked.

NOTE 1 – Irregularities in the APDU exchanges between U-ASEs are not visible to the TPPM unless they are intentionally signalled to the MACF; in such a case they may be treated as a TP internal error. Although the U-ASE may define such an irregularity as a protocol error, it is not a protocol error in the scope of Recommendations X.860, X.861, and X.862.

c) *Node crash* – A condition where the operation of the PM cannot continue as determined by local considerations. Upon restart after a node crash, the internal event “Restart after node crash” (see 11.4.3) is triggered.

An internal error or node crash may be triggered by an unexpected event which is received from the TPSUI. Note that rule f) in 7.2 specifies that the procedures assume the operation of the TPSUI is correct according to the service rules, but the state tables in Annex A check for violations of these rules. Should such a violation occur, either an internal error or node crash may be triggered, depending on the scope of the violation as determined locally.

NOTE 2 – An example of a TPSUI triggering a node crash may occur when an error is made in a TP service which affects all dialogues, such as the TP-COMMIT request.

NOTE 3 – A timer expiring is an example of a condition which may trigger an internal error.

7.2 Procedure Rules

The following rules govern the execution of the procedures:

a) *Parameter inheritance*

The tables of 9.3 use the notation “(=)” to represent matching of parameters/fields values from the values of parameters/fields of the preceding (causal) primitive/APDU. This value matching is assumed implicitly, so that explicit calling out of the setting of these values is not done in the procedures.

b) *Procedure atomicity*

Each procedure executes atomically, except in the case of a node crash (see 7.1.3).

c) *Inspection of transaction-related state*

The transaction-related state consists of the transaction state, the node type (that is, root, intermediate, or leaf), and whether the node is a superior, subordinate, or does not exist in the transaction tree. Any inspection of the transaction-related state within the procedures refers to the state at the time of the input event which triggered the current action sequence, with one exception: if the MACF is being re-entered in the same action sequence as a result of an A-ABORT request or an A-RELEASE (Result=affirmative) response, inspection of the transaction-related state refers to its value at the time the MACF is re-entered.

NOTE 1 – This handles the situation where the MACF transitioned from the ACTIVE state to the DECIDED (rollback) state, and then the U-ASE issued an A-ABORT request (for example). The state inspection when the MACF is re-entered will not cause a rollback, since the MACF will see the DECIDED (rollback) state and not the ACTIVE state.

d) *Procedure sequence*

The execution of each action specified in the procedure is assumed to be in the sequence specified in the procedure, unless explicitly stated otherwise.

e) *Protocol error detection*

A protocol error is declared when one of the following conditions occurs:

1) a procedure, other than an internal event procedure (refer to 10.6 and 11.4) is invoked and

   i) no action is taken and no condition is applicable as a result of that procedure invocation; or

      NOTE 2 – The action "continue" is used in the procedures as a null action, to avoid incurring errors of this type. Other conditions in the same procedure may be applicable, however, resulting in non-null actions being taken.

   ii) the procedure precondition is violated (preconditions are presented at the beginning of some procedures in the form of declarative sentences);

2) a TP indication or confirm is issued that violates the constraints specified in Recommendation X.861;

3) a CCR or ACSE protocol error occurs;

4) a TP, CCR, or ACSE APDU is received by the PM which is either not correct ("invalid", see CCITT Rec. X.290) or is not expected ("inopportune", see CCITT Rec. X.290) in the current state of the PM.

   When a protocol error is declared,

   – if the protocol error occurs in the TP-ASE or SACF with no attached MACF, procedure "Protocol error" (see 10.5.59) is executed;

   – if a TPPM MACF is attached to the association on which the protocol error occurred and a dialogue is active, the procedure "Protocol error or ... on a dialogue" (see 11.3.21) is executed with an indication of a protocol error. As a local decision, this procedure may be invoked on multiple associations, if the protocol error is the result of the attempted issuance of a TP indication or confirm not associated with a particular dialogue;

   – if a TPPM MACF is attached to the association on which the protocol error occurred and a channel is active, the procedure "Protocol error or ... on a channel" (see 11.3.22) is executed with an indication of a protocol error. As a local decision, this procedure may be invoked on multiple associations, if the protocol error is the result of the attempted issuance of a TP indication or confirm not associated with a particular dialogue.

   – if a CPM MACF is attached to the association on which the protocol error occurred, the procedure "Protocol error or ... (CPM)" (see 11.3.23) is executed with an indication of a protocol error.

f) *Service rules assumption*

Each TP service primitive is assumed to have been received in accordance with the constraints and conditions specified in CCITT Rec. X.861 and the requirements in Annex F.

g) *No superior/subordinate assumption*

If an action refers to a superior or subordinate, and there is no superior or subordinate (because the node is a root or leaf, respectively), the action is not taken.

h) *Bounds of the past*

In certain cases, the text refers to a TP or CCR service which has been received. For CCR and TP and related AF services contained in the Commit and Unchained Functional Units, this means that the service primitive was received since the beginning of the current transaction. For all other services, this means that the service primitive was received since the beginning of the current dialogue. In any case, this type of memory of previously received service primitives never survives a node crash.

i) *Dialogue assumption*

Any dialogue or channel referred to in a procedure is assumed to be the dialogue or channel on which the service primitive was received/issued, unless stated otherwise.

j) *Tree topology terminology*

Whenever the terms superior, subordinate, root node, intermediate node, or leaf node occur without the qualification "dialogue", they are understood to refer to the transaction tree.

7.3 Definitions

When the following definitions or their logical negations are used in the text, they will appear in italics. AF services used in these definitions are defined in 9.2.

Attach – The specified SAO and association becomes part of the PM. Any indications or confirms made from that SAO are seen by the PM; the PM may direct requests or responses to the SAO.

Close the PSAP – No further PSDUs are accepted at the PSAP unless and until the PSAP is opened (see 7.3, "Open the PSAP").

Commit confirm – One of the following:

- C-COMMIT confirm;
- C-RECOVER (done) confirm;
- AF-HEURISTIC-REPORT (commitRC) indication;
- AF-HEURISTIC-REPORT (recoverDoneRC) indication;
- AF-ABORT (user, commitRC) indication; or
- AF-ABORT-AND-HEURISTIC-REPORT (commitRC) indication.

Commit indication – One of the following:

- C-COMMIT indication;
- C-COMMIT+C-BEGIN indication;
- AF-ABORT (user, commitRI) indication;
- C-RECOVER (commit) indication; or
- AF-RECOVER (commit) indication.

Commit request – One of the following:

- C-COMMIT request;
- C-COMMIT+C-BEGIN request;
- AF-ABORT (user, commitRI) request;
- C-RECOVER(commit) request; or
- AF-RECOVER (commit) request.

Detach – The specified SAO and association ceases being part of the PM. The SAO is no longer able to make indications or confirms to any PM; no PM may direct requests or responses to the SAO.

Dialogue has been detached – One of the following service primitives has been issued/received by the PM for the dialogue:

- SAF-DETACH-ASSOCIATION request;
- SAF-ASSOCIATION-LOST indication;
- A-ABORT request;
- A-[P-]ABORT indication;
- A-RELEASE (Result=affirmative) response or confirm.

Dialogue is chaining transaction branches; chaining dialogue – When all of the following conditions are met:

- the dialogue exists;
- the Chained Transactions functional unit was selected;
- no TP-U-ABORT request was received for the dialogue;
- no AF-ABORT, AF-ABORT-AND-HEURISTIC-REPORT, or A[-P]-ABORT indication was received for the dialogue; and
- if the outcome of the transaction is commitment, no TP-DEFERRED-END-DIALOGUE request and no AF-DEFER (end-dialogue) indication has been received for the dialogue.

Dialogue will have a coordination level of "commitment" – A dialogue established with the following:

- the Chained Transactions functional unit; or
- the begin-transaction parameter is set to "true" on the TP-BEGIN-DIALOGUE request or indication.

NOTE 1 – This definition is necessary because the coordination level does not become defined until the TP-BEGIN-DIALOGUE indication is made. This definition is intended only for use during dialogue establishment.

Discard a queue – The SACF discards all queued service primitives.

NOTE 2 – This definition is used only when a dialogue is terminated.

Establish a queue – The SACF ensures that the AF, CCR, and Presentation service primitives invoked subsequent to the establishment of the queue, are queued.

Flush a queue – The SAO processes some or all (depending on the context in which the definition is used) of the queued service primitives in the order in which they were queued. If all requests and responses were flushed, the SACF then ensures that any subsequently invoked AF, CCR, ACSE, and Presentation requests and responses are not queued.

NOTE 3 – The processing of all requests and responses on the queue is done by the SAO atomically as part of the action sequence in which the queue is flushed.

Forget a transaction – Remove from secure storage the log-ready or log-commit record concerning this transaction, retaining, if any, the log-heuristic and/or the log-damage records.

Last commit confirm was received – When all of the following conditions are met:

- the TPSUI does not *owe a TP-DONE request*;
- a *commit confirm* has been received from each of the subordinates to which a *commit request* was issued.

Last partner identifier is valid – The last-partner-identifier parameter of the most recently received AF-BEGIN-DIALOGUE indication or AF-BID indication is either

- absent or may carry any value, if no AF-BEGIN-DIALOGUE request was issued on this association; or
- has a value equal to the Correlator of the most recently issued AF-BEGIN-DIALOGUE request on this association.

Last ready was received – When all of the following conditions are met:

- a TP-COMMIT request has been received;
- if the TPPM previously started to set the *TPPM bound data* into the ready-to-commit state, the *TPPM bound data* are in the ready-to-commit state; and,

  NOTE 4 – The TPPM may either atomically set the bound data to the ready-to-commit state when writing the log-ready record, or may start to set the bound data to the ready-to-commit state before writing the log-ready record. This condition applies only to the case where the TPPM previously started to set the bound data to the ready-to-commit state.
- a C-READY indication has been received from each of the subordinates to which an AF-PREPARE request was issued.

Last rollback confirm was received – When all of the following conditions are met:

- the TPSUI does not *owe a TP-DONE request*;
- a *rollback indication* or *rollback confirm* has been received from each of the subordinates whose *dialogue has not been detached*.

Open the PSAP – PSDUs are now accepted at the PSAP.

Rollback confirm – One of the following:

- C-ROLLBACK confirm;
- AF-HEURISTIC-REPORT (rollbackRC) indication;
- AF-ABORT (user/provider, rollbackRC) indication;
- AF-ABORT-AND-HEURISTIC-REPORT (rollbackRC) indication; or
- AF-BEGIN-DIALOGUE (accepted/rejected(user), rollbackRC) confirm.

Rollback indication – One of the following:

- C-ROLLBACK indication;
- AF-HEURISTIC-REPORT (rollbackRI) indication;
- AF-ABORT (user/provider, rollbackRI) indication;
- AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) indication; or
- AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) confirm.

Rollback reporting has completed – A *rollback response* was issued to the superior or a *rollback confirm* was received from the superior, or there is no superior dialogue.

Rollback request – One of the following:

- C-ROLLBACK request;
- AF-HEURISTIC-REPORT (rollbackRI) request;
- AF-ABORT (user/provider, rollbackRI) request; or
- AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) request.

Rollback response – One of the following:

- C-ROLLBACK response;
- AF-HEURISTIC-REPORT (rollbackRC) request;
- AF-ABORT (user/provider, rollbackRC) request; or
- AF-ABORT-AND-HEURISTIC-REPORT (rollbackRC) request.

Token – The Session Layer synchronize-minor token which is required by CCR.

A TP-DONE request is owed – When either or both of the following cases holds:

a) the TPPM has received or issued one or more of the following service primitives without having received a subsequent TP-DONE request:
   - a TP-COMMIT indication;
   - a TP-ROLLBACK request/indication;

b) the TPPM is in the DECIDED (commit) or DECIDED (rollback) state and has received or issued one or more of the following service primitives on a dialogue with coordination level of "commitment" without having received a subsequent TP-DONE request:

- a TP-P-ABORT indication;
- a TP-U-ABORT request/indication; or
- a TP-BEGIN-DIALOGUE (rejected) confirm.

TPPM bound data – The bound data controlled by the TPPM.

Transaction initiation purging period – A state of a TPPM with respect to a given dialogue which is entered upon receipt of a TP-BEGIN-TRANSACTION request if

a) the Shared Control functional unit is selected; and

b) there is a *user error purging period.*

The *transaction initiation purging period* is terminated as soon as

a) the number of AF-U-ERROR confirms, AF-END-DIALOGUE indications with the Confirmation parameter set to "true", and AF-HANDSHAKE indications received since the reception of the TP-BEGIN-TRANSACTION request equals the number of TP-U-ERROR requests that were outstanding at that time; or

b) a *rollback confirm* is received.

Transfer the channel – The specified SAO is transferred from the PM to another PM. The specified service invocation and any subsequent service invocations made at this SAO are sent/received to/by the PM to which the SAO is transferred.

User error purging period – A state of a TPPM with respect to a given dialogue which is entered upon receipt of a TP-U-ERROR request if

a) the Polarized Control functional unit is selected and the TPPM does not have control and there is no handshake or dialogue termination indication outstanding; or

b) the Shared Control functional unit is selected and there is no handshake or dialogue termination indication outstanding.

The *user error purging period* is terminated as soon as

a) if the Polarized Control functional unit is selected and a TP-HANDSHAKE indication, a TP-GRANT-CONTROL indication, a TP-HANDSHAKE-AND-GRANT-CONTROL indication, or a TP-END-DIALOGUE indication is issued; or

b) if the Shared Control functional unit is selected and the number of AF-U-ERROR confirms, AF-END-DIALOGUE indications with the confirmation parameter set to "true", and AF-HANDSHAKE indications received since the beginning of the *user error purging period* equals the number of TP-U-ERROR requests received during that period; or

c) a *rollback confirm* is received.

Write the log-commit record – The TPPM ensures that the information specified in 7.4.2 will be available even after the occurrence of a node crash. Remove from secure storage the log-ready record concerning this transaction, if one exists.

Write the log-damage record – The TPPM ensures that the information specified in 7.4.4 will be available even after the occurrence of a node crash.

Write the log-heuristic record – The TPPM ensures that the information specified in 7.4.3 will be available even after the occurrence of a node crash.

Write the log-ready record – The TPPM ensures that the information specified in 7.4.1 will be available even after the occurrence of a node crash.

7.4 Log records used by the PM

The transaction identifier defined in CCITT Rec. X.860 is the atomic action identifier as defined in ISO/IEC 9804. The transaction branch identifier defined in CCITT Rec. X.860 is the branch identifier as defined in ISO/IEC 9804.

7.4.1 Log-ready record

The log-ready record contains the following information written in secure storage:

a) to identify the transaction:
   - atomic action identifier;

b) to identify the branch to the superior:
   - branch identifier;
   - if provided on the TP-INITIALIZE-RI or -RC APDU, the recovery-context-handle received from the superior;

c) for each subordinate, if any, to identify the subordinate:
   - branch identifier;
   - subordinate AE Title;
   - if provided on the TP-INITIALIZE-RI or -RC APDU, the recovery-context-handle received from the subordinate.

7.4.2 Log-commit record

The log-commit record contains the following information written in secure storage:

a) to identify the transaction:
   - atomic action identifier;

b) for each subordinate, to identify the subordinate:
   - branch identifier;
   - subordinate AE Title;
   - if provided on the TP-INITIALIZE-RI or -RC APDU, the recovery-context-handle received from the subordinate.

7.4.3 Log-heuristic record

The log-heuristic record contains the following information written in secure storage:

a) the atomic action identifier;

b) the state of the bound data;

c) information necessary to execute compensating actions, if required.

NOTE – The log-heuristic record models the need for an open system to retain, beyond node crashes, information about the heuristic decision.

7.4.4 Log-damage record

The log-damage record contains the following information written in secure storage:

a) the atomic action identifier;

b) the current known state of the bound data in the node's subtree. Its value is either "heuristic-hazard" or "heuristic-mix".

7.5 Recovery-context-handle

A recovery-context-handle is an identification of a grouping of log records, that will be used for all transactions on a particular association. The use of this grouping and associated recovery-context-handle are optional on any particular association.

NOTE – A possible use of the recovery-context-handle is to allow the partitioning of the set of log records, each part having a different value for the recovery-context-handle.

When the recovery-context-handle is provided by the partner for a given association, its value shall be logged for all transaction branches that are initiated by the partner on this association, and, if initiation of recovery is subsequently required for any of these transaction branches, the value of the recovery-context-handle shall be conveyed on the consequent recovery primitives.

8 Use of ACSE, CCR and the Presentation Layer

8.1 Introduction

This subclause identifies the use and requirements made of ACSE, CCR, and the Presentation Layer, and the rules for establishing, assigning, and terminating associations.

8.2 Use of ACSE Service primitives

The Association Control Service Element (ACSE) is used as described in Recommendation X.217 to establish and release associations.

The TPPM uses the following ACSE services:

– A-ASSOCIATE and A-RELEASE to establish and release associations; and

– A-ABORT to abruptly release an association.

The TPPM also must react to the occurrence of the A-P-ABORT indication primitive.

8.2.1 Use of the A-ASSOCIATE parameters

The parameters of the A-ASSOCIATE service are used by the PMs as specified in Table 1.

TABLE 1/X.862

Use of A-ASSOCIATE parameters

A-ASSOCIATE Parameters	Used by TPPM	
	Application-supported Transactions	Provider-supported Transactions or TP Channel
Mode	Yes	Yes
Application Context Name	Yes	Yes
Calling AP-Title	Conditional	Yes
Calling AE Qualifier	Conditional	Yes

8.2.2 Use of the A-RELEASE parameters

The parameters of the A-RELEASE service are used by the PMs as specified in Table 2.

TABLE 2/X.862

Use of A-RELEASE parameters

A-RELEASE Parameters	Used by TPPM
Reason	No
User Information	No
Result	Yes

8.2.3 Use of the A-ABORT and A-P-ABORT parameters

The parameters of the A-ABORT and A-P-ABORT services are used by the PMs as specified in Tables 3 and 4.

TABLE 3/X.862

Use of A-ABORT parameters

A-ABORT Parameters	Used by TPPM
Abort Source	No
User Information	Yes

TABLE 4/X.862

Use of A-P-ABORT parameters

A-P-ABORT Parameters	Used by TPPM
Provider Reason	No

8.3 Use of CCR Service primitives

The Commitment, Concurrency and Recovery Service Element (CCR) is used for provider-supported transactions.

The PMs use the following CCR services:

- C-BEGIN, C-PREPARE, C-READY, C-COMMIT and C-ROLLBACK for TP services supported by commitment-related functional units; and
- C-RECOVER for transaction recovery.

The PMs use the User Data parameter of some CCR services to convey certain TP APDUs. These CCR services and TP APDUs are specified in Table 30.

The parameters of the CCR services are used by the PMs as specified in Tables 5 to 10.

TABLE 5/X.862

Use of C-BEGIN parameters

C-BEGIN Parameters	Used by TPPM
Atomic Action Identifier – Master's Name	Yes
Atomic Action Identifier – Suffix	Yes
Branch Identifier – Superior's Name	Yes
Branch Identifier – Suffix	Yes
User Data	No

Where the TP procedures refer to the "atomic-action-identifier" parameter of C-BEGIN request and indication, this is the combination of the "Atomic Action Identifier – Master's Name" and the "Atomic Action Identifier – Suffix". Where the TP procedures refer to the "atomic-action-branch-identifier" parameter of C-BEGIN request and indication, this is the combination of the "Branch Identifier – Superior's Name" and the "Branch Identifier – Suffix".

TABLE 6/X.862

Use of C-PREPARE parameters

C-PREPARE Parameters	Used by TPPM
User Data	Yes

TABLE 7/X.862

Use of C-CREADY parameters

C-CREADY Parameters	Used by TPPM
User Data	No

TABLE 8/X.862

Use of C-COMMIT parameters

C-COMMIT Parameters	Used by TPPM
User Data	Conditional

TABLE 9/X.862

Use of C-ROLLBACK parameters

C-ROLLBACK Parameters	Used by TPPM
User Data	Conditional

TABLE 10/X.862

Use of C-RECOVER parameters

C-RECOVER Parameters	Used by (TP)PM
Recovery State	Yes
Atomic Action Identifier	Yes
Branch Identifier	Yes
User Data	Conditional

8.4 Use of the Presentation Layer

8.4.1 Use of Presentation Service primitives

Implementations shall take care that parallelism between the lower layers and the SAO does not result in a violation of the service user rules of those layers.

NOTE – An example of this problem may occur in the case of a rollback. A C-ROLLBACK indication, which is mapped to a P-RESYNCHRONIZE indication, may be processed by the Session layer and not yet processed by the SAO. Before this indication is processed by the SAO, a C-ROLLBACK request, mapped to a P-RESYNCHRONIZE request may be sent to Session, resulting in a violation of the Session Service user rules.

In addition to Presentation Service primitives used by CCR and ACSE Protocol Machines, the TPPM makes use of

- P-TOKEN-PLEASE and P-TOKEN-GIVE for token management (to position the tokens correctly for CCR);
- P-DATA for all other services.

The U-ASE may make use of the P-TOKEN-GIVE or P-TOKEN-PLEASE service to manage the Session tokens. In general, the use of these services by the U-ASE is manifested in the TPPM as a TP-DATA request or a U-ASE indication. There are some cases, however, where the P-TOKEN-GIVE indication which refers to the synchronize-minor token may be seen by the PM. In this case, the procedures of the PM will refer to a P-TOKEN-GIVE (sync-minor) request or indication.

The parameters of the Presentation services are used by the TPPMs as specified in Tables 11 to 13.

TABLE 11/X.862

Use of P-TOKEN-PLEASE parameters

P-TOKEN-PLEASE Parameters	Used by TPPM
Tokens (synchronize-minor)	Yes
User data	Yes

TABLE 12/X.862

Use of P-TOKEN-GIVE (sync-minor) parameters

P-TOKEN-GIVE (sync-minor) Parameters	Used by TPPM
Tokens (synchronize-minor)	Yes
User data	Yes

TABLE 13/X.862

Use of P-DATA parameters

Use of P-DATA Parameters	Used by TPPM
User data	Yes

8.4.2 Mapping of C-ROLLBACK-RI to Presentation

CCR requires a C-ROLLBACK-RI to be mapped to a P-RESYNCHRONIZE request. When CCR is used with TP, the Tokens parameter of the P-RESYNCHRONIZE request shall be set so that the synchronize-minor token is passed to the superior. TP places no requirements on the setting of the Tokens parameter for the other available tokens.

NOTE – If the C-ROLLBACK-RI is issued by a superior, CCR does not specify a value for the Tokens parameter of the P-RESYNCHRONIZE request.

8.5 Association Management

8.5.1 Introduction

This subclause defines the requirements of this protocol specification with respect to the management and use of associations.

8.5.2 Association/dialogue compatibility

An association is said to be compatible with a dialogue if it meets the following conditions:

a) the association shall have been established with an AEI fulfilling the requirements expressed in the Application Context Name, Recipient-AP-Title, and any of the following for which a value was specified: Recipient-TPSU-Title, Recipient-API-Identifier, Recipient-AE-Qualifier, and Recipient-AEI-Identifier parameters as specified by the TP-BEGIN-DIALOGUE request;

b) the association shall have selected the kernel and full duplex Session functional units, the kernel Presentation functional unit, and, if the Commit functional unit is selected, the Session functional units as required by CCR;

NOTE – This includes the Session Data Separation functional unit required by CCR version 2.

c) if the Commit functional unit is selected, CCR version 2's abstract syntax name shall be found in the Presentation Context Definition List and the application context;

d) The association shall have been established with a Quality of Service parameter compatible with the Quality-of-Service parameter specified by the TP-BEGIN-DIALOGUE request, if any.

8.5.3 Association/channel compatibility

An association is said to be compatible with a channel if it meets the following conditions:

a) the association shall have been established with an AEI identified by the AE-title as specified in the log record(s) for the transaction(s) to be recovered, and with an application context appropriate for recovery;

b) the association shall have selected the kernel and full duplex Session functional units, the kernel Presentation functional unit, and the Session functional units as required by CCR;

c) CCR version 2's abstract syntax name shall be found in the Presentation Context Definition List and the application context.

8.5.4 Initiating an association establishment

When establishing an association, a TP-INITIALIZE-RI APDU shall be constructed and issued as User Information of the A-ASSOCIATE request. Table 14 lists the fields of this TP APDU.

TABLE 14/X.862

TP-INITIALIZE-RI/RC APDUs' fields

TP APDU	TP-INITIALIZE-	
Field	RI	RC
Protocol-Version	M	M
Contention-Winner-Assignment	M	
Bid-Mandatory	M	
Recovery-Context-Handle	O	O
Diagnostic		O

The fields of the TP-INITIALIZE-RI APDU are set as follows:

a) the Protocol-Version field indicates the possible versions of the TP Protocol that can be supported. The TPPM may support more than one version of the protocol;

NOTE 1 – A TPPM may also propose different subsets of the versions it supports; which versions to propose is a local matter.

b) the Contention-Winner-Assignment field identifies whether or not the initiating TPPM will be considered as the contention-winner of this association. This field takes one of the following values:

"true" (the initiator is the contention-winner);

"false" (the initiator is the contention-loser).

If CCR is included in the application context of the association, then the following applies to the setting of the A-ASSOCIATE request parameter "Initial Assignment of Tokens":

1) if the value of the Contention-Winner-Assignment field is "true", the value of the A-ASSOCIATE request parameter "Initial Assignment of Tokens" (see 8.2.1) is "requestor side";

2) if the value of this field is "false", the value of the A-ASSOCIATE request parameter "Initial Assignment of Tokens" is "acceptor side";

c) the Bid-Mandatory field indicates whether the use of the bid mechanism (by the contention-loser) is mandatory or not. This field takes one of the following values:

"true";

"false";

d) the Recovery-Context-Handle field is optionally used to provide a value that is to be supplied when recovery is requested by the remote TPPM;

NOTE 2 – An association, once established, may be required to support dialogues with different requirements, and also TP channels. Therefore, the requirements declared when the association is established, must be sufficient for all intended uses of the association. For example, a Recovery-Context-Handle may be specified even though initial use of the association may be for a dialogue without the Commit functional unit or for a TP channel, neither of which have any use for a Recovery-Context-Handle.

8.5.5 Receiving an association establishment indication

Upon receipt of an A-ASSOCIATE indication, a TP-INITIALIZE-RI APDU shall be received as User Information of the A-ASSOCIATE indication. Table 14 lists the fields of this TP APDU.

The fields of the TP-INITIALIZE-RI APDU are used as follows:

a) if the Protocol-Version field contains a version that is supported by the TPPM, the association may be accepted. If not, the association shall be rejected. The TPPM ignores any values that indicate a later version of the protocol than it can support;

b) if the value of the Contention-Winner-Assignment field is acceptable to the TPPM, the association may be accepted. Otherwise, the association shall be rejected;

c) if the value of the Bid-Mandatory field is acceptable to the TPPM, the association may be accepted. Otherwise, the association shall be rejected;

d) if the Recovery-Context-Handle field is present, its value shall be stored in the recovery log (the log-ready record or the log-commit record, whichever applies, see 7.5) for all transactions on the association;

e) if CCR will be used on the association (for a dialogue with coordination level "Commitment" or a channel), and the A-ASSOCIATE indication either

i) does not contain an entry for CCR version 2's abstract syntax name in the Presentation Context Definition List parameter; or

ii) the Session functional units required by CCR version 2 are not selected in the Session Requirements parameter;

then the association shall be rejected. Otherwise, the association may be accepted.

8.5.6 Responding to association establishment

When responding to association establishment, a TP-INITIALIZE-RC APDU shall be constructed and issued as User Information of the A-ASSOCIATE response. Table 14 lists the fields of this TP APDU.

The fields of the TP-INITIALIZE-RC APDU (and the Result parameter of the A-ASSOCIATE response) are set as follows:

a) if the association is accepted,

1) the Result parameter of the A-ASSOCIATE response shall be set to "accepted";

2) the Protocol-Version field of the TP-INITIALIZE-RC APDU shall be set to the version of this Recommendation to be used for this association. This version shall be one of the protocol versions proposed on the TP-INITIALIZE-RI APDU;

3) the Recovery-Context-Handle field of the TP-INITIALIZE-RC APDU may (optionally) be set to a value that shall be used when recovery is requested by the remote TPPM;

4) the Diagnostic field of the TP-INITIALIZE-RC APDU shall be omitted;

b) if the association is rejected,

1) the Result parameter of the A-ASSOCIATE response shall be set to

i) "rejected(permanent)", if the Diagnostic field of the TP-INITIALIZE-RC APDU contains any of the settings

a) "tp-protocol-version-incompatibility";

b) "ccr-version-2-not-available";

ii) "rejected(transient)", otherwise;

2) the Protocol-Version field of the TP-INITIALIZE-RC APDU shall be set to the versions of this Recommendation that can be supported;

3) the Recovery-Context-Handle field of the TP-INITIALIZE-RC APDU shall be omitted;

4) the Diagnostic field of the TP-INITIALIZE-RC APDU shall be set to all applicable values of the following:

i) "ccr-version-2-not-available", if CCR is required on the association and either or both the CCR version 2 is not available or the Session functional units required for CCR version 2 are not selected in the A-ASSOCIATE indication;

ii) "tp-protocol-version-incompatibility", if none of the values of the Protocol-Version field offered in the TP-INITIALIZE-RI APDU can be supported for this association;

iii) "contention-winner-assignment-rejected", if the value of the Contention-Winner-Assignment field of the TP-INITIALIZE-RI APDU is not acceptable for this association;

iv) "bid-mandatory-value-rejected", if the value of the Bid-Mandatory field of the TP-INITIALIZE-RI APDU is not acceptable for this association;

v) "no-reason-given", if none of the above Diagnostic values applies.

8.5.7 Receiving confirmation of association establishment

Upon receipt of an A-ASSOCIATE confirm, a TP-INITIALIZE-RC APDU shall be received as User Information of the A-ASSOCIATE confirm. Table 14 lists the fields of this TP APDU.

The fields of the TP-INITIALIZE-RC APDU are used as follows:

a) if the association is accepted, Protocol-Version defines the protocol version of this Recommendation to be used for this association. If the value of the Protocol-Version field is not one of the versions that was proposed on the TP-INITIALIZE-RI APDU, this is an error and the association shall be released;

b) if the association is rejected, the Protocol-Version field contains the protocol versions of this Recommendation that can be supported;

c) if the association is accepted and if the Recovery-Context-Handle field is present, its value shall be stored in the recovery log (the log-ready record or the log-commit record, whichever applies, see 7.5) for all transactions on the association.

The A-ASSOCIATE confirm with no embedded TP-INITIALIZE-RC APDU shall only be received when the association establishment was rejected by ACSE.

If the Application Context Name parameter on the A-ASSOCIATE confirm is different from the Application Context Name parameter on the A-ASSOCIATE request, the PM makes a local decision whether to

1) accept the association using this new application context; or

2) release the association.

NOTE – When an association has been rejected, it is a local decision as to what to do next. The TPPM, based on a local decision, may notify the TPSUI that the dialogue is being rejected, it may try again (immediately) to establish the association, it may wait for some period of time and then retry, etc.

8.5.8 Initiating an association release

Release of an association may be initiated according to a local decision at any time the SACF is in the FREE state (see 10.2).

8.5.9 Aborting an association

An A-ABORT request may be issued by a U-ASE at any time. If a U-ASE issues an A-ABORT request, then the TPPM will take the actions appropriate to association abort which may include rolling back the current transaction or initiating recovery.

9 TP-ASE description

9.1 Introduction

This subclause defines the Service Primitives provided by the TP-ASE to the MACF (through the applicable SACF procedures). It further defines the TP APDUs generated to, and received from, the partner TP-ASE. It also defines the TP APDU mappings onto CCR, ACSE, and Presentation services.

Table 15 lists the AF Service primitives together with associated TP APDUs.

TABLE 15/X.862

AF Service Primitives and Associated TP APDUs

AF Service Primitives	TP APDUs
AF-BEGIN-DIALOGUE req/ind AF-BEGIN-DIALOGUE rsp/cnf	TP-BEGIN-DIALOGUE-RI TP-BEGIN-DIALOGUE-RC
AF-BID req/ind AF-BID rsp/cnf	TP-BID-RI TP-BID-RC
AF-END-DIALOGUE req/ind AF-END-DIALOGUE rsp/ind	TP-END-DIALOGUE-RI TP-END-DIALOGUE-RC
AF-U-ERROR req/ind AF-U-ERROR rsp/cnf	TP-U-ERROR-RI TP-U-ERROR-RC
AF-ABORT req/ind	TP-ABORT-RI
AF-ABORT-AND-HEURISTIC-REPORT req/ind	TP-ABORT-RI + TP-HEURISTIC-REPORT-RI
AF-GRANT-CONTROL req/ind	TP-GRANT-CONTROL-RI
AF-REQUEST-CONTROL req/ind	TP-REQUEST-CONTROL-RI
AF-HANDSHAKE req/ind AF-HANDSHAKE rsp/cnf	TP-HANDSHAKE-RI TP-HANDSHAKE-RC
AF-HANDSHAKE-AND-GRANT-CONTROL req/ind AF-HANDSHAKE-AND-GRANT-CONTROL rsp/cnf	TP-HANDSHAKE-AND-GRANT-CONTROL-RI TP-HANDSHAKE-AND-GRANT-CONTROL-RC
AF-DEFER req/ind	TP-DEFER-RI
AF-PREPARE req/ind	TP-PREPARE-RI
AF-HEURISTIC-REPORT req/ind	TP-HEURISTIC-REPORT-RI
AF-TOKEN-GIVE req/ind	TP-TOKEN-GIVE-RI
AF-TOKEN-PLEASE req/ind	TP-TOKEN-PLEASE-RI
AF-RECOVER req/ind	TP-RECOVER-RI

9.2 AF Service Definition

The primitives and parameters of the AF services are given in 9.3. The sequence of primitives is given by the appropriate tables in 9.3, reading from left-to-right. This protocol specification (see clauses 7 to 11 and, indirectly by reference, the TP Service) defines the constraints on, effects, and collisions of the service primitives.

9.2.1 AF-BEGIN-DIALOGUE

This service is initiated as a direct result of a TP-BEGIN-DIALOGUE request service primitive, or is initiated directly by the CPM to establish a channel.

This service is a confirmed service for channels and a conditionally confirmed service for dialogues.

NOTE – The only time this service is not confirmed is when the confirmation parameter of the AF-BEGIN-DIALOGUE request is set to "negative", the dialogue is not rejected, and a rollback-initiating service primitive or a TPPM-initiated rollback occurs at the partner prior to any other requests or responses by that partner. In this case, a C-ROLLBACK indication or confirm will serve to confirm the dialogue establishment.

The AF-BEGIN-DIALOGUE response and confirm are used as delimiters for discarding stray APDUs.

When the response and confirm service primitives are referenced in the procedure clauses, the first value listed in the parenthetical argument is the value of the Result parameter; the second is the value of the Mapping parameter.

9.2.2 AF-BID

This confirmed service is used by the SACF in order to gain the rights of the contention-winner temporarily for attempting establishment of the subsequent dialogue or channel.

When the response and confirm service primitives are referenced in the procedure clauses, the value listed in the parenthetical argument is the value of the Result parameter.

9.2.3 AF-END-DIALOGUE

This service is initiated as a direct result of a TP-END-DIALOGUE request service primitive, or is initiated directly by the CPM to terminate a channel.

This is an optionally confirmed service for dialogues. This is an unconfirmed service for channels.

9.2.4 AF-U-ERROR

This service is initiated as a direct result of a TP-U-ERROR request service primitive.

This is an unconfirmed service in Polarized Control.

In Shared Control, this is an unconfirmed service when it serves as a negative response to a prior AF-HANDSHAKE indication or an AF-END-DIALOGUE indication with the Confirmation parameter set to "true". Otherwise, this is a confirmed service and the request primitive begins the *user error purging period*; in this case, either an AF-U-ERROR confirm, an AF-HANDSHAKE indication, or an AF-END-DIALOGUE indication with the Confirmation parameter set to "true" serves as the confirmation to the AF-U-ERROR request (but see the definition of *user error purging period* in 7.3 for more details when more than one AF-U-ERROR request is unconfirmed).

9.2.5 AF-ABORT

This service is initiated as a direct result of a TP-U-ABORT request service primitive, or is initiated directly by the PM to abnormally terminate a dialogue or channel.

This is an unconfirmed service.

When this service primitive is referenced in the procedure clauses, the first value listed in the parenthetical argument is the value of the Type parameter; the second is the value of the Mapping parameter.

9.2.6 AF-GRANT-CONTROL

This service is initiated as a direct result of a TP-GRANT-CONTROL request service primitive.

This is an unconfirmed service.

9.2.7 AF-REQUEST-CONTROL

This service is initiated as a direct result of a TP-REQUEST-CONTROL request service primitive.

This is an unconfirmed service.

9.2.8 AF-HANDSHAKE

This service is initiated as a direct result of a TP-HANDSHAKE request service primitive.

This is a confirmed service.

9.2.9 AF-HANDSHAKE-AND-GRANT-CONTROL

This service is initiated as a direct result of a TP-HANDSHAKE-AND-GRANT-CONTROL request service primitive.

This service is a confirmed service.

9.2.10 AF-DEFER

This service is initiated as a result of either a TP-DEFERRED-END-DIALOGUE or a TP-DEFERRED-GRANT-CONTROL request service primitive.

This is an unconfirmed service.

When this service primitive is referenced in the procedure clauses, the value listed in the parenthetical argument is the value of the Type parameter.

9.2.11 AF-PREPARE

This service is initiated as a direct result of either a TP-PREPARE request service primitive or a TP-COMMIT request service primitive by a superior.

This is an unconfirmed service.

9.2.12 AF-HEURISTIC-REPORT

This service is initiated by a subordinate as a result of the existence of log-damage in the subtree.

This is an unconfirmed service.

When this service primitive is referenced in the procedure clauses, the value listed in the parenthetical argument is the value of the Mapping parameter.

9.2.13 AF-ABORT-AND-HEURISTIC-REPORT

This service is initiated by a subordinate as a result of the existence of log-damage in the subtree along with a dialogue abort condition.

This is a combination of the AF-ABORT and AF-HEURISTIC-REPORT service and has the combined semantics of the AF-ABORT and AF-HEURISTIC-REPORT services.

This is an unconfirmed service.

When this service primitive is referenced in the procedure clauses, the value listed in the parenthetical argument is the value of the Mapping parameter.

9.2.14 AF-RECOVER

This service enables TPPMs to invoke recovery after a failure when the recovery-context-handle is provided.

This service is unconfirmed.

When this service primitive is referenced in the procedure clauses, the value listed in the parenthetical argument is the value of the Recovery-State parameter.

9.2.15 AF-TOKEN-GIVE

This service is used to transfer the *token* to the peer PM either during two-way-recovery or while establishing or terminating a dialogue.

This is an unconfirmed service.

9.2.16 AF-TOKEN-PLEASE

This service is used to request the *token* from the peer PM; it will be used by CPMs only.

This is an unconfirmed service.

9.3 AF-Services and TP APDUs: parameters and fields Mappings

9.3.1 AF-BEGIN-DIALOGUE request/indication/response/confirm, TP-BEGIN-DIALOGUE-RI/-RC APDU

Tables 16 and 17 give the parameters and fields mappings for Dialogue Establishment and Channel Establishment, respectively. The parameters and fields are as described in the "Primitives and parameters" subclause for the TP-BEGIN-DIALOGUE service in Recommendation X.861, with the following exceptions:

a) *Functional-Units* – The meaning and usage of this parameter/field is as described for the TP-BEGIN-DIALOGUE Service in Recommendation X.861, except that when it is used on a Channel, the parameter specifies only the Recovery Functional Unit (see 13.1.3);

b) *Result* – The meaning and usage of this parameter/field is as described for the TP-BEGIN-DIALOGUE Service in Recommendation X.861, except that the value "rejected(provider)" is permitted on the AF-BEGIN-DIALOGUE response. For a channel, the value "rejected(user)" is not used;

c) *Diagnostic* – The meaning and usage of this parameter/field is as described for the TP-BEGIN-DIALOGUE Service in Recommendation X.861, except that the following additional values are allowed:

   1) "two-way-recovery-not-supported" when "two-way-recovery" was the value of the Channel-Utilization parameter/field. This value only applies to channels;

   2) "association-reserved" when the contention-winner has reserved the association for its use;

   3) "tppm-recovery-not-available" when the CPM is unable to support recovery, due to a local condition. This value only applies to channels.

      The following values do not apply to channels:

      1) "recipient-tpsu-title-unknown";

      2) "tpsu-not-available(permanent)";

      3) "tpsu-not-available(transient)";

      4) "recipient-tpsu-title-required";

      5) "functional-unit-combination-not-supported";

d) *Correlator* – A correlator unique within the scope of an association.

   Due to the use of unconfirmed services and re-use of associations, it may happen that APDUs that are foreign to a particular dialogue are received. Such APDUs are referred to as "stray APDUs".

   To resolve such an ambiguity, a correlator is conveyed with the request for, and the acknowledgment/rejection of a dialogue/channel establishment to identify the dialogue/channel.

   The value of this parameter is set on the request/response when the service primitive passes through the SACF;

e) *Channel-Utilization* – Identifies the use of the channel. It takes one of the following values:

   1) "one-way-recovery";

   2) "two-way-recovery";

   depending on the desired mode of recovery and is present only if the Recovery Functional Unit (see 13.1.3.2) is selected in the value of the Functional-Units parameter of the AF-BEGIN-DIALOGUE request;

f) *Mapping* – Indicates the underlying service to which this AF service is mapped. For AF-BEGIN-DIALOGUE response, it may have one of the following values:

"dataRI "- Mapped to P-DATA request

"rollbackRI" – Mapped to C-ROLLBACK request

"rollbackRC" – Mapped to C-ROLLBACK response

For AF-BEGIN-DIALOGUE confirm, it may have one of the following values:

"dataRI" – Mapped from P-DATA indication

"rollbackRI" – Mapped from C-ROLLBACK indication

"rollbackRC" – Mapped from C-ROLLBACK confirm

g) *Last-Partner-Identifier* – Contains the value of the Correlator of the last TP-BEGIN-DIALOGUE-RI APDU received by the contention-loser. If no dialogue has been established on the association, the bid mechanism has been used for this dialogue, or the requestor is the contention-winner, this parameter/field does not exist.

TABLE 16/X.862

Dialogue Establishment mappings

Service Primitive/TP APDU	TP-	AF-	TP-	AF-	TP-		TP-	AF-	TP-	AF-	TP-
	- BEGIN-DIALOGUE -										
Parameter/Field	req	req	-RI	ind	ind		rsp	rsp	-RC	cnf	cnf
Initiating-AP-Title					O						
Initiating-API-Identifier					O						
Initiating-AE-Qualifier					O						
Initiating-AEI-Identifier					O						
Initiating-TPSU-Title	U	(=)	(=)	(=)	(=)						
Recipient-AP-Title	M										
Recipient-API-Identifier	C										
Recipient-AE-Qualifier	C										
Recipient-AEI-Identifier	C										
Recipient-TPSU-Title	U	(=)	(=)	(=)							
Functional-Units	M	(=)	(=)	(=)	(=)			C	(=)	(=)	(=)
Quality-of-Service	U										
Application Context Name	M										
Begin-Transaction	C	(=)	(=)	(=)	(=)						
Confirmation	M	(=)	(=)	(=)	(=)						
Result							M	(=)/M	(=)	(=)	(=)
Diagnostic								C	(=)	(=)/M	(=)
Rollback											M
Correlator		M	(=)	(=)				(=)	(=)	(=)	
Channel-Utilization											
Mapping								M		(=)	
Last-Partner-Identifier		C	(=)	(=)							
User-Data	U	(=)	(=)	(=)	(=)		U	(=)	(=)	(=)	(=)

TABLE 17/X.862

Channel Establishment mappings

Service Primitive/TP APDU	AF-	TP-	AF-		AF-	TP-	AF-
	- - - - - - - - - - - - BEGIN-DIALOGUE- - - - - - - - - - - -						
Parameter/Field	req	-RI	ind		rsp	-RC	cnf
Initiating-AP-Title							
Initiating-API-Identifier							
Initiating-AE-Qualifier							
Initiating-AEI-Identifier							
Initiating-TPSU-Title							
Recipient-AP-Title							
Recipient-API-Identifier							
Recipient-AE-Qualifier							
Recipient-AEI-Identifier							
Recipient-TPSU-Title							
Functional-Units	M	(=)	(=)				
Quality-of-Service							
Application Context Name							
Begin-Transaction							
Confirmation							
Result					M	(=)	(=)
Diagnostic					C	(=)	(=)
Rollback							
Correlator	M	(=)	(=)		(=)	(=)	(=)
Channel-Utilization	M	(=)	(=)				
Mapping					M		(=)
Last-Partner-Identifier	C	(=)	(=)				
User-Data							

9.3.2 AF-BID request/indication/response/confirm, TP-BID-RI/-RC APDU

Table 18 gives the parameters and fields mappings for the bid mechanism. The parameters and fields are as follows:

a) *CCR-Token-Requested* – Indicates whether the *token* required by CCR is requested. It takes the following values:

   1) "true", when the *token* is requested;

   2) "false", when the *token* is not requested;

b) *Last-Partner-Identifier* – Contains the value of the Correlator of the last TP-BEGIN-DIALOGUE-RI APDU received by the contention-loser. If no dialogue has been established on the association, this parameter/field does not exist;

c) *Result* – Indicates whether the contention-loser has been temporarily granted the rights of the contention-winner. It takes the following values:

   1) "accepted", when the rights are granted;

   2) "rejected", when the rights are not granted.

TABLE 18/X.862

Bid mechanism mappings

Service Primitive/TP APDU	AF-	TP-	AF-		AF-	TP-	AF-
	- - - - - - - - - - - - - - BID - - - - - - - - - - - - - -						
Parameter/Field	req	-RI	ind		rsp	-RC	cnf
CCR-Token-Requested	M	(=)	(=)				
Last-Partner-Identifier	C	(=)	(=)				
Result					M	(=)	(=)

9.3.3 AF-END-DIALOGUE request/indication/response/confirm, TP-END-DIALOGUE-RI/-RC APDU

Table 19 gives the parameter and field mappings for Dialogue Termination. The parameter and field are as described in the "Primitives and parameters" subclause for the TP-END-DIALOGUE service in Recommendation X.861.

Table 20 gives the parameter and field mappings for Channel Termination, the parameter and field is as follows:

a) *Confirmation* – This must be set to "false" (see 11.4.6, "Terminating a channel").

The AF-END-DIALOGUE response and confirm primitives have no parameters; the TP-END-DIALOGUE-RC APDU has no fields.

TABLE 19/X.862

Dialogue termination mappings

Service Primitive/ TP APDU	TP-	AF-	TP-	AF-	TP-
	- - - - - END-DIALOGUE - - - - -				
Parameter/Field	req	req	RI	ind	ind
Confirmation	M	(=)	(=)	(=)	(=)

TABLE 20/X.862

Channel termination mappings

Service Primitive/ TP APDU	AF-	TP-	AF-
	- - - END-DIALOGUE - - -		
Parameter/Field	req	RI	ind
Confirmation	M	(=)	(=)
NOTE – The confirmation parameter is always "false" for Channel Termination (11.4.6, "Terminating a channel.")			

9.3.4 AF-U-ERROR request/indication/response/confirm, TP-U-ERROR-RI/-RC APDU

These services have no parameters and these TP APDUs have no fields.

9.3.5 AF-ABORT request/indication, TP-ABORT-RI APDU

Tables 21 and 22 give the parameters and field mappings for User Abort and Provider Abort, respectively. The parameters and fields are as described in the "Primitives and parameters" subclause for the TP-U-ABORT and TP-P-ABORT services in Recommendation X.861, with the following exceptions:

a) *Type* – Indicates the type of abort (user or provider). It takes one of the following values:

   1) "user",

   2) "provider";

b) *Mapping* **–** Indicates the underlying service to which this AF service is mapped. For AF-ABORT request, it takes one of the following values:

   "abortRI" – Mapped to A-ABORT request

   "dataRI" – Mapped to P-DATA request

   "commitRI" – Mapped to C-COMMIT request

   "commitRC" – Mapped to C-COMMIT response

   "rollbackRI" – Mapped to C-ROLLBACK request

   "rollbackRC" – Mapped to C-ROLLBACK response

   For AF-ABORT indication, it takes one of the following values:

   "abortRI" – Mapped from A-ABORT indication

   "dataRI" – Mapped from P-DATA indication

   "commitRI" – Mapped from C-COMMIT indication

   "commitRC" – Mapped from C-COMMIT confirm

   "rollbackRI" – Mapped from C-ROLLBACK indication

   "rollbackRC" – Mapped from C-ROLLBACK confirm

c) *Diagnostic* – Does not take the values "end-dialogue-collision" or "begin-transaction-end-dialogue-collision".

   NOTE – These values are generated locally by the MACF.

TABLE 21/X.862

User Abort mappings

Service Primitive/ TP APDU	TP-U	AF-	TP-	AF-	TP-U
	- - - - - - - ABORT - - - - - - -				
Parameter/Field	req	req	RI	ind	ind
Type		M	(=)	(=)	
Mapping		M		(=)	
Diagnostic					
Rollback					M
User-Data	U	(=)	(=)	(=)	(=)

TABLE 22/X.862

Provider Abort mappings

Service Primitive/ TP APDU	AF-	TP-	AF-	TP-P
	- - - - - - ABORT - - - - - -			
Parameter/Field	req	RI	ind	ind
Type	M	(=)	(=)	
Mapping	M		(=)	
Diagnostic	M	(=)	(=)	(=)/M
Rollback				M
User-Data				

9.3.6 AF-GRANT-CONTROL request/indication, TP-GRANT-CONTROL-RI APDU

These services have no parameters and this TP APDU has no fields.

9.3.7 AF-REQUEST-CONTROL request/indication, TP-REQUEST-CONTROL-RI APDU

These services have no parameters and this TP APDU has no fields.

9.3.8 AF-HANDSHAKE request/indication/response/confirm, TP-HANDSHAKE-RI/-RC APDU

Table 23 gives the parameter and field mappings for Handshake. The parameter and field are as described in the "Primitives and parameters" subclause for the TP-HANDSHAKE service in Recommendation X.861.

The AF-HANDSHAKE response and confirm primitives have no parameters; the TP-HANDSHAKE-RC APDU has no fields.

TABLE 23/X.862

Handshake mappings

Service Primitive/ TP APDU	TP-	AF-	TP-	AF-	TP-
	- - - - - HANDSHAKE - - - - -				
Parameter/Field	req	req	RI	ind	ind
Confirmation-Urgency	C	(=)	(=)		

9.3.9 AF-HANDSHAKE-AND-GRANT-CONTROL request/indication/response confirm, TP-HANDSHAKE-AND-GRANT-CONTROL-RI/-RC APDU

Table 24 gives the parameter and field mappings for Handshake and Grant Control. The parameter and field are as described in the "Primitives and parameters" subclause for the TP-HANDSHAKE-AND-GRANT-CONTROL service in Recommendation X.861.

The AF-HANDSHAKE-AND-GRANT-CONTROL response and confirm primitives have no parameters; the TP-HANDSHAKE-AND-GRANT-CONTROL-RC APDU has no fields.

TABLE 24/X.862

Handshake and Grant Control mappings

Service Primitive/ TP APDU	TP-	AF-	TP-	AF-	TP-
	HANDSHAKE -AND-GRANT-CONTROL				
Parameter/Field	req	req	RI	ind	ind
Confirmation-Urgency	M	(=)	(=)		

9.3.10 AF-DEFER request/indication, TP-DEFER-RI APDU

Table 25 gives the parameter and field mappings for Deferred End Dialogue and Deferred Grant Control. The parameter and field are as described in the following:

a) *Type* – Indicates the type of Deferred service (End Dialogue or Grant Control). It takes one of the following values:

1) "end-dialogue",

2) "grant-control".

TABLE 25/X.862

Deferred End Dialogue and Deferred Grant Control mappings

Service Primitive/ TP APDU	TP-D-E-D or D-G-C[a)]	AF	TP-	AF-	TP-D-E-D or D-G-C[a)]
	- - - - - - DEFER - - - - - - -				
Parameter/Field	req	req	RI	ind	ind
Type		M	(=)	(=)	
[a)] TP-DEFERRED-END-DIALOGUE or TP-DEFERRED-GRANT-CONTROL					

9.3.11 AF-PREPARE request/indication, TP-PREPARE-RI APDU

Table 26 gives the parameter and field mappings for TP/AF-PREPARE. The parameters and fields are as described in the "Primitives and parameters" subclauses for TP-PREPARE request and TP-PREPARE indication in Recommendation X.861.

TABLE 26/X.862

TP/AF-PREPARE mappings

Service Primitive/ TP APDU	TP-	AF-	TP-	AF-	TP-
	- - - - - - - - PREPARE - - - - - -				
Parameter/Field	req	req	RI	ind	ind
Data-Permitted	C	(=)	(=)	(=)	(=)

9.3.12 AF-HEURISTIC-REPORT request/indication, TP-HEURISTIC-REPORT-RI APDU

Table 27 gives the parameters and field mappings for Heuristic Reporting. The parameters and field are as described in the "Primitives and parameters" subclause for the TP-HEURISTIC-REPORT service in Recommendation X.861, and in the "C-RECOVER parameters" subclause in ISO/IEC 9804, with the following exception:

a) *Mapping* – Indicates the underlying service to which this AF service is mapped. For AF-HEURISTIC-REPORT request, it takes one of the following values:

"commitRC" – Mapped to C-COMMIT response

"recoverDoneRC" – Mapped to C-RECOVER (done) response

"rollbackRI" – Mapped to C-ROLLBACK request

"rollbackRC" – Mapped to C-ROLLBACK response

For AF-HEURISTIC-REPORT indication, it takes one of the following values:

"commitRC" – Mapped from C-COMMIT confirm

"recoverDoneRC" – Mapped from C-RECOVER (done) confirm

"rollbackRI" – Mapped from C-ROLLBACK indication

"rollbackRC" – Mapped from C-ROLLBACK confirm

TABLE 27/X.862

Heuristic Reporting mappings

Service Primitive/ TP APDU	AF-	TP-	AF-	TP-
	- - HEURISTIC-REPORT - -			
Parameter/Field	req	RI	ind	ind
Mapping	M		(=)	
Heuristic-Report	M	(=)	(=)	(=)
Atomic Action Identifier	C[a)]			
Branch Identifier	C[a)]			
[a)] These parameters exist if the Mapping parameter is recoverDoneRC.				

9.3.13 AF-ABORT-AND-HEURISTIC-REPORT request/indication

Table 28 gives the parameters mappings for the combined Auxiliary Facility Service AF-ABORT-AND-HEURISTIC-REPORT. The parameters are as described in the "Primitives and parameters" subclause for the TP-HEURISTIC-REPORT service and the TP-U-ABORT service in Recommendation X.861, with the following exceptions:

a) *Mapping* – Indicates the underlying service to which this AF service is mapped. For AF-ABORT-AND-HEURISTIC-REPORT request, it takes one of the following values:

"commitRC" – Mapped to C-COMMIT response

"rollbackRI" – Mapped to C-ROLLBACK request

"rollbackRC" – Mapped to C-ROLLBACK response

For AF-ABORT-AND-HEURISTIC-REPORT indication, it takes one of the following values:

"commitRC" – Mapped from C-COMMIT confirm

"rollbackRI" – Mapped from C-ROLLBACK indication

"rollbackRC" – Mapped from C-ROLLBACK confirm

The User-Data parameter of the AF-ABORT-AND-HEURISTIC-REPORT service is present if the TP-U-ABORT request has a User-Data parameter.

TABLE 28/X.862

AF-ABORT-AND-HEURISTIC-REPORT request/indication

Service Primitive/ TP APDU	AF-	AF-
	ABORT-AND-HEURISTIC-REPORT	
Parameter/Field	req	ind
Mapping	M	(=)
Heuristic-Report	M	(=)
User-Data	C	(=)

9.3.14 AF-RECOVER request/indication, TP-RECOVER-RI APDU

Table 29 gives the parameters and field mappings for TP/AF-RECOVER. The parameters and fields are as described in the "C-RECOVER parameters" subclause in ISO/IEC 9804, with the following exceptions:

a) *Recovery-Context-Handle* – Takes the value of the field with the same name received on the TP-INITIALIZE-RI/RC APDU from the partner AEI.

TABLE 29/X.862

TP/AF-RECOVER mappings

Service Primitive/ TP APDU	AF-	TP-	AF-
	- - - RECOVER - - -		
Parameter/Field	req	RI	ind
Recovery-State	M		(=)
Recovery-Context-Handle	M	(=)	(=)
Atomic Action Identifier	M		
Branch Identifier	M		

If a Recovery-Context-Handle does not exist for the remote partner, then this AF-Service and this TP APDU shall not be used.

9.3.15 AF-TOKEN-GIVE request/indication, TP-TOKEN-GIVE-RI APDU

Table 30 gives the parameters and field mappings for the AF-TOKEN-GIVE service. The parameters and fields are as described following:

a) *Reason* – Indicates the reason for which the *token* is transferred. It takes one of the following values:

1) regular – the *token* is transferred under the following conditions:

i) when it arrives at the contention-loser outside of a dialogue (that is, in the SACF FREE, STRAY, or BIDDING states);

ii) when it arrives at the contention-winner after an AF-BID (accepted) response request is issued;

iii) after the issuance of a *rollback response* or the receipt of a *rollback confirm* outside of a dialogue (that is, in the SACF CLEANUP ROLLBACK INDICATION EXPECTED or CLEANUP ROLLBACK CONFIRM EXPECTED states) by the contention-loser;

2) keep – the *token* is transferred under the following conditions:

i) when an AF-BEGIN-DIALOGUE indication is received by the contention-winner and the bid mechanism was not used;

ii) when an AF-TOKEN-GIVE (regular) indication is received by the contention-winner within a dialogue (that is, in the SACF BUSY state);

3) two-way-recovery – the *token* is transferred on a two-way-recovery channel after the issuance of a C-RECOVER request or AF-RECOVER request;

b) *Correlator* – Contains the value of the Correlator of the last TP-BEGIN-DIALOGUE-RI APDU received by the contention-winner. The Correlator of the AF-TOKEN-GIVE request is present if the value of the Reason parameter is set to "keep".

TABLE 30/X.862

TP/AF-TOKEN-GIVE mappings

Service Primitive/ TP APDU	AF-	TP-	AF-
	- - TOKEN-GIVE - -		
Parameter/Field	req	RI	ind
Reason	M	(=)	(=)
Correlator	C	(=)	(=)

9.3.16 AF-TOKEN-PLEASE request/indication, TP-TOKEN-PLEASE-RI APDU

These services have no parameters and this TP APDU has no fields.

9.4 Procedures

The following subclauses specify the actions taken upon receipt of the specified AF-Service primitive, TP APDU, or ACSE or CCR Service primitive containing a TP APDU.

NOTES

1 ACSE and CCR indication and confirm service primitives that do not contain an embedded TP APDU are given to the MACF through the appropriate SACF procedures.

2 TP APDUs not contained in ACSE or CCR Service primitives are contained in Presentation Service primitives.

9.4.1 AF-BEGIN-DIALOGUE request

– Send a TP-BEGIN-DIALOGUE-RI APDU.

9.4.2 TP-BEGIN-DIALOGUE-RI TP APDU

– Issue an AF-BEGIN-DIALOGUE indication.

9.4.3 AF-BEGIN-DIALOGUE response

– Send a TP-BEGIN-DIALOGUE-RC APDU as user data in the service specified by the Mapping parameter.

9.4.4 TP-BEGIN-DIALOGUE-RC TP APDU

– Issue an AF-BEGIN-DIALOGUE confirm with the value of the Mapping parameter set to "dataRI".

9.4.5 AF-BID request

– Send a TP-BID-RI APDU.

9.4.6 TP-BID-RI TP APDU

– Issue an AF-BID indication.

9.4.7 AF-BID response

– Send a TP-BID-RC APDU.

9.4.8 TP-BID-RC TP APDU

– Issue an AF-BID confirm.

9.4.9 AF-END-DIALOGUE request

– Send a TP-END-DIALOGUE-RI APDU.

9.4.10 TP-END-DIALOGUE-RI TP APDU

– Issue an AF-END-DIALOGUE indication.

9.4.11 AF-END-DIALOGUE response

– Send a TP-END-DIALOGUE-RC APDU.

9.4.12 TP-END-DIALOGUE-RC TP APDU

– Issue an AF-END-DIALOGUE confirm.

9.4.13 AF-U-ERROR request

– Send a TP-U-ERROR-RI APDU.

9.4.14 TP-U-ERROR-RI TP APDU

– Issue an AF-U-ERROR indication.

9.4.15 AF-U-ERROR response

– Send a TP-U-ERROR-RC APDU.

9.4.16 TP-U-ERROR-RC TP APDU

– Issue an AF-U-ERROR confirm.

9.4.17 AF-ABORT request

– Send a TP-ABORT-RI TP APDU as user data in the service specified by the Mapping parameter.

9.4.18 TP-ABORT-RI TP APDU

– Issue an AF-ABORT indication with the value of the Mapping parameter set to “dataRI”.

9.4.19 AF-GRANT-CONTROL request

– Send a TP-GRANT-CONTROL-RI APDU.

9.4.20 TP-GRANT-CONTROL-RI TP APDU

– Issue an AF-GRANT-CONTROL indication.

9.4.21 AF-REQUEST-CONTROL request

– Send a TP-REQUEST-CONTROL-RI APDU.

9.4.22 TP-REQUEST-CONTROL-RI TP APDU

– Issue an AF-REQUEST-CONTROL indication.

9.4.23 AF-HANDSHAKE request

– Send a TP-HANDSHAKE-RI APDU.

9.4.24 TP-HANDSHAKE-RI TP APDU

– Issue an AF-HANDSHAKE indication.

9.4.25 AF-HANDSHAKE response

– Send a TP-HANDSHAKE-RC APDU.

9.4.26 TP-HANDSHAKE-RC TP APDU

– Issue an AF-HANDSHAKE confirm.

9.4.27 AF-HANDSHAKE-AND-GRANT-CONTROL request

– Send a TP-HANDSHAKE-AND-GRANT-CONTROL-RI APDU.

9.4.28 TP-HANDSHAKE-AND-GRANT-CONTROL-RI TP APDU

– Issue an AF-HANDSHAKE-AND-GRANT-CONTROL indication.

9.4.29 AF-HANDSHAKE-AND-GRANT-CONTROL response

– Send a TP-HANDSHAKE-AND-GRANT-CONTROL-RC APDU.

9.4.30 TP-HANDSHAKE-AND-GRANT-CONTROL-RC TP APDU

– Issue an AF-HANDSHAKE-AND-GRANT-CONTROL confirm.

9.4.31 AF-DEFER request

– Send a TP-DEFER-RI APDU.

9.4.32 TP-DEFER-RI TP APDU

– Issue an AF-DEFER indication.

9.4.33 AF-PREPARE request

– Send a TP-PREPARE-RI APDU as User Data of a C-PREPARE request.

9.4.34 C-PREPARE indication

The TP-PREPARE-RI APDU is received as User Data of the C-PREPARE indication.

– Issue an AF-PREPARE indication.

9.4.35 AF-HEURISTIC-REPORT request

– Send a TP-HEURISTIC-REPORT-RI APDU as user data in the service specified by the Mapping parameter.

9.4.36 AF-ABORT-AND-HEURISTIC-REPORT request

– Send a TP-HEURISTIC-REPORT-RI APDU followed by a TP-ABORT-RI APDU with the value of the Type field set to “user” as user data in the service specified by the Mapping parameter.

9.4.37 AF-RECOVER request

– Send a TP-RECOVER-RI APDU as user data of a C-RECOVER request.

9.4.38 C-RECOVER indication

The TP-RECOVER-RI APDU is received as User Data of the C-RECOVER indication.

– Issue an AF-RECOVER indication.

9.4.39 A-ABORT indication

The TP-ABORT-RI APDU is received as User Information of the A-ABORT indication.

– Issue an AF-ABORT indication with the Mapping parameter set to “abortRI”.

9.4.40 C-ROLLBACK indication

a) If both a TP-ABORT-RI APDU and a TP-HEURISTIC-REPORT-RI APDU are received as User Data,

– issue an AF-ABORT-AND-HEURISTIC-REPORT indication with the value of the

1) Heuristic-Report parameter set to that of the TP-HEURISTIC-REPORT-RI TP APDU;

2) Mapping parameter set to “rollbackRI”;

b) if only a TP-ABORT-RI APDU is received as User Data,

– issue an AF-ABORT indication with the value of the Mapping parameter set to “rollbackRI”;

c) if only a TP-HEURISTIC-REPORT-RI APDU is received as User Data,

– issue an AF-HEURISTIC-REPORT indication with the value of the Mapping parameter set to “rollbackRI”;

d) if a TP-BEGIN-DIALOGUE-RC APDU is received as User Data,

– issue an AF-BEGIN-DIALOGUE confirm with the value of the Mapping parameter set to “rollbackRI”.

9.4.41 C-ROLLBACK confirm

a) If both a TP-ABORT-RI APDU and a TP-HEURISTIC-REPORT-RI APDU are received as User Data,

– issue an AF-ABORT-AND-HEURISTIC-REPORT indication with the value of the

1) Heuristic-Report parameter set to that of the TP-HEURISTIC-REPORT-RI TP APDU;

2) Mapping parameter set to “rollbackRC”;

b) if only a TP-ABORT-RI APDU is received as User Data,

– issue an AF-ABORT indication with the value of the Mapping parameter set to “rollbackRC”;

c) if only a TP-HEURISTIC-REPORT-RI APDU is received as User Data,

– issue an AF-HEURISTIC-REPORT indication with the value of the Mapping parameter set to “rollbackRC;

d) if a TP-BEGIN-DIALOGUE-RC APDU is received as User Data,

– issue an AF-BEGIN-DIALOGUE confirm with the value of the Mapping parameter set to “rollbackRC”.

9.4.42 C-COMMIT indication

The TP-ABORT-RI APDU is received as User Data of the C-COMMIT indication.

– Issue an AF-ABORT indication with the value of the Mapping parameter set to “commitRI”.

9.4.43 C-COMMIT confirm

a) If both a TP-ABORT-RI APDU and a TP-HEURISTIC-REPORT-RI APDU are received as User Data,

– issue an AF-ABORT-AND-HEURISTIC-REPORT indication with the value of the

1) Heuristic-Report parameter set to that of the TP-HEURISTIC-REPORT-RI TP APDU;

2) Mapping parameter set to “commitRC”;

b) if only a TP-ABORT-RI APDU is received as User Data,

– issue an AF-ABORT indication with the value of the Mapping parameter set to “commitRC”;

c) if only a TP-HEURISTIC-REPORT-RI APDU is received as User Data,

– issue an AF-HEURISTIC-REPORT indication with the value of the Mapping parameter set to “commitRC”.

9.4.44 C-RECOVER confirm

The TP-HEURISTIC-REPORT-RI APDU is received as User Data of the C-RECOVER confirm.

- Issue an AF-HEURISTIC-REPORT indication with the value of the Mapping parameter set to "recoverDoneRC".

9.4.45 P-TOKEN-GIVE (sync-minor) indication

The TP-TOKEN-GIVE-RI APDU is received as User data of the P-TOKEN-GIVE (sync-minor) indication.

- Issue an AF-TOKEN-GIVE indication.

9.4.46 AF-TOKEN-GIVE request

- Send a TP-TOKEN-GIVE-RI APDU as User data of a P-TOKEN-GIVE (sync-minor) request.

9.4.47 P-TOKEN-PLEASE (sync-minor) indication

The TP-TOKEN-PLEASE-RI APDU is received as User data of the P-TOKEN-PLEASE (sync-minor) indication.

- Issue an AF-TOKEN-PLEASE indication.

9.4.48 AF-TOKEN-PLEASE request

- Send a TP-TOKEN-PLEASE-RI APDU as User data of a P-TOKEN-PLEASE (sync-minor) request.

9.5 Mapping

All TP APDUs are transferred as specified in clauses 9, 10, and 11, either as non-embedded TP APDUs or embedded in user data of other ASE service primitives.

The TP APDUs are carried by CCR, ACSE, or Presentation services as shown in Table 31, except for the case of concatenation (see 10.7).

10 SACF description

10.1 Introduction

The SACF procedures (described in 10.2 through 10.6) handle the queuing, bidding, and token control related to dialogue/channel establishment as well as the management of the association while not in use by a dialogue or channel. When unqualified, the term SACF refers to these procedures.

Dashed lists are used exclusively to present the actions.

The rules associated with the concatenator part of the SACF are described in 10.7.

The router part of the SACF is described in 10.8.

TABLE 31/X.862

CCR, ACSE and Presentation services carrying TP APDUs

TP APDUs	CCR, ACSE and Presentation Services[a)]
TP-BEGIN-DIALOGUE-RI	P-DATA req
TP-BEGIN-DIALOGUE-RC	P-DATA req or C-ROLLBACK req, or C-ROLLBACK rsp
TP-BID-RI/-RC	P-DATA req
TP-END-DIALOGUE-RI/-RC	P-DATA req
TP-ABORT-RI	P-DATA req or C-ROLLBACK req or C-ROLLBACK rsp or C-COMMIT req or C-COMMIT rsp or A-ABORT req
TP-U-ERROR-RI/-RC	P-DATA req
TP-GRANT-CONTROL-RI	P-DATA req
TP-REQUEST-CONTROL-RI	P-DATA req
TP-HANDSHAKE-RI/-RC	P-DATA req
TP-HANDSHAKE-AND-GRANT-CONTROL-RI/-RC	P-DATA req
TP-PREPARE-RI	C-PREPARE req
TP-DEFER-RI	P-DATA req
TP-HEURISTIC-REPORT-RI	C-ROLLBACK req, or C-ROLLBACK rsp, C-COMMIT rsp, or C-RECOVER (done) rsp
TP-TOKEN-GIVE-RI	P-TOKEN-GIVE (sync-minor) req
TP-TOKEN-PLEASE-RI	P-TOKEN-PLEASE (sync-minor) req
TP-RECOVER-RI	C-RECOVER req
TP-INITIALIZE-RI	A-ASSOCIATE req
TP-INITIALIZE-RC	A-ASSOCIATE rsp

a) TP APDUs shown as mapping to the P-DATA Service may have a different mapping depending on the combined set of concatenation rules used in the SAO.

10.2 SACF states

The SACF has one of the following states at all times. These states are visible only to the SACF. The SACF state is changed either upon receipt of a relevant AF, CCR, or SAF service primitive or, spontaneously, upon certain SACF internal events. When the SAO is newly created, the SACF is in the FREE state. The SACF states are:

a) FREE

This state is used when the SAO is available to be *attached* to a PM for a dialogue or channel. It is therefore in the pool of free associations. When the association is newly established, the SACF is in the FREE state.

b) STRAY

This state is used to filter service primitives that may be received between the receipt of an AF-BEGIN-DIALOGUE request and the receipt of the corresponding AF-BEGIN-DIALOGUE confirm in the case where there is no bidding.

c) BIDDING (contention-loser only)

This state is used to filter service primitives which may be received between the receipt of an AF-BEGIN-DIALOGUE request and the receipt of an AF-BID confirm and the SACF bids. In the case of a dialogue, this state only applies to a subordinate dialogue.

d) BID CONFIRM RECEIVED (contention-loser only)

This state is used to detect protocol errors which become manifest by receiving an indication or confirm primitive between the receipt of a AF-BID confirm and an AF-BEGIN-DIALOGUE confirm. In the case of a dialogue, this state only applies to a subordinate dialogue.

e) BID INDICATION RECEIVED (contention-winner only)

This state is used to detect protocol errors which become manifest by receiving an indication or confirm primitive between the receipt of a AF-BID indication and an AF-BEGIN-DIALOGUE indication. In the case of a dialogue, this state only applies to the superior dialogue.

f) BUSY

This state is used to allow pass through of service primitives that may be received between the receipt of:

1) an AF-BEGIN-DIALOGUE indication by a contention-loser, or by a contention-winner without having issued an AF-BEGIN-DIALOGUE request; or

2) an AF-BEGIN-DIALOGUE confirm with a valid Correlator; or

3) a C-ROLLBACK indication or confirm after an AF-BEGIN-DIALOGUE request with the Confirmation parameter set to "negative" has been issued and an AF-BEGIN-DIALOGUE confirm has not been received

and the issuance of an SAF-DETACH-ASSOCIATION request.

g) CLEANUP ROLLBACK INDICATION EXPECTED (superior only)

This state is used when a *rollback indication* is expected outside of a dialogue and must be acknowledged with a *rollback response*.

h) CLEANUP BEGIN INDICATION EXPECTED (subordinate only)

This state is used when a C-BEGIN indication is expected outside of a dialogue and therefore the atomic action branch must be rolled back.

i) CLEANUP ROLLBACK CONFIRM EXPECTED (subordinate only)

This state is used when a *rollback confirm* is expected outside of a dialogue. If, however, a *rollback indication* is received, i.e., a rollback collision occurs, it is the responsibility of the SACF to resend the semantics of the previous *rollback request* in the *rollback response*, using the appropriate AF-service, if necessary.

10.3 Service definitions for SAF-DETACH-ASSOCIATION and SAF-ASSOCIATION-LOST

10.3.1 SAF-DETACH-ASSOCIATION request

The MACF uses this service to notify the SACF to *detach* from the association.

When the request service primitive is referenced in the procedure clauses, the value listed in the parenthetical argument is the Status parameter.

This is an unconfirmed service.

Table 32 gives the parameter of this primitive.

TABLE 32/X.862

SAF-DETACH-ASSOCIATION parameter

SAF-DETACH-ASSOCIATION	
Parameter	req
Status	M

a) *Status* – Indicates the status of the association that is being *detached*. The values are:

1) "free" – The association is available for assignment to another dialogue;

2) "rollback-indication-expected" – The association is in a state where the partner TPPM is expected to issue a *rollback request* and the corresponding *rollback indication* is expected. Once the *rollback indication* is received, the association will be available for assignment to another dialogue;

3) "rollback-confirm-expected" – A *rollback confirm* is expected. Once the *rollback confirm* is received the association is available for assignment. If a *rollback indication* is received, the AF-service corresponding to the previous *rollback request* is reissued as a *rollback response*. If the previous *rollback request* was not an AF-service, a C-ROLLBACK response is issued. An AF-ABORT (user, dataRI) indication may also be received since this may be an alternative to the C-BEGIN indication. When the AF-ABORT (user/dataRI) indication is received, the association is available;

4) "begin-indication-expected" – A C-BEGIN is expected to be received on this association. Once the C-BEGIN indication is received, a C-ROLLBACK request is issued to roll back the branch. Only when the *rollback confirm* is received is the association available;

5) "begin-fear" – a C-BEGIN indication may be received in the future due to one of the following conditions:

i) the Unchained Transactions functional unit is selected and the dialogue was terminated by an A-ABORT (user, dataRI) request, an AF-END-DIALOGUE request with the Confirmation parameter set to "false", or an AF-BEGIN-DIALOGUE (rejected(user/provider)) response; or

ii) the *dialogue is chaining*, *rollback reporting has completed*, and an AF-ABORT (user, dataRI) request was issued while in the DECIDED (rollback) state.

10.3.2 SAF-ASSOCIATION-LOST indication

The SACF uses this service to notify the MACF that it is *detached* from the association.

10.4 Procedure for SAF-DETACH-ASSOCIATION request

If the value of the status parameter is

a) "free" or "begin-fear" and

1) a queue exists,

– continue;

2) no queue exists,

– enter the FREE state;

– issue an AF-TOKEN-GIVE (regular) request if the SACF is a contention-loser and the *token* is owned;

b) "rollback-indication-expected" and there is no queue,

– enter the CLEANUP ROLLBACK INDICATION EXPECTED state;

c) "rollback-confirm-expected" and there is no queue,

– enter the CLEANUP ROLLBACK CONFIRM EXPECTED state;

d) "begin-indication-expected",

– enter the CLEANUP BEGIN INDICATION EXPECTED state;

e) "rollback-indication-expected" or "rollback-confirm-expected" and there is a queue,

– *discard the queue*;

– issue an AF-TOKEN-GIVE (regular) request, if the SACF is the contention-loser and the *token* is owned;

– enter the FREE state.

Always

– *detach* the MACF from the association.

10.5 Procedures for TP-ASE, CCR, ACSE, and Presentation Service Primitives

Service primitives received from the MACF are assumed valid, i.e., issued in accordance with the procedures specified in clause 11.

10.5.1 AF-BEGIN-DIALOGUE request

This service primitive is received while the SACF is in the FREE state, and the association is compatible with the dialogue or channel.

If the SACF is a contention-loser and one or more of the following is true:

a) the bid-mandatory field of the TP-INITIALIZE-RI APDU was "true" for this association;

b) the last time this SAO was detached from the MACF this was done by an SAF-DETACH-ASSOCIATION request which had the Type parameter set to "begin-fear"; or

c) according to a local decision, the SACF will bid,

then

a) formulate the parameters of the AF-BID request with the value of the

   1) Last-Partner-Identifier parameter

      i) omitted if no AF-BEGIN-DIALOGUE indication has been received on this association since it was established;

      ii) set to the Correlator of the most recently received AF-BEGIN-DIALOGUE indication otherwise;

   2) CCR-Token-Requested parameter set to either

      i) "true" if the Commit or Recovery Functional Unit is selected; or

      ii) "false" otherwise;

b) take the following actions

   – issue an AF-BID request;

   – *establish a* queue;

   – enter the BIDDING state.

If no AF-BID request was issued,

– enter the STRAY state.

If the SACF is a contention-winner and the last time this SAO was detached from the MACF this was done by an SAF-DETACH-ASSOCIATION request which had the Type parameter set to "begin-fear",

– *establish a queue*.

Always take the following actions:

a) formulate the parameters of the AF-BEGIN-DIALOGUE request with the value of the

   1) Last-Partner-Identifier parameter

      i) omitted if any of the following are true:

         a) the SACF is a contention-winner;

         b) an AF-BID request was issued; or

         c) no AF-BEGIN-DIALOGUE indication has been received on this association;

      ii) set to the Correlator of the most recently received AF-BEGIN-DIALOGUE indication otherwise;

   2) Correlator parameter set to a value which is unique within the scope of the association;

b) if a queue exists,

   – queue the AF-BEGIN-DIALOGUE request;

c) if a queue does not exist,

   – pass through the AF-BEGIN-DIALOGUE request.

10.5.2 AF-BEGIN-DIALOGUE indication

If the SACF is the contention-winner and the Bid-Mandatory field of the TP-INITIALIZE-RI APDU was set to "false", and either

a) the SACF is in the FREE state and the *last partner identifier is not valid*; or

b) the SACF is in the STRAY state

– continue.

If the SACF is the contention-loser and in the STRAY or BIDDING states,

– issue an SAF-ASSOCIATION-LOST indication if no SAF-DETACH-ASSOCIATION request was received;

– *discard the queue* (if any).

NOTE 1 – It is a local matter whether the TPPM retries establishing a dialogue or channel on another association; however, in the case where the SAF-ASSOCIATION-LOST indication is not issued because an SAF-DETACH-ASSOCIATION request was already received, retrying is recommended.

If all of the following conditions are true:

a) the SACF is the contention-winner in the FREE state and the *last partner identifier is valid*;

b) the Commit or Recovery functional unit is selected;

c) the Bid-Mandatory field of the TP-INITIALIZE-RI APDU was set to "false";

d) the association has not been reserved for other use; and

e) the *token* is owned by the SACF,

then

– issue an AF-TOKEN-GIVE (keep) request.

NOTE 2 – If the Commit functional unit is not supported, this service primitive need not be generated, as the dialogue will be rejected by the MACF.

If the SACF is one of the following:

a) the contention-winner and either in the FREE state, the *last partner identifier is valid*, the Bid-Mandatory field of the TP-INITIALIZE-RI APDU was set to "false", and the association has not been reserved for other use, or in the BID INDICATION RECEIVED state and an AF-BID response has been sent; or

b) the contention-loser and in the FREE, STRAY, or BIDDING state;

then

– create a new MACF, if this is a dialogue;

– *attach* to the CPM, if this is a channel;

– enter the BUSY state;

– pass the service primitive through.

If the SACF is the contention-winner and in the FREE state and the Bid-Mandatory field of the TP-INITIALIZE-RI APDU was set to "false", the *last partner identifier is valid*, and the association has been reserved for other use,

– issue an AF-BEGIN-DIALOGUE (rejected(provider), dataRI) response with the Diagnostic parameter set to "association-reserved".

10.5.3 AF-BEGIN-DIALOGUE response

The Correlator parameter of the AF-BEGIN-DIALOGUE response is set to the value of the parameter on the previous AF-BEGIN-DIALOGUE indication.

– Pass the service primitive through.

10.5.4 AF-BEGIN-DIALOGUE confirm

If the SACF is in the FREE or BIDDING state and the Mapping parameter is set to "dataRI",

– continue.

If the SACF is in the STRAY state and the Mapping parameter is set to "dataRI" and the Correlator does not match the Correlator of the previous AF-BEGIN-DIALOGUE request,

– continue.

If the SACF is in the STRAY or BID CONFIRM RECEIVED state and the Correlator matches the Correlator of the previous AF-BEGIN-DIALOGUE request and the Diagnostic parameter is either absent or set to a value different from "association-reserved",

– enter the BUSY state;

– pass the service primitive through.

If the SACF is the contention-loser in the STRAY state and the Correlator matches the Correlator of the previous AF-BEGIN-DIALOGUE request and the Diagnostic parameter is set to "association-reserved" and the Mapping parameter is set to "dataRI",

– enter the BUSY state;

– pass the service primitive through.

10.5.5 AF-BID indication

The SACF shall be the contention-winner.

If either of the following is true:

a) the SACF is in the FREE state and the *last partner identifier is not valid;* or

b) the SACF is in the STRAY or CLEANUP ROLLBACK INDICATION EXPECTED state;

then

– continue.

If the SACF is in the FREE state and the *last partner identifier is valid* and all of the following conditions are met:

a) the value of the CCR-Token-Requested parameter is set to "true"; and

b) the SACF does not have the *token*; and

NOTE 1 – The situation that the value of the CCR-Token-Requested parameter is set to "true" and the TPPM does not have the *token* may arise if a P-TOKEN-GIVE (sync-minor) request crosses an unconfirmed dialogue ending APDU, and the AF-BID request was issued prior to receiving the P-TOKEN-GIVE (sync-minor) indication.

c) according to a local decision, the SACF intends to issue an AF-BID (accepted) response only after the *token* arrives,

then

– enter the BID INDICATION RECEIVED state.

If the SACF is in the FREE state and none of the preceding conditions apply,

a) always

– issue an AF-BID response with the Result parameter set based on a local decision;

NOTE 2 – The decision on whether the Result parameter of an AF-BID response is set to "rejected" or to "accepted" will be made depending on whether the association on which the AF-BID indication was received has been reserved for other purposes or not.

b) if the Result parameter is set to "rejected"

– continue;

c) if the Result parameter is set to "accepted"

– enter the BID INDICATION RECEIVED state;

– issue an AF-TOKEN-GIVE (regular) request if the CCR-Token-Requested parameter on the AF-BID indication is set to "true", and the SACF has the *token*.

10.5.6 AF-BID confirm

If the SACF is in the BIDDING state and the result parameter is "accepted",

- *flush the queue* up to and excluding a C-BEGIN request;
- enter the FREE state if an SAF-DETACH-ASSOCIATION request was received;

  NOTE 1 – The MACF procedures in clause 11 are designed in such a way that an SAF-DETACH-ASSOCIATION request will never be received after a C-BEGIN request was queued and before the queue is entirely flushed.

- enter the BID CONFIRM RECEIVED state if no SAF-DETACH-ASSOCIATION request was received.

If the SACF is in the BIDDING state and the result parameter is "rejected",

a) enter the FREE state;

b) issue an SAF-ASSOCIATION-LOST indication if no SAF-DETACH-ASSOCIATION request was received;

c) *discard the queue*.

NOTE 2 – It is a local matter whether the TPPM retries establishing a dialogue or channel on another association; however, in the case where the SAF-ASSOCIATION-LOST indication is not issued because an SAF-DETACH-ASSOCIATION request was already received, retrying is recommended.

10.5.7 AF-END-DIALOGUE request

If a queue exists,

- queue the service primitive.

If no queue exists,

- pass the service primitive through.

10.5.8 AF-END-DIALOGUE indication

If the SACF is in the FREE, BIDDING, or STRAY state,

- continue.

If the SACF is in the BUSY state,

- pass the service primitive through.

10.5.9 AF-END-DIALOGUE confirm

If the SACF is in the FREE, BIDDING, or STRAY state,

- continue.

If the SACF is in the BUSY state,

- pass the service primitive through.

10.5.10 AF-U-ERROR request

If a queue exists,

- queue the service primitive.

If no queue exists,

- pass the service primitive through.

10.5.11 AF-U-ERROR indication

If the SACF is in the FREE, BIDDING, STRAY, or CLEANUP ROLLBACK INDICATION EXPECTED state,

- continue.

If the SACF is in the BUSY state,

- pass the service primitive through.

10.5.12 AF-U-ERROR confirm

If the SACF is in the FREE, BIDDING, or STRAY state,

– continue.

If the SACF is in the BUSY state,

– pass the service primitive through.

10.5.13 AF-ABORT request

If a queue exists and the value of the Mapping parameter is not "abortRI",

– queue the service primitive.

If a queue does not exist or the value of the Mapping parameter is "abortRI",

– pass the service primitive through.

NOTE – If the Mapping parameter is "abortRI", the association will cease to exist when the A-ABORT request is issued.

10.5.14 AF-ABORT (provider, abortRI) indication

NOTE – Upon receipt of an AF-ABORT (provider, abortRI) indication, the association ceases to exist.

If the SACF is in the FREE, BID INDICATION RECEIVED, CLEANUP ROLLBACK INDICATION EXPECTED, or CLEANUP BEGIN INDICATION RECEIVED state,

– continue.

If the SACF is in the STRAY, BIDDING, BID CONFIRM RECEIVED, or BUSY state,

– pass the service primitive through if no SAF-DETACH-ASSOCIATION request was received;

– *discard the queue*.

10.5.15 AF-ABORT (user, dataRI) indication

If the SACF is in the FREE, BIDDING, STRAY, CLEANUP ROLLBACK INDICATION EXPECTED, or state,

– continue.

If the SACF is in the CLEANUP BEGIN INDICATION EXPECTED state,

– enter the FREE state.

If the SACF is in the BUSY state,

– pass the service primitive through.

10.5.16 A-ABORT request or A-RELEASE (Result=affirmative) response

If the SACF is in the STRAY, BIDDING, BID CONFIRM RECEIVED, or BUSY state,

– *discard the queue*;

– pass the service primitive through.

NOTE – Upon issuance of either of these service primitives, the association ceases to exist.

10.5.17 A-[P-]ABORT indication or A-RELEASE (Result=affirmative) confirm

If the SACF is in the BIDDING, STRAY, BID CONFIRM RECEIVED, or BUSY state,

– pass the service primitive through, if no SAF-DETACH-ASSOCIATION request was received;

10.5.18 AF-GRANT-CONTROL request

If a queue exists,

– queue the service primitive.

If no queue exists,

– pass the service primitive through.

10.5.19 AF-GRANT-CONTROL indication

If the SACF is in the FREE, BIDDING, or STRAY state,

– continue.

If the SACF is in the BUSY state,

– pass the service primitive through.

10.5.20 AF-REQUEST-CONTROL request

If a queue exists,

– queue the service primitive.

If no queue exists,

– pass the service primitive through.

10.5.21 AF-REQUEST-CONTROL indication

If the SACF is in the FREE, BIDDING, or STRAY state,

– continue.

If the SACF is in the BUSY state,

– pass the service primitive through.

10.5.22 AF-HANDSHAKE request

If a queue exists,

– queue the service primitive.

If no queue exists,

– pass the service primitive through.

10.5.23 AF-HANDSHAKE indication

If the SACF is in the FREE, BIDDING, or STRAY state,

– continue.

If the SACF is in the BUSY state,

– pass the service primitive through.

10.5.24 AF-HANDSHAKE confirm

If the SACF is in the FREE, BIDDING, or STRAY state,

– continue.

If the SACF is in the BUSY state,

– pass the service primitive through.

10.5.25 AF-HANDSHAKE-AND-GRANT-CONTROL request

If a queue exists,

– queue the service primitive.

If no queue exists,

– pass the service primitive through.

10.5.26 AF-HANDSHAKE-AND-GRANT-CONTROL indication

If the SACF is in the FREE, BIDDING, or STRAY state,

– continue.

If the SACF is in the BUSY state,

– pass the service primitive through.

10.5.27 AF-HANDSHAKE-AND-GRANT-CONTROL confirm

If the SACF is in the FREE, BIDDING, or STRAY state,

– continue.

If the SACF is in the BUSY state,

– pass the service primitive through.

10.5.28 AF-DEFER request

If a queue exists,

– queue the service primitive.

If no queue exists,

– pass the service primitive through.

10.5.29 AF-DEFER indication

If the SACF is in the BUSY state,

– pass the service primitive through.

10.5.30 AF-PREPARE request

If a queue exists,

– queue the service primitive.

If no queue exists,

– pass the service primitive through.

10.5.31 AF-PREPARE indication

If the SACF is in the BUSY state,

– pass the service primitive through.

If the SACF is in the CLEANUP ROLLBACK CONFIRM EXPECTED state,

– continue.

10.5.32 AF-HEURISTIC-REPORT (commitRC) indication, or AF-HEURISTIC-REPORT (recoverDoneRC) indication

If the SACF is in the BUSY state,

– pass the service primitive through.

10.5.33 C-BEGIN request

If the SACF does not have the *token* and is in the

a) STRAY or BID CONFIRM RECEIVED state,

– *establish a queue*; and

– queue the service primitive.

b) BIDDING state,

– queue the service primitive.

NOTE – Only under these conditions will the SACF queue for the *token* on a dialogue. Under other conditions, the TPSUI is assumed to have the *token* (see Annex B). For conditions where the SACF will queue for the *token* on a channel, see 10.5.46.

If the SACF has the *token*,

– pass the service primitive through.

10.5.34 C-BEGIN indication

If the SACF is in the FREE state and the last time this SAO was detached from the MACF this was done by an SAF-DETACH-ASSOCIATION request which had the Type parameter set to "begin-fear", or if the SACF is in the CLEANUP BEGIN INDICATION EXPECTED state,

- issue a C-ROLLBACK request;
- enter the CLEANUP ROLLBACK CONFIRM EXPECTED state.

If the SACF is in the BUSY state,

- pass the service primitive through.

If the SACF is in the BIDDING or STRAY state and the last time this SAO was detached from the MACF this was done by an SAF-DETACH-ASSOCIATION request which had the Type parameter set to "begin-fear",

- issue an SAF-ASSOCIATION-LOST indication, if no SAF-DETACH-ASSOCIATION request was received;
- *discard the queue*;

NOTE – It is a local matter whether the TPPM retries establishing a dialogue or channel on another association; however, in the case where the SAF-ASSOCIATION-LOST indication is not issued because an SAF-DETACH-ASSOCIATION request was already received, retrying is recommended.

- issue a C-ROLLBACK request;
- enter the CLEANUP ROLLBACK CONFIRM EXPECTED state.

10.5.35 C-BEGIN confirm

If the SACF is in the BUSY state,

- pass the service primitive through.

10.5.36 C-READY indication

If the SACF is in the BUSY state,

- pass the service primitive through.

10.5.37 C-COMMIT indication or C-COMMIT+C-BEGIN indication

If the SACF is in the BUSY state,

- pass the service primitive through.

10.5.38 AF-ABORT (user, commitRI) indication or AF-ABORT (user, commitRC) indication

If the SACF is in the BUSY state,

- pass the service primitive through.

10.5.39 C-COMMIT confirm

If the SACF is in the BUSY state,

- pass the service primitive through.

10.5.40 AF-ABORT-AND-HEURISTIC-REPORT (commitRC) indication

If the SACF is in the BUSY state,

- pass the service primitive through.

10.5.41 C-ROLLBACK request

If a queue exists,

- queue the service primitive.

If no queue exists,

- pass the service primitive through.

10.5.42 C-ROLLBACK indication

NOTE 1 – After receipt of a *rollback response* or a *rollback confirm*, the *token* is set according to the TP/CCR rules described in 8.4.2 and sent to the superior of the branch. Since the SACF is not aware of the superior of the branch, it returns the *token* if the SACF is the contention-loser.

If the SACF is in the BUSY state,

- pass the service primitive through.

If the SACF is in the STRAY or BID CONFIRM RECEIVED state,

- enter the BUSY state;
- pass the service primitive through.

If the SACF is in the

a) CLEANUP ROLLBACK CONFIRM EXPECTED state,

1) if the previous request or response was an AF-ABORT (provider, rollbackRI) request with the Diagnostic parameter set to "begin-transaction-reject",

   - issue an AF-ABORT (provider, rollbackRC) request with the Diagnostic parameter set to "begin-transaction-reject";

2) if the previous request or response was an AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) response,

   - issue an AF-BEGIN-DIALOGUE (rejected(user), rollbackRC) response, with the same values of the corresponding parameters as in the previous AF-BEGIN-DIALOGUE response, except for the Mapping parameter;

3) if the previous request or response was neither an AF-ABORT (provider, rollbackRI) request with Diagnostic parameter set to "begin-transaction-request", nor an AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) response,

   - issue a C-ROLLBACK response;

   NOTE 2 – The semantic of "abort" or "rejected dialogue" carried on the previous C-ROLLBACK request must be repeated on the C-ROLLBACK response [in a 2) and 3) above] because the C-ROLLBACK-RI has been suppressed by the Session Layer when the C-ROLLBACK-RI collision occurs.

4) if the SACF is the contention-loser and owns the *token*,

   - issue an AF-TOKEN-GIVE (regular) request;

5) always

   - enter the FREE state;

b) CLEANUP ROLLBACK INDICATION EXPECTED state,

1) always

   - issue a C-ROLLBACK response;
   - enter the FREE state;

2) if the SACF is the contention-loser and owns the *token*,

   - issue an AF-TOKEN-GIVE (regular) request.

10.5.43 AF-ABORT (rollbackRI) indication, AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) indication, or AF-HEURISTIC-REPORT (rollbackRI) indication

NOTE – After receipt of a *rollback response* or a *rollback confirm*, the *token* is set according to the TP/CCR rules described in 8.4.2 and sent to the superior of the branch. Since the SACF is not aware of the superior of the branch, it returns the *token* if the SACF is the contention-loser.

If the SACF is in the BUSY state,

- pass the service primitive through.

If the SACF is in the STRAY or BID CONFIRM RECEIVED state,

- enter the BUSY state;
- pass the service primitive through.

If the SACF is in the CLEANUP ROLLBACK CONFIRM EXPECTED state and this is an AF-ABORT (rollbackRI) indication,

a) always

- issue a C-ROLLBACK response;
- enter the FREE state;

b) if the SACF is the contention-loser and owns the token,

- issue an AF-TOKEN-GIVE (regular) request.

10.5.44 C-ROLLBACK confirm, AF-HEURISTIC-REPORT (rollbackRC) indication, AF-ABORT (user/provider, rollbackRC) indication or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRC) indication

NOTE – After receipt of a *rollback response* or a *rollback confirm*, the *token* is set according to the TP/CCR rules described in 8.4.2 and sent to the superior of the branch. Since the SACF is not aware of the superior of the branch, it returns the *token* if the SACF is the contention-loser.

If the SACF is in the BUSY state,

- pass the service primitive through.

If the SACF is in the STRAY or BID CONFIRM RECEIVED state,

- enter the BUSY state;
- pass the service primitive through.

If the SACF is in CLEANUP ROLLBACK CONFIRM EXPECTED state,

- enter the FREE state;
- issue an AF-TOKEN-GIVE (regular) request, if the SACF is a contention-loser and owns the *token*.

10.5.45 AF-RECOVER indication

If the SACF is in the BUSY state,

- pass the service primitive through.

10.5.46 C-RECOVER request or AF-RECOVER request

If the SACF is in BUSY state and

a) at least one of the two following conditions is true,

1) the *token* is owned,

2) a C-RECOVER (ready) indication or an AF-RECOVER (ready) indication was the most recently received primitive (including requests and responses from the MACF) on this association, and this is a C-RECOVER (commit) request,

- pass the service primitive through;

b) otherwise,

- *establish a queue*, if one does not exist;
- queue the service primitive.

10.5.47 C-RECOVER indication

If the SACF is in the BUSY state,

- pass the service primitive through.

10.5.48 C-RECOVER confirm

If the SACF is in the BUSY state,

- pass the service primitive through.

10.5.49 U-ASE request

If a queue exists,

– queue the service primitive.

If no queue exists,

– pass the service primitive through.

10.5.50 U-ASE indication

If the SACF is in the FREE, BIDDING, or STRAY state,

– suppress the service primitive.

If the SACF is in the BUSY state,

– pass the service primitive through.

10.5.51 AF-TOKEN-GIVE (regular) indication

If the SACF is the contention-loser in the

a) FREE, STRAY, or BIDDING state,
   – issue an AF-TOKEN-GIVE (regular) request;
b) BID CONFIRM RECEIVED state,
   – *flush the queue*.

If the SACF is a contention-winner in the

a) STRAY state, and
   1) there is a queue,
      – *flush the queue*;
      – enter the FREE state, if an SAF-DETACH-ASSOCIATION request has been received;
   2) there is no queue,
      – continue;
      – enter the FREE state, if an SAF-DETACH-ASSOCIATION request has been received;
b) BID INDICATION RECEIVED state and received an AF-BID indication with the CCR-Token-requested parameter set to “false”,
   – continue;
c) CLEANUP ROLLBACK CONFIRM EXPECTED, or FREE state,
   – continue;
d) BID INDICATION RECEIVED state and received an AF-BID indication with the CCR-Token-requested parameter set to “true, and
   1) has not issued an AF-BID (accepted) response,
      – issue an AF-BID (accepted) response;
      – issue an F-TOKEN-GIVE (regular) request;
   2) has issued an AF-BID (accepted) response but has not issued an AF-TOKEN-GIVE (regular) request,
      – issue an AF-TOKEN-GIVE (regular) request;
e) BUSY state and all of the following are true:
   1) the Commit functional unit is selected;
   2) an AF-BEGIN-DIALOGUE indication was received and was not preceded by an AF-BID indication; and
   3) no AF-TOKEN-GIVE (keep) request was issued; then
      – issue an AF-TOKEN-GIVE (keep) request;

10.5.52 AF-TOKEN-GIVE (keep) indication

If the SACF is a contention-loser and is in the STRAY or BUSY state and the value of the Correlator parameter is equal to the Correlator of the last TP-BEGIN-DIALOGUE-RI APDU sent,

- *flush the queue*; and
- pass the service primitive to the U-ASE.

If the SACF is a contention-loser and is either

a) in the FREE state; or

b) in the STRAY or BIDDING state and the value of the Correlator parameter is not equal to the Correlator of the last TP-BEGIN-DIALOGUE-RI APDU sent,

then

- issue an AF-TOKEN-GIVE (regular) request.

10.5.53 AF-TOKEN-GIVE (two-way-recovery) request

If the SACF is in BUSY state and

a) the *token* is owned,
   - pass the service primitive through;

b) the *token* is not owned,
   - *establish a queue*, if one does not exist;
   - queue the service primitive.

10.5.54 AF-TOKEN-GIVE (two-way-recovery) indication

If the association is assigned to a channel and the SACF is in the BUSY state and there is no queue,

- pass the service primitive through.

If the association is assigned to a channel and the SACF is in the BUSY state and there is a queue,

- *flush the queue*.

10.5.55 P-TOKEN-GIVE (sync-minor) indication

If the SACF is the contention-loser in the

a) FREE, STRAY, or BIDDING state,
   - issue an AF-TOKEN-GIVE (regular) request;

b) BUSY state,
   - pass the *token* to the U-ASE, if the Dialogue functional unit is selected.

If the SACF is the contention-winner in the

a) STRAY state, and
   1) there is a queue,
      - *flush the queue*;
      - enter the FREE state, if an SAF-DETACH-ASSOCIATION request has been received;
   2) there is no queue,
      - continue;

b) FREE state,
   - continue;

c) BUSY state,
   - pass the *token* to the U-ASE, if the Dialogue functional unit is selected.

10.5.56 AF-TOKEN-PLEASE request

If the SACF is in BUSY state,

- pass the service primitive through.

10.5.57 AF-TOKEN-PLEASE indication

If the association is assigned to a channel and the SACF is in the

a) BUSY state,

– pass the service primitive through;

b) FREE, BIDDING, or STRAY state,

– continue.

10.5.58 P-TOKEN-PLEASE indication

If the association is assigned to a dialogue and the SACF is in the BUSY state,

– pass the service primitive to the U-ASE;

otherwise

– continue.

10.5.59 Protocol error

If the SACF is not *attached* to an MACF,

– issue an AF-ABORT (provider, abortRI) request, with the Diagnostic parameter set to “protocol-error”.

10.5.60 Other service primitives

If the SACF is in the BUSY state, the following service primitives are always passed through:

AF-END-DIALOGUE response

AF-U-ERROR response

AF-HANDSHAKE response

AF-HANDSHAKE-AND-GRANT-CONTROL response

AF-HEURISTIC-REPORT request

AF-ABORT-AND-HEURISTIC-REPORT request

AF-TOKEN-GIVE (regular) request

AF-TOKEN-GIVE (keep) request

C-BEGIN response

C-READY request

C-COMMIT request

C-COMMIT response

C-COMMIT+C-BEGIN request

C-ROLLBACK response

C-RECOVER response

P-TOKEN-GIVE (sync-minor) request

A-ABORT request

10.6 SACF internal events

10.6.1 Unsolicited BID reject

This procedure is entered by a contention-winner SACF that is in the BID INDICATION RECEIVED state and has not yet issued an AF-BID response.

NOTE – The SACF, originally intending to accept the BID, but not having the *token*, delayed responding until the *token* was received. In the meantime, some internal condition has arisen that warrants rejecting the BID.

– Issue an AF-BID response with the value of the Result parameter set to “rejected”;

– enter the FREE state.

10.7 Concatenation

10.7.1 Mapping precedence

This protocol specification defines the rules governing the concatenation of TP APDUs and their mapping onto other services. These concatenation rules do not affect lower layer concatenation mechanisms (e.g. the Session Layer concatenation). Alternative mappings to Presentation Services are sometimes used depending on the APDUs being concatenated.

The mapping of any concatenation sequence involving one or more CCR APDUs shall be as specified in ISO/IEC 9805. Concatenation sequences involving only TP APDUs shall be mapped to the User data parameter of the P-DATA service with the exception of those TP APDUs for which a mapping to a different Presentation or ACE service is specifically defined in the procedures in clause 9. Concatenations involving U-ASE APDUs and not involving any CCR APDUs shall be mapped to the User data parameter of the P-DATA service unless otherwise specified in the U-ASE specification. Any such other mapping shall not interfere with the operation or semantics of either CCR or TP.

Subclause 9.5 shows the TP mapping of TP APDUs onto underlying services, if the TP concatenation mechanism is not used (basic unconcatenated TP APDU mapping).

10.7.2 Concatenation rules

This subclause specifies the rules for determining valid concatenations of TP, U-ASE, CCR, and ACSE APDUs.

NOTE 1 – This subclause does not specify the complete set of rules for determining valid sequences of TP, U-ASE, CCR, and ACSE APDUs. The ACSE and CCR Recommendations themselves impose constraints which are not repeated here. Also the procedures in clauses 9, 10, and 11 further restrict the valid sequences of TP, U-ASE, CCR, and ACSE APDUs.

a) The APDUs in Table 33 shall not be concatenated with any APDU;

TABLE 33/X.862

APDUs that can not be concatenated

TP-BID-RI
TP-BID-RC
TP-BEGIN-DIALOGUE-RC (rejected)
TP-PREPARE-RI
TP-RECOVER-RI
C-ROLLBACK-RI
C-ROLLBACK-RC

b) The APDUs in Table 34 shall be first in a concatenation sequence. These APDUs must begin a concatenation sequence because no prior APDU is possible;

TABLE 34/X.862

APDUs that begin a concatenation sequence

TP-BEGIN-DIALOGUE-RI
TP-BEGIN-DIALOGUE-RC (accepted)

c) The APDUs in Table 35 shall be last in a concatenation sequence. These APDUs must end a concatenated sequence because they are part of a confirmed exchange or because no subsequent APDU is possible.

Based on a local decision, each APDU in Table 35 may be concatenated to an existing concatenation sequence;

TABLE 35/X.862

APDUs that end a concatenation sequence

TP-END-DIALOGUE-RI
TP-END-DIALOGUE-RC
TP-ABORT-RI
TP-GRANT-CONTROL-RI
TP-REQUEST-CONTROL-RI
TP-HANDSHAKE-RI
TP-HANDSHAKE-AND-GRANT-CONTROL-RI

d) If the preceding TP-HANDSHAKE-RI or TP-HANDSHAKE-AND-GRANT-CONTROL-RI had the confirmation-urgency field equal to "urgent", or the confirmation-urgency field was absent from the TP-HANDSHAKE-RI, then the corresponding APDU in Table 36 shall be last in a concatenation sequence.

If the preceding TP-HANDSHAKE-RI or TP-HANDSHAKE-AND-GRANT-CONTROL-RI had the confirmation-urgency field equal to "normal", then the corresponding APDU in Table 36 need not end a concatenation sequence.

Based on a local decision, each APDU in Table 36 may be concatenated to an existing concatenation sequence;

TABLE 36/X.862

APDUs that conditionally end a concatenation sequence

TP-HANDSHAKE-RC
TP-HANDSHAKE-AND-GRANT-CONTROL-RC

e) The APDUs in Table 37 may be concatenated and need not begin nor end a concatenation sequence. Based on a local decision, each APDU in Table 37 may be concatenated to an existing concatenation sequence;

TABLE 37/X.862

APDUs that may be concatenated

TP-U-ERROR-RI
TP-U-ERROR-RC
TP-TOKEN-GIVE-RI
TP-TOKEN-PLEASE-RI
TP-DEFER-RI
TP-HEURISTIC-REPORT-RI
TP-INITIALIZE-RI
TP-INITIALIZE-RC
U-ASE APDU

NOTE 2 – The TP-INITIALIZE-RI/RC are the only TP APDUs mapped to the A-ASSOCIATE services. The U-ASE is free to map its APDUs on A-ASSOCIATE services.

NOTE 3 – Some of the TP APDUs in Table 37 are not (expected to be) concatenated because they are defined to be mapped into other service in isolation rather than because of any concatentation rule (e.g. TP-TOKEN-GIVE/PLEASE-RI is only ever carried on P-TOKEN-GIVE/PLEASE-RI in isolation).

10.8 Routeing

The router part of the SACF receives CCR, ACSE and Presentation indications and confirms and determines which part of the PM shall receive the service primitive. This ensures that each service primitive is seen by the MACF (and possibly the SACF procedures) only once and that the full combined semantics of any TP APDU carried on the user data of a service primitive is given to the MACF with a single indication or confirm.

If the user data parameter associated with the service primitive is not present, the service primitive will be given to the MACF through the appropriate SACF procedures.

11 MACF description

11.1 Introduction

This subclause describes the TPPM MACF procedures related to the use of TP Service primitives by the TPSUI.

These procedures identify which actions are to be taken by the MACF. Main procedures and Internal Event procedures that pertain to both the TPPM and the CPM, and that pertain only to the CPM, are identified accordingly in the subclause title. Subclause titles without such identification pertain only to the TPPM.

Dashed lists are used exclusively to present the actions.

NOTE – This representation makes it easier for the reader to locate the actions when using the “Index of Actions and Events” which follows clause 15.

11.2 CAF service definition

11.2.1 CAF-PLEASE request

This service is used by the TPPM to request the assignment of a channel for the purpose of initiating recovery. The issuance of the CAF-PLEASE request always results in a subsequent CAF-GIVE indication or CAF-FAIL indication, provided the TPPM still exists.

This service does not relate to any particular channel.

This is an unconfirmed service.

Table 38 gives the parameters of this primitive.

TABLE 38/X.862

CAF-PLEASE parameters

CAF-PLEASE	
Parameter	req
AE-Title	M
Atomic Action Identifier	M
Branch Identifier	M

a) *AE-Title* – Specifies the AE Title of the transaction to be recovered;

b) *Atomic Action Identifier* – Together with the Branch Identifier, specifies the transaction branch to be recovered. Its value can be in the range as specified in ISO/IEC 9805;

c) *Branch Identifier* – Together with the Atomic Action Identifier, specifies the transaction branch to be recovered. Its value can be in the range as specified in ISO/IEC 9805.

The parameter values for "Atomic Action Identifier" and "Branch Identifier" are obtained from the log-ready and log-commit records for the transaction and branch, respectively, being recovered. These parameters are not set explicitly in the procedures that follow, but are assumed to be set on each CAF-PLEASE request.

11.2.2 CAF-GIVE indication

This service indicates that a *channel has been transferred* to the TPPM for the purpose of recovery. This *transfer of the channel* is made because of a previous CAF-PLEASE request.

Upon issuance of this service primitive, the channel has been completely established and a C-RECOVER request may be immediately issued by the MACF.

NOTE – The SACF may queue the C-RECOVER request if the *token* is not owned.

This service relates to the *channel which is to be transferred*.

This is an unconfirmed service.

Table 39 gives the parameters of this primitive.

TABLE 39/X.862

CAF-GIVE parameters

CAF-GIVE	
Parameter	ind
Channel-Utilization	M

a) *Channel-Utilization* – Specifies the type of recovery to be performed on this channel. The values are:

"one-way-recovery",

"two-way-recovery".

11.2.3 CAF-FAIL indication

This service indicates that a request for the assignment of a channel for recovery can not be satisfied by the CPM. This indication is a response to a previous CAF-PLEASE request.

The TPPM is responsible for issuing a further CAF-PLEASE request if recovery is still required.

This service does not relate to any particular channel.

This is an unconfirmed service.

This service has no parameters.

11.2.4 CAF-DETACH request

This service indicates that the TPPM has no further use for the channel. Issuing a CAF-DETACH request results in the *transfer of the channel* to the CPM.

This service relates to the *channel which is to be transferred*.

This is an unconfirmed service.

Table 40 gives the parameters of this primitive.

TABLE 40/X.862

CAF-DETACH parameters

CAF-DETACH	
Parameter	req
Type	M

a) *Type* – This parameter can take the value:

1) "clean-up", when the channel is being *detached* from the TPPM and a C-RECOVER indication or confirm may be subsequently received by the CPM;

2) "free", when the channel is available for another recovery exchange;

3) "not-used", when the TPPM did not use the channel and is returning it immediately after the issuance of the CAF-GIVE indication.

When this service primitive is referenced in the procedure clauses, the value listed in the parenthetical argument is the value of the Type parameter.

11.2.5 CAF-RECOVER indication

This service indicates that a *channel has been transferred* to the TPPM for the purpose of recovering a specific transaction branch. The indication identifies the transaction branch.

The channel has been completely established and the response to the recovery action can be sent immediately on the channel.

The service relates to a specific transaction branch. After the recovery action has concluded, the channel must be *detached* from the TPPM.

When this service primitive is referenced in the procedure clauses, the first value listed in the parenthetical argument is the value of the Recovery State parameter.

Table 41 gives the parameters of this primitive:

TABLE 41/X.862

CAF-RECOVER parameters

CAF-RECOVER	
Parameter	Ind
Recovery State	M
Atomic Action Identifier	M
Branch Identifier	M
Channel-Utilization	M

a) *Recovery State* – Specifies the peer's view of the state of the branch. The values are

"ready",

"commit";

b) *Atomic Action Identifier* – Together with the Branch Identifier, specifies the transaction branch to be recovered. Its value can be in the range as specified in ISO/IEC 9805;

c) *Branch Identifier* – Together with the Atomic Action Identifier, specifies the transaction branch to be recovered. Its value can be in the range as specified in ISO/IEC 9805;

d) *Channel-Utilization* – Specifies the type of recovery to be performed on this channel. The values are:

"one-way-recovery",

"two-way-recovery".

11.3 Main procedures

These procedures are invoked by TP, AF, SAF, CAF, and CCR services.

11.3.1 TP-BEGIN-DIALOGUE request

Depending on a local decision, either

– assign an association compatible with this dialogue;

NOTE 1 – Whether this association is assigned from the pool of associations, or has been newly established for use with this dialogue is a local matter.

– issue an AF-BEGIN-DIALOGUE request;

– invoke the "Initiating a transaction branch" procedure (see 11.5.4), if the coordination level is "commitment"; or

– issue a TP-BEGIN-DIALOGUE (rejected(provider)) confirm with the Rollback parameter set to "false" and the Diagnostic parameter set to

a) "recipient-unknown", if this dialogue establishment request is being rejected as a result of an A-ASSOCIATE confirm with the Diagnostic parameter set to one of

1) "called AP title not recognized";

2) "called AE qualifier not recognized";

3) "called AP invocation-identifier not recognized";

4) "called AE invocation-identifier not recognized";

b) "no-reason-given" otherwise.

NOTE 2 – The TPPM will normally only choose to issue the TP-BEGIN-DIALOGUE (rejected) confirm because it is unable to obtain a compatible association, either from the pool, or by establishing a new association. If a TP-BEGIN-DIALOGUE (rejected) confirm is issued because of a failed attempt to establish an association, it is a local matter to convey the parameter from the A-ASSOCIATE confirm (other than those enumerated above) to the TPSUI.

11.3.2 AF-BEGIN-DIALOGUE indication (TPPM and CPM)

If the dialogue or channel is not to be rejected,

a) if a dialogue, and the *dialogue will not have a coordination level of commitment*,

– create a TPSUI of the type specified by the Recipient-TPSU-Title parameter of the AF-BEGIN-DIALOGUE indication, or a TPSUI of a default type if the parameter is not present;

NOTE 1 – From the OSIE perspective, whether a new TPSUI is "created" in a real open system or whether an old instance is reused, is a local matter.

– issue a TP-BEGIN-DIALOGUE indication;

b) if a dialogue, and the *dialogue will have a coordination level of commitment*,

– continue;

NOTE 2 – If the *dialogue will have a coordination level of "commitment"*, a TP-BEGIN-DIALOGUE indication will be issued on receipt of a C-BEGIN indication (see 11.3.37).

c) if a channel

– issue an AF-BEGIN-DIALOGUE (accepted, dataRI) response.

If the dialogue or channel is to be rejected,

– issue an AF-BEGIN-DIALOGUE (rejected(provider), dataRI) response with the value of the

a) Diagnostic parameter, if a dialogue, set to, as appropriate, one of:

1) "recipient-tpsu-title-unknown";

2) "tpsu-not-available(permanent)";

3) "tpsu-not-available(transient)";

4) "recipient-tpsu-title-required";

5) "functional-unit-not-supported";

6) "functional-unit-combination-not-supported";

7) "no-reason-given";

b) Diagnostic parameter, if a channel, set to, as appropriate, one of:

1) "functional-unit-not-supported";

2) "tppm-recovery-not-available";

3) "two-way-recovery-not-supported";

4) "no-reason-given";

c) Functional-Units parameter set to the functional units which are supported, if the Diagnostic parameter is set to "functional-unit-not-supported";

– issue an SAF-DETACH-ASSOCIATION (free) request if the Unchained Transactions functional unit is not selected, or if a channel;

– issue an SAF-DETACH-ASSOCIATION (begin-fear) request if the Unchained Transactions functional unit is selected and the *dialogue will not have a coordination level of "commitment"*;

– issue an SAF-DETACH-ASSOCIATION (begin-indication-expected) request if the *dialogue will have a coordination level of "commitment".*

11.3.3 TP-BEGIN-DIALOGUE response

If the coordination level is "none" and the Result parameter is

a) "accepted",

– invoke the "First request/response" procedure (see 11.5.3);

b) "rejected",

– issue an AF-BEGIN-DIALOGUE (rejected(user), dataRI) response;

– issue an SAF-DETACH-ASSOCIATION (begin-fear) request if the Unchained Transactions functional unit is selected;

– issue an SAF-DETACH-ASSOCIATION (free) request if the Unchained Transactions functional unit is not selected.

If the coordination level is "commitment" and the Result parameter is

a) "accepted", and the TPPM is in the

1) ACTIVE state,

– invoke the "First request/response" procedure (see 11.5.3);

2) DECIDED (rollback) state,

– continue;

NOTE 1 – This situation occurs when the TPPM received the C-ROLLBACK indication before the TPSUI has issued TP-BEGIN-DIALOGUE (accepted) response. The TP-BEGIN-DIALOGUE-RC APDU will be sent as User Data of the *rollback response*, which will be issued upon the receipt of a TP-DONE request.

b) "rejected", and the TPPM is in the

1) ACTIVE state,

– issue an AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) response;

– issue an SAF-DETACH-ASSOCIATION (rollback-confirm-expected) request;

– cease to be part of the transaction;

2) DECIDED (rollback) state,

NOTE 2 – The only time the TPPM could be in this state is if it is a leaf and it received a *rollback indication* from the superior.

– issue an AF-BEGIN-DIALOGUE (rejected(user), rollbackRC) response;

– issue an SAF-DETACH-ASSOCIATION (free) request;

– cease to be part of the transaction.

11.3.4 AF-BEGIN-DIALOGUE (accepted) confirm on a Dialogue

If the value of the Mapping parameter is "rollbackRC", the TPPM shall be in the DECIDED (rollback) state.

If the value of the Mapping parameter is "dataRI" or "rollbackRC", do the following:

a) if the confirmation parameter of the TP-BEGIN-DIALOGUE request was "always" and a TP-U-ABORT request was not received,

– issue a TP-BEGIN-DIALOGUE confirm with the rollback parameter set to "false";

b) if the confirmation parameter of the TP-BEGIN-DIALOGUE request was "always" and the Mapping parameter is "dataRI" and a TP-U-ABORT request was received,

– continue;

c) if the confirmation parameter of the TP-BEGIN-DIALOGUE request was "negative",

– continue;

d) if the value of the Mapping parameter is "rollbackRC",

1) if a TP-U-ABORT request was received and no AF-ABORT request was issued,

– issue an AF-ABORT (user, dataRI) request;

NOTE – If a TP-U-ABORT request was received, an AF-ABORT request could not have been issued if the Mapping parameter is "rollbackRC".

– issue an SAF-DETACH-ASSOCIATION (free) request;

2) if the *last rollback confirm was received* and this is an intermediate node and the superior *dialogue has not been detached*,

– invoke the "Reporting rollback to superior" procedure (see 11.5.10);

3) if the *last rollback confirm was received* and the *superior dialogue is not chaining* and *rollback reporting has completed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6);

4) if the Unchained Transactions functional unit is selected on the dialogue and no TP-U-ABORT request was received,

– *close the PSAP*.

11.3.5 AF-BEGIN-DIALOGUE (rejected, dataRI) confirm on a Dialogue

If the Diagnostic parameter is set to "association-reserved", set the value of that parameter for the TP-BEGIN-DIALOGUE confirm to "no-reason-given".

If the coordination level is "none",

– issue a TP-BEGIN-DIALOGUE confirm with the value of the Rollback parameter set to "false";

– issue an SAF-DETACH-ASSOCIATION (free) request.

If the coordination level is "commitment" and either

a) the Unchained Transactions functional unit is selected and the Type parameter is "rejected(user)"; or

b) the Type parameter is "rejected(provider)";

and the TPPM is in the

a) ACTIVE state and a TP-COMMIT request was received,
   - issue a TP-BEGIN-DIALOGUE confirm with the Rollback parameter set to "true";
   - issue an SAF-DETACH-ASSOCIATION (rollback-indication-expected) request;
   - invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);

b) ACTIVE state and a TP-COMMIT request was not received,
   - issue a TP-BEGIN-DIALOGUE confirm with the Rollback parameter set to "false";
   - issue an SAF-DETACH-ASSOCIATION (rollback-indication-expected) request;

c) DECIDED (rollback) state,
   1) always
      - issue an SAF-DETACH-ASSOCIATION (rollback-confirm-expected) request;
   2) if a TP-U-ABORT request was not received,
      - issue a TP-BEGIN-DIALOGUE confirm with the Rollback parameter set to "false";

      NOTE – *A TP-DONE request is now owed.*
   3) if a TP-U-ABORT request was received and the *last rollback confirm was received*,
      i) if this is an intermediate node and the superior *dialogue has not been detached*,
         - invoke the "Reporting rollback to superior" procedure (see 11.5.10);
      ii) if the superior *dialogue is not chaining* and *rollback reporting has completed*,
         - invoke the "Initiating transaction after rollback" procedure (see 11.5.6);

11.3.6 AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) confirm

If the coordination level is "commitment" and if the TPPM is in the

a) ACTIVE state and a TP-COMMIT request was received,
   - issue an TP-BEGIN-DIALOGUE confirm with the Rollback parameter set to "true";
   - invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);
   - issue an SAF-DETACH-ASSOCIATION (free) request;

b) ACTIVE state and a TP-COMMIT request was not received,
   - issue a TP-BEGIN-DIALOGUE confirm with the Rollback parameter set to "false";
   - issue a C-ROLLBACK response;
   - issue an SAF-DETACH-ASSOCIATION (free) request;

c) DECIDED (rollback) state,
   1) always
      - issue a C-ROLLBACK response;
      - issue an SAF-DETACH-ASSOCIATION (free) request;
   2) if a TP-U-ABORT request was not received,
      - issue a TP-BEGIN-DIALOGUE confirm with the Rollback parameter set to "false";

      NOTE – *A TP-DONE request is now owed.*

3) if a TP-U-ABORT request was received and the *last rollback confirm was received*,

i) if this is an intermediate node and the superior *dialogue has not been detached*,

– invoke the "Reporting rollback to superior" procedure (see 11.5.10);

ii) if the superior *dialogue is not chaining* and *rollback reporting has completed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6);

11.3.7 AF-BEGIN-DIALOGUE (rejected(user), rollbackRC) confirm

If the coordination level is commitment, and the TPPM is in the DECIDED (rollback) state,

a) always

– issue an SAF-DETACH-ASSOCIATION (free) request;

b) if a TP-U-ABORT request was not received,

– issue a TP-BEGIN-DIALOGUE confirm with the Rollback parameter set to "false";

NOTE – *A TP-DONE request is now owed*.

c) if a TP-U-ABORT request was received and the *last rollback confirm was received*,

1) if this is an intermediate node and the superior *dialogue has not been detached*,

– invoke the "Reporting rollback to superior" procedure (see 11.5.10);

2) if the superior *dialogue is not chaining* and *rollback reporting has completed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6).

11.3.8 AF-BEGIN-DIALOGUE confirm (CPM)

If the result parameter is "accepted" and a TPPM with a branch corresponding to the Atomic Action identifier and Branch Identifier specified in a previous CAF-PLEASE request is found,

– *transfer the channel* to the requesting TPPM;

– issue a CAF-GIVE indication to the TPPM with a branch corresponding to the Atomic Action identifier and Branch Identifier specified in a previous CAF-PLEASE request.

If the result parameter is "accepted" and a TPPM with a branch corresponding to the Atomic Action Identifier and Branch Identifier specified in a previous CAF-PLEASE request is not found,

– retain control of the channel.

NOTE – The CPM may make local decisions to allocate the channel to another TPPM in response to a subsequent CAF-PLEASE request, or to terminate the channel, or if the channel supports two-way-recovery to pass the *token* to the remote CPM.

If the result parameter is "rejected(provider)",

– issue a CAF-FAIL indication to the TPPM with a branch corresponding to the Atomic Action Identifier and Branch Identifier specified in the previous CAF-PLEASE request;

– issue an SAF-DETACH-ASSOCIATION (free) request.

11.3.9 SAF-ASSOCIATION-LOST indication

NOTE 1 – It is a local matter whether an implementation retries establishing a dialogue on another association.

If the coordination level is "none",

– issue a TP-BEGIN-DIALOGUE (rejected(provider)) confirm with the value of the Rollback parameter set to "false" and with the Diagnostic parameter set to "no-reason-given".

If the coordination level is "commitment" and if the TPPM is in the

a) ACTIVE state and a TP-COMMIT request was received,

– issue a TP-BEGIN-DIALOGUE (rejected(provider)) confirm with the Rollback parameter set to "true" and with the Diagnostic parameter set to "no-reason-given";

– invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);

b) ACTIVE state and a TP-COMMIT request was not received,

– issue a TP-BEGIN-DIALOGUE (rejected(provider)) confirm with the Rollback parameter set to "false" and with the Diagnostic parameter set to "no-reason-given";

c) DECIDED (rollback) state,

1) if a TP-U-ABORT request was not received,

– issue a TP-BEGIN-DIALOGUE (rejected(provider)) confirm with the Rollback parameter set to "false" and with the Diagnostic parameter set to "no-reason-given";

NOTE 2 – *A TP-DONE request is now owed.*

2) if a TP-U-ABORT request was received and the *last rollback confirm was received*,

i) if this is an intermediate node and the superior *dialogue has not been detached*,

– invoke the "Reporting rollback to superior" procedure (see 11.5.10);

ii) if the superior *dialogue is not chaining* and *rollback reporting has completed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6).

11.3.10 SAF-ASSOCIATION-LOST indication (CPM)

– Issue a CAF-FAIL indication to the TPPM with a branch corresponding to the Atomic Action Identifier and Branch Identifier specified in the previous CAF-PLEASE request;

– continue.

11.3.11 TP-END-DIALOGUE request

– Invoke the "First request/response" procedure (see 11.5.3), if this is a superior dialogue and if no AF-BEGIN-DIALOGUE response has been issued on the dialogue since an AF-BEGIN-DIALOGUE indication has been received;

– issue an AF-END-DIALOGUE request.

If the value of the confirmation parameter is "false",

– issue an SAF-DETACH-ASSOCIATION (begin-fear) request if the Unchained Transactions functional unit is selected and this is a superior dialogue;

– issue an SAF-DETACH-ASSOCIATION (free) request if the Unchained Transactions functional unit is not selected or this is a subordinate dialogue.

11.3.12 AF-END-DIALOGUE indication

If the coordination level is "none", and

a) the value of the Confirmation parameter is "false",

– issue a TP-END-DIALOGUE indication;

– issue an SAF-DETACH-ASSOCIATION (free) request;

b) the value of the Confirmation parameter is "true" and the dialogue is in a *user error purging period*,

1) if the Polarized Control functional unit is selected,

– issue a TP-END-DIALOGUE indication;

2) if the Shared Control functional unit is selected,

– continue;

c) the value of the Confirmation parameter is "true", the dialogue is not in a *user error purging period*, and

1) a dialogue termination request is outstanding and the Shared Control functional unit is selected,

– issue a TP-P-ABORT indication with the value of the Diagnostic parameter set to "end-dialogue-collision" and the value of the Rollback parameter set to "false";

– issue an SAF-DETACH-ASSOCIATION (free) request;

2) a dialogue termination request is not outstanding,

– issue a TP-END-DIALOGUE indication.

If the coordination level is "commitment", the indication was from a subordinate, a TP-BEGIN-TRANSACTION request has been received, a C-BEGIN confirm was not received, and the TPPM is in the

a) ACTIVE state, a TP-COMMIT request was not received, and the Confirmation parameter is set to "false",

   – issue a TP-P-ABORT indication with the Diagnostic parameter set to "begin-transaction-end-dialogue-collision" and with the Rollback parameter set to "false";

   – issue an SAF-DETACH-ASSOCIATION (rollback-indication-expected) request;

b) ACTIVE state, a TP-COMMIT request was received, and the Confirmation parameter is set to "false",

   – issue a TP-P-ABORT indication with the Diagnostic parameter set to "begin-transaction-end-dialogue-collision" and with the Rollback parameter set to "true";

   – issue an SAF-DETACH-ASSOCIATION (rollback-indication-expected) request;

   – invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);

c) ACTIVE state, the Confirmation parameter is set to "true", and the dialogue is in the *transaction initiation purging period*,

   – continue;

d) ACTIVE state, a TP-COMMIT request was not received, the Confirmation parameter is set to "true",, and the dialogue is not in the *transaction initiation purging period*,

   – issue a TP-P-ABORT indication with the Diagnostic parameter set to "begin-transaction-end-dialogue-collision" and with the Rollback parameter set to "false";

   – issue an SAF-DETACH-ASSOCIATION (rollback-indication-expected) request;

e) ACTIVE state, a TP-COMMIT request was received, the Confirmation parameter is set to "true", and the dialogue is not in the *transaction initiation purging period*,

   – issue a TP-P-ABORT indication with the Diagnostic parameter set to "begin-transaction-end-dialogue-collision" and with the Rollback parameter set to "true";

   – issue an SAF-DETACH-ASSOCIATION (rollback-indication-expected) request;

f) DECIDED (rollback) state and the dialogue is not in the *transaction initiation purging period*,

   1) always

      – issue an SAF-DETACH-ASSOCIATION (rollback-confirm-expected) request;

   2) if a TP-U-ABORT request was not received,

      – issue a TP-P-ABORT indication with the Diagnostic parameter set to "begin-transaction-end-dialogue-collision" and with the Rollback parameter set to "false";

        NOTE – *A TP-DONE request is now owed.*

   3) if a TP-U-ABORT request was received and the *last rollback confirm was received*,

      i) if this is an intermediate node and the superior *dialogue has not been detached*,

         – invoke the "Reporting rollback to superior" procedure (see 11.5.10);

      ii) if the superior *dialogue is not chaining* and *rollback reporting has completed*,

         – invoke the "Initiating transaction after rollback" procedure (see 11.5.6);

g) DECIDED (rollback) state and the dialogue is in the *transaction initiation purging period*,

   – continue.

11.3.13 AF-END-DIALOGUE indication (CPM)

– Issue an SAF-DETACH-ASSOCIATION (free) request.

11.3.14 TP-END-DIALOGUE response

– Invoke the "First request/response" procedure (see 11.5.3), if this is a superior dialogue and if no AF-BEGIN-DIALOGUE response has been issued on the dialogue since an AF-BEGIN-DIALOGUE indication has been received;

– issue an AF-END-DIALOGUE response;

– issue an SAF-DETACH-ASSOCIATION (free) request.

11.3.15 AF-END-DIALOGUE confirm

If the Confirmation parameter of the TP-END-DIALOGUE request previously issued was "true",

– issue a TP-END-DIALOGUE confirm;

– issue an SAF-DETACH-ASSOCIATION (free) request.

11.3.16 TP-U-ERROR request

– Invoke the "First request/response" procedure (see 11.5.3), if this is a superior dialogue and if no AF-BEGIN-DIALOGUE response has been issued on the dialogue since an AF-BEGIN-DIALOGUE indication has been received;

– issue an AF-U-ERROR request.

11.3.17 AF-U-ERROR indication

If the TPPM is in the ACTIVE state and already issued an AF-PREPARE request on this dialogue,

– invoke the "Initiating rollback at TPPM" procedure (see 11.5.5).

If the TPPM is in the ACTIVE state and no AF-PREPARE request has been issued, or if the coordination level is "none",

a) if the Shared Control functional unit was selected

– issue a TP-U-ERROR indication;

– issue an AF-U-ERROR response if both of the following conditions are met:

1) this is a subordinate dialogue or an AF-BEGIN-DIALOGUE response was issued; and

NOTE – The AF-U-ERROR response will be issued after the AF-BEGIN-DIALOGUE response.

2) there is no dialogue termination request outstanding and no handshake request outstanding;

b) if the Polarized Control functional unit was selected

– continue, if the TPPM is in a *user error purging period*;

– issue a TP-U-ERROR indication if the TPPM is not in a *user error purging period*.

If the TPPM is in the DECIDED (rollback) state,

– continue.

11.3.18 AF-U-ERROR confirm

If the Shared Control functional unit is selected,

– continue.

11.3.19 TP-U-ABORT request

NOTE 1 – There are some cases where an AF-ABORT request will not be issued by this procedure. If the transaction branch has not completed the termination phase, the issuance of the AF-ABORT request is deferred until the necessary response/request is issued to complete the transaction. This is required because, according to CCR rules, nothing can be issued until this time. If the AF-ABORT request is to be deferred, this procedure will either continue or initiate rollback.

– Invoke the "First request/response" procedure (see 11.5.3), if this is a superior dialogue and if no AF-BEGIN-DIALOGUE response has been issued on the dialogue since an AF-BEGIN-DIALOGUE indication has been received and the TPPM is not in the DECIDED (rollback) state.

If the coordination level is "none",

- issue an AF-ABORT (user, dataRI) request;
- issue an SAF-DETACH-ASSOCIATION (begin-fear) request if the Unchained Transactions functional unit is selected and this is a superior dialogue;
- issue an SAF-DETACH-ASSOCIATION (free) request if the Unchained Transactions functional unit is not selected or this is a subordinate dialogue.

If the coordination level is "commitment", and the TPPM is in the

a) ACTIVE state,
   - issue an AF-ABORT (user, rollbackRI) request if the dialogue is to a subordinate;

     NOTE 2 – The TPPM does not issue a C-ROLLBACK request to the superior at this time. It must wait for TP-DONE and all *rollback confirms*.
   - invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);

b) READY state,
   - continue;

c) DECIDED (commit) state, and
   1) the TP-U-ABORT request pertains to the superior dialogue, and the TPPM
      i) has received a C-COMMIT+C-BEGIN indication
         - invoke the "Rollback next transaction" procedure (see 11.5.11);
      ii) has received a C-COMMIT indication
         - continue;
   2) the TP-U-ABORT request pertains to a subordinate dialogue, and the TPPM
      i) has sent a C-COMMIT+C-BEGIN request,
         - invoke the "Rollback next transaction" procedure (see 11.5.11);
      ii) has sent a C-COMMIT request and has received a *commit confirm*
         - issue an AF-ABORT (user, dataRI) request;
         - issue an SAF-DETACH-ASSOCIATION (free) request;
      iii) has sent a C-COMMIT request and has not received a *commit confirm*
         - continue;

d) DECIDED (rollback) state and a *rollback response* was issued or a *rollback confirm* was received and
   1) the TP-U-ABORT request pertains to the superior dialogue and
      i) a C-BEGIN indication was not received while in the DECIDED (rollback) state,
         - issue an AF-ABORT (user, dataRI) request;
         - issue an SAF-DETACH-ASSOCIATION (begin-fear) request if the Chained Transactions functional unit is selected;

           NOTE 3 – *A TP-DONE request is owed*, which will invoke the "Initiating Next Transaction after Rollback" procedure.
         - *open the PSAP* if the Unchained Transactions functional unit is selected;
         - issue an SAF-DETACH-ASSOCIATION (free) request if the Unchained Transactions functional unit is selected;
      ii) a C-BEGIN indication was received while in the DECIDED (rollback) state,
         - issue an AF-ABORT (user, rollbackRI) request on the superior dialogue;
         - *open the PSAP*;
         - issue an SAF-DETACH-ASSOCIATION (rollback-confirm-expected) request;
   2) the TP-U-ABORT request pertains to a subordinate dialogue,
      - issue an AF-ABORT (user, dataRI) request;
      - *open the PSAP*, if the Unchained Transactions functional unit is selected;
      - issue an SAF-DETACH-ASSOCIATION (free) request;

e) DECIDED (rollback) state and neither a *rollback response* was issued nor a *rollback confirm* was received,

– continue.

11.3.20 AF-ABORT (user, dataRI) indication

If the coordination level is "none",

– issue a TP-U-ABORT indication with the Rollback parameter set to "false";

– issue an SAF-DETACH-ASSOCIATION (free) request.

If the coordination level is "commitment", the indication was from a subordinate, and the TPPM is in the

a) ACTIVE state, and

1) a TP-COMMIT request was not received;

2) a C-BEGIN confirm was not received;

then

– issue a TP-U-ABORT indication with the Rollback parameter set to "false";

– issue an SAF-DETACH-ASSOCIATION (rollback-indication-expected) request;

b) ACTIVE state, and

1) a TP-COMMIT request was received;

2) a C-BEGIN confirm was not received;

then

– issue a TP-U-ABORT indication with the Rollback parameter set to "true";

– issue an SAF-DETACH-ASSOCIATION (rollback-indication-expected) request;

– invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);

c) DECIDED (rollback) state, and

1) if a *rollback confirm* was received or a *rollback response* was issued, and the *dialogue is chaining*;

– issue a TP-U-ABORT indication with the Rollback parameter set to "false";

– issue an SAF-DETACH-ASSOCIATION (free) request;

NOTE 1 – In this situation, a TP-U-ABORT request cannot have been previously received on this association because, in that case, the association would have been immediately or eventually *detached* and the event causing this procedure invocation could not have happened.

2) if a *rollback confirm* was not received and the Unchained Transactions functional unit is selected,

i) if a TP-U-ABORT request was not received,

– issue a TP-U-ABORT indication with the Rollback parameter set to "false";

ii) always

– issue an SAF-DETACH-ASSOCIATION (rollback-confirm-expected) request.

iii) if the *last rollback confirm was received* and this is an intermediate node and the superior *dialogue has not been detached*,

– invoke the "Reporting rollback to superior" procedure (see 11.5.10);

iv) if the *last rollback confirm was received*, the superior *dialogue is not chaining*, and *rollback reporting has completed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6).

If the coordination level is "commitment" and the indication is from the superior, and the TPPM is in the DECIDED (rollback) state and has issued a *rollback response* to or received a *rollback confirm* from the superior,

– issue a TP-U-ABORT indication with the Rollback parameter set to "false";

– issue an SAF-DETACH-ASSOCIATION (free) request.

NOTE 2 – In this situation, a TP-U-ABORT request could not have been previously received on this dialogue because the association would have been *detached* since the rollback report to the superior occurred (and then the TPPM would not have received the AF-ABORT indication). Therefore, *a TP-DONE request must be owed*, preventing the transaction after the rollback from beginning. In addition, the *superior dialogue is* necessarily *chaining* and a C-BEGIN indication could not have been received in this state, since this would have led to *closing the PSAP*.

11.3.21 Protocol error, internal error, A[-P]-ABORT indication, AF-ABORT (provider, abortRI) indication, A-ABORT request, A-RELEASE (Result=affirmative) response, or A-RELEASE (Result=affirmative) confirm on a dialogue

NOTE – The A-ABORT request in the title of this procedure refer to when these services are issued by the U-ASE or some part of the SACF to ACSE. The A-ABORT indication includes the case where the service primitive has the value of the Abort Source parameter equal to "ACSE service-user", and is therefore indicated by ACSE to the U-ASE.

If this is a protocol error or internal error,

- issue an AF-ABORT (provider, abortRI) request with the Diagnostic parameter set to
  1) "protocol error", if this is a protocol error;
  2) "transient-failure" or "permanent-failure", based on a local decision, if this is an internal error.

If no TP-U-ABORT request was received,

- issue a TP-P-ABORT indication with the Rollback parameter set to
  a) "true", if the TPPM is in the ACTIVE state, does not have a dialogue establishment indication outstanding, and the coordination level is "commitment";
  b) "false", otherwise;

and the Diagnostic parameter set to

a) "protocol-error", if this is a protocol error;

b) "transient-failure" or "permanent-failure", based on a local decision, if this is an internal error;

c) "permanent-failure", if this is an A-RELEASE response, an A-RELEASE confirm, an A-[P-] ABORT indication, or an A-ABORT request; or

d) to the Diagnostic parameter on the AF-ABORT indication, if this is an AF-ABORT indication;

- cease to be part of the transaction, if there is a dialogue establishment indication outstanding.

If the dialogue is with the superior, the coordination level is "commitment", and the TPPM is in the

a) ACTIVE state and does not have a dialogue establishment indication outstanding,
   - invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);

b) READY state
   - issue a CAF-PLEASE request with the AE-Title of the CAF-PLEASE request set to the value of the AE-Title taken from the branch identifier for the superior, contained in the log-ready record;

c) DECIDED (commit) state
   - invoke the "Rollback next transaction" procedure (see 11.5.11) if a C-COMMIT+C-BEGIN indication was received from the superior;

d) DECIDED (rollback) state
   1) if a TP-U-ABORT request was received and the *last rollback confirm was received*,
      - invoke the "Initiating transaction after rollback" procedure (see 11.5.6);
   2) otherwise,
      - continue.

If the dialogue is with the subordinate, the coordination level is "commitment", and the TPPM is in the

a) ACTIVE state,
   - invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);

b) READY state,
   - continue;

c) DECIDED (commit) state,

– invoke the "Rollback next transaction" procedure (see 11.5.11) if a C-COMMIT+C-BEGIN request was issued;

– issue a CAF-PLEASE request if a *commit confirm* has not been received, with the AE-Title of the CAF-PLEASE request set to the value of the AE-Title taken from the branch identifier for the subordinate, contained in the log-commit record;

d) ACTIVE, or DECIDED (rollback) state, and both of the following are true:

1) an AF-PREPARE request has been issued to this subordinate; and

2) no *rollback confirm* or *rollback indication* has been received from this subordinate,

then

– issue a TP-HEURISTIC-REPORT indication with the Heuristic-Report parameter set to "heuristic-hazard";

– *write a* log-*damage record* with the value "heuristic-hazard" if no log-damage record exists;

e) DECIDED (rollback) state, neither a *rollback confirm* was received nor a *rollback response* was issued, the *last rollback confirm was received*, and

1) if this is an intermediate node and the superior *dialogue has not been detached*,

– invoke the "Reporting rollback to superior" procedure (see 11.5.10);

2) if the *superior dialogue is not chaining and rollback reporting has completed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6);

f) DECIDED (rollback) state,

– continue.

11.3.22 Protocol error, internal error, A[-P]-ABORT indication, AF-ABORT (provider, abortRI) indication, A-ABORT request, A-RELEASE (Result=affirmative) response, or A-RELEASE (Result=affirmative) confirm on a channel

If this is a protocol error or internal error and the association has not been aborted,

– issue an AF-ABORT (provider, abortRI) request with the Diagnostic parameter set to

1) "protocol error", if this is a protocol error;

2) "transient-failure" or "permanent-failure", based on a local decision, if this is an internal error.

If the channel was with the superior and the TPPM is in the

a) READY state,

– issue a CAF-PLEASE request with the AE-Title of the CAF-PLEASE request set to the value of the AE-Title taken from the branch identifier for the superior, contained in the log-ready record.

b) DECIDED (commit) state,

– continue.

If the channel was with the subordinate and the TPPM is in the

a) READY state,

– continue;

b) DECIDED (commit) state,

– issue a CAF-PLEASE request with the AE-Title of the CAF-PLEASE request set to the value of the AE-Title taken from the branch identifier for the superior, contained in the log-ready record.

11.3.23 Protocol error, internal error, A[-P]-ABORT indication, AF-ABORT (provider, abortRI) indication, A-RELEASE (Result=affirmative) response, or A-RELEASE (Result=affirmative) confirm (CPM)

If this is a protocol error or internal error,

- issue an AF-ABORT (provider, abortRI) request with the Diagnostic parameter set to
  1) "protocol error", if this is a protocol error;
  2) "transient-failure" or "permanent-failure", based on a local decision, if this is an internal error.

Always

- issue a CAF-FAIL indication to the TPPM with a branch corresponding to the Atomic Action Identifier and Branch Identifier specified in the previous CAF-PLEASE request.

11.3.24 TP-GRANT-CONTROL request

- Invoke the "First request/response" procedure (see 11.5.3), if this is a superior dialogue and if no AF-BEGIN-DIALOGUE response has been issued on the dialogue since an AF-BEGIN-DIALOGUE indication has been received;
- issue an AF-GRANT-CONTROL request.

11.3.25 AF-GRANT-CONTROL indication

If the coordination level is "none",

- issue a TP-GRANT-CONTROL indication.

If the coordination level is "commitment" and the TPPM is in the

a) ACTIVE state,
   - issue a TP-GRANT-CONTROL indication;

b) DECIDED (rollback) state,
   - continue.

11.3.26 TP-REQUEST-CONTROL request

- Invoke the "First request/response" procedure (see 11.5.3), if this is a superior dialogue and if no AF-BEGIN-DIALOGUE response has been issued on the dialogue since an AF-BEGIN-DIALOGUE indication has been received;
- issue an AF-REQUEST-CONTROL request.

11.3.27 AF-REQUEST-CONTROL indication

- Continue if one of the following conditions is met:
  a) the TPPM does not have the control of the dialogue;
  b) the TPPM has an outstanding dialogue termination request;
  c) the TPPM has already invoked an AF-PREPARE request for the current provider-supported transaction;
  d) the TPPM is in the DECIDED (rollback) state.

Otherwise,

- issue a TP-REQUEST-CONTROL indication.

11.3.28 TP-HANDSHAKE request

- Invoke the "First request/response" procedure (see 11.5.3), if this is a superior dialogue and if no AF-BEGIN-DIALOGUE response has been issued on the dialogue since an AF-BEGIN-DIALOGUE indication has been received;
- issue an AF-HANDSHAKE request.

11.3.29 AF-HANDSHAKE indication

Do only the first applicable action of the following:

a) if the TPPM is in the DECIDED (rollback) state and the coordination level is "commitment",

   – continue;

b) if the Shared Control functional unit is selected and the TPPM is in a *user error purging period*,

   – continue;

c) if the TPPM is in the ACTIVE state, a C-READY indication was not received, the Shared Control functional unit is selected and an AF-PREPARE request had already been issued on this dialogue,

   – invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);

d) if the TPPM is not in a *user error purging period*,

   – issue a TP-HANDSHAKE indication;

e) if the Polarized Control functional unit was selected and the TPPM is in a *user error purging period*,

   – issue a TP-HANDSHAKE indication.

11.3.30 TP-HANDSHAKE response

– Invoke the "First request/response" procedure (see 11.5.3), if this is a superior dialogue and if no AF-BEGIN-DIALOGUE response has been issued on the dialogue since an AF-BEGIN-DIALOGUE indication has been received;

– issue an AF-HANDSHAKE response.

11.3.31 AF-HANDSHAKE confirm

If the coordination level is "none",

– issue a TP-HANDSHAKE confirm.

If the coordination level is "commitment" and the TPPM is in the

a) ACTIVE state,

   – issue a TP-HANDSHAKE confirm;

b) DECIDED (rollback) state,

   – continue.

11.3.32 TP-HANDSHAKE-AND-GRANT-CONTROL request

– Invoke the "First request/response" procedure (see 11.5.3), if this is a superior dialogue and if no AF-BEGIN-DIALOGUE response has been issued on the dialogue since an AF-BEGIN-DIALOGUE indication has been received;

– issue an AF-HANDSHAKE-AND-GRANT-CONTROL request.

11.3.33 AF-HANDSHAKE-AND-GRANT-CONTROL indication

If the coordination level is "none",

– issue a TP-HANDSHAKE-AND-GRANT-CONTROL indication.

If the coordination level is "commitment" and the TPPM is in the

a) ACTIVE state,

   – issue a TP-HANDSHAKE-AND-GRANT-CONTROL indication;

b) DECIDED (rollback) state,

   – continue.

11.3.34 TP-HANDSHAKE-AND-GRANT-CONTROL response

- Invoke the "First request/response" procedure (see 11.5.3), if this is a superior dialogue and if no AF-BEGIN-DIALOGUE response has been issued on the dialogue since an AF-BEGIN-DIALOGUE indication has been received;
- issue an AF-HANDSHAKE-AND-GRANT-CONTROL response.

11.3.35 AF-HANDSHAKE-AND-GRANT-CONTROL confirm

If the coordination level is "none",

- issue a TP-HANDSHAKE-AND-GRANT-CONTROL confirm.

If the coordination level is "commitment" and the TPPM is in the

a) ACTIVE state,
   - issue a TP-HANDSHAKE-AND-GRANT-CONTROL confirm;

b) DECIDED (rollback) state,
   - continue.

11.3.36 TP-BEGIN-TRANSACTION request

NOTE – The Session Layer synchronize-minor token is needed in order to issue this request. The TPPM guarantees that this token will be positioned with the issuer unless the TPSUI or U-ASE have moved it, in which case it is the responsibility of the TPSUI to get the *token* before issuing this request. This is a constraint on the movement of the *token* by the U-ASE, described in Annex B.

- Invoke the "Initiating a transaction branch" procedure (see 11.5.4).

11.3.37 C-BEGIN indication

The indication shall be from the superior in the dialogue tree. The Commit functional unit shall be selected. Either the coordination level shall not be "commitment", or the TPPM shall be in the DECIDED (rollback) state and the *dialogue shall be chaining.*

If the Shared Control functional unit is selected and a dialogue termination request is outstanding,

- issue a TP-P-ABORT indication with the Diagnostic parameter set to "begin-transaction-end-dialogue-collision" and the Rollback parameter set to "false";
- issue a C-ROLLBACK request;
- issue an SAF-DETACH-ASSOCIATION (rollback-confirm-expected) request.

If the TPPM is a root in a transaction tree and a dialogue termination request is not outstanding,

- issue an AF-ABORT (provider, rollbackRI) request with the Diagnostic parameter set to "begin-transaction-reject";
- issue a TP-P-ABORT indication with the value of the Rollback parameter set to "false"; and with the Diagnostic parameter set to "begin-transaction-reject";
- issue an SAF-DETACH-ASSOCIATION (rollback-confirm-expected) request.

NOTE 1 – An implementation may choose to wait for the current transaction to complete and then accept the C-BEGIN indication. From a conformance testing view, this is equivalent to not being able to process the C-BEGIN indication until the current transaction has completed (when it can then be successfully processed, instead of rejected). The TPPM procedures and state tables do not provide procedures to allow waiting for the transaction to complete.

If the TPPM is not a root in the transaction tree and a dialogue termination request is not outstanding,

a) if a TP-BEGIN-DIALOGUE indication has been issued and the TPPM is not in the DECIDED (rollback) state,
   - issue a TP-BEGIN-TRANSACTION indication;
   - become a leaf node;
   - enter the ACTIVE state.

b) if a TP-BEGIN-DIALOGUE indication has not been issued,
   - create a TPSUI of the type specified by the Recipient-TPSU-Title parameter of the AF-BEGIN-DIALOGUE indication, or a TPSUI of a default type if the parameter is not present;

NOTE 2 – From the OSIE perspective, whether a new TPSUI is "created" in a real open system or whether an old instance is reused, is a local matter.

– issue a TP-BEGIN-DIALOGUE indication with the parameters as specified in the previously received AF-BEGIN-DIALOGUE indication;

NOTE 3 – If the *dialogue will have a coordination level of "commitment"*, the TP-BEGIN-DIALOGUE indication is issued as above since the C-BEGIN indication has arrived.

– become a leaf node;

– enter the ACTIVE state.

c) if an AF-BEGIN-DIALOGUE response was issued,

– issue a C-BEGIN response;

d) if the TPPM is in the DECIDED (rollback) state and *a TP-DONE request is owed*,

– *close the PSAP*;

e) if the TPPM is in the DECIDED (rollback) state and *a TP-DONE request is not owed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6).

11.3.38 C-BEGIN confirm

– Continue.

11.3.39 TP-DATA request

– Invoke the "First request/response" procedure (see 11.5.3), if this is a superior dialogue and if no AF-BEGIN-DIALOGUE response has been issued on the dialogue since an AF-BEGIN-DIALOGUE indication has been received;

– issue a U-ASE request.

11.3.40 U-ASE indication

If the TPPM is in a *user error purging period*,

– continue;

otherwise,

a) if the coordination level is "none"

– issue a TP-DATA indication;

b) if the coordination level is "commitment" and the TPPM is in the

1) ACTIVE state

i) and a TP-COMMIT request has been received, and this indication occurred on a dialogue with the Shared Control functional unit selected or on a dialogue with the Polarized Control functional unit selected after an AF-PREPARE request with the Data-Permitted parameter set to "true" has been issued,

– invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);

ii) otherwise,

– issue a TP-DATA indication;

2) DECIDED (rollback) state

– continue.

11.3.41 TP-DEFERRED-END-DIALOGUE request

– Optionally issue an AF-DEFER (end-dialogue) request according to a local decision.

NOTE – It is an implementation option to either invoke the AF-DEFER request immediately or to delay it until the AF-PREPARE request is invoked.

11.3.42 TP-DEFERRED-GRANT-CONTROL request

– Optionally issue an AF-DEFER (grant-control) request according to a local decision.

NOTE – It is an implementation option to either invoke the AF-DEFER request immediately or to delay it until the AF-PREPARE request is invoked.

11.3.43 AF-DEFER indication

If the coordination level is "commitment", and the TPPM is in the

a) ACTIVE state, either

– issue a TP-DEFERRED-END-DIALOGUE indication if the Type parameter is "end-dialogue"; or

– issue a TP-DEFERRED-GRANT-CONTROL indication if the Type parameter is "grant-control";

b) DECIDED (rollback) state,

– continue.

11.3.44 TP-PREPARE request

If a TP-DEFERRED-END-DIALOGUE request was received and no AF-DEFER (end-dialogue) request was issued,

– issue an AF-DEFER (end-dialogue) request.

If no TP-DEFERRED-END-DIALOGUE request was received, a TP-DEFERRED-GRANT-CONTROL request was received and no AF-DEFER (grant-control) request was issued,

– issue an AF-DEFER (grant-control) request.

Always

– issue an AF-PREPARE request.

11.3.45 TP-COMMIT request

For each subordinate to which an AF-PREPARE request has not already been issued,

a) if a TP-DEFERRED-END-DIALOGUE request was received and no AF-DEFER (end-dialogue) request was issued,

– issue an AF-DEFER (end-dialogue) request;

b) if no TP-DEFERRED-END-DIALOGUE request was received, a TP-DEFERRED-GRANT-CONTROL request was received and no AF-DEFER (grant-control) request was issued,

– issue an AF-DEFER (grant-control) request;

c) always

– issue an AF-PREPARE request with the Data-Permitted parameter

1) absent, if the Shared Control functional unit is selected;

2) set to "false", if the Polarized Control functional unit is selected.

If the TPPM is the root,

– invoke the "Making commitment decision" procedure (see 11.5.7) if the *last ready was received.*

If the TPPM is an intermediate or leaf,

– invoke the "Entering READY state" procedure (see 11.5.2) if the *last ready was received.*

11.3.46 AF-PREPARE indication

If the coordination level is "commitment" and TPPM is in the

a) ACTIVE state, and

1) the TPPM is in a *user error purging period* or a handshake request is outstanding,

NOTE – A handshake request outstanding may occur only if the Shared Control functional unit was selected.

– invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);

2) otherwise,

– issue a TP-PREPARE indication;

b) DECIDED (rollback) state

– continue.

11.3.47 C-READY indication

The TPPM shall be in the ACTIVE state and an AF-PREPARE request shall have been issued.

If the *last ready was not received* and

a) a TP-COMMIT request was not received,

NOTE – In this case a TP-PREPARE request was received.

– issue a TP-READY indication;

b) a TP-COMMIT request was received,

– continue.

If the *last ready was received* and

a) the TPPM is a root node,

– invoke the "Making commitment decision" procedure (see 11.5.7);

b) the TPPM is an intermediate node,

– invoke the "Entering READY state" procedure (see 11.5.2).

11.3.48 C-COMMIT indication or C-COMMIT+C-BEGIN indication

The TPPM shall be in the READY state.

– Invoke the "Receiving commit order" procedure (see 11.5.8).

If the TPPM is an intermediate node,

– invoke the "Sending commit order" procedure (see 11.5.12).

11.3.49 AF-ABORT (user, commitRI) indication

The TPPM shall be in the READY state.

– Invoke the "Receiving commit order" procedure (see 11.5.8);

– issue a TP-U-ABORT indication with the value of the Rollback parameter set to "false" if no TP-U-ABORT request was received.

If the TPPM is an intermediate,

– invoke the "Sending commit order" procedure (see 11.5.12).

11.3.50 TP-DONE request

If the Heuristic-Report parameter is specified,

– invoke the "Recording the heuristic condition" procedure (see 11.5.9).

If the TPPM is in the DECIDED (commit) state and

a) the *last commit confirm was received*,

– invoke the "Completing commitment" procedure (see 11.5.1);

b) the *last commit confirm was not received*,

– continue.

If the TPPM is in the DECIDED (rollback) state and

a) the *last rollback confirm was received*,

1) if the TPPM is an intermediate or a leaf and the superior *dialogue has not been detached* and the TPPM has not issued a *rollback request* or a *rollback response* to the superior,

– invoke the "Reporting rollback to superior" procedure (see 11.5.10);

2) if the *superior dialogue is not chaining* and *rollback reporting has completed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6);

3) if the TPPM is an intermediate and a C-BEGIN indication has been received and the *dialogue has not been detached*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6);

4) otherwise,

– continue;

b) the *last rollback confirm was not received*,

– continue.

11.3.51 C-COMMIT confirm or AF-HEURISTIC-REPORT (commitRC) indication

If this is an AF-HEURISTIC-REPORT indication,

– issue a TP-HEURISTIC-REPORT indication;

– invoke the "Recording the heuristic condition" procedure (see 11.5.9).

If either

a) a TP-DEFERRED-END-DIALOGUE request was received and no TP-U-ABORT request was received, or

b) an AF-ABORT (commitRI) request was issued,

then

– issue an SAF-DETACH-ASSOCIATION (free) request.

If a TP-U-ABORT request was received,

a) if a C-COMMIT+C-BEGIN request was issued,

– issue an AF-ABORT (user, rollbackRI) request;

– issue an SAF-DETACH-ASSOCIATION (rollback-confirm-expected) request;

b) if no C-COMMIT+C-BEGIN request was issued,

– issue an AF-ABORT (user, dataRI) request;

– issue an SAF-DETACH-ASSOCIATION (free) request.

If no TP-U-ABORT request was received and no TP-DEFERRED-END-DIALOGUE request was received,

– issue a C-ROLLBACK request, if a C-COMMIT+C-BEGIN request was issued and a TP-ROLLBACK indication is pending;

– *close the PSAP*.

NOTE – Any further events to/from the subordinate are to be handled either as part of the next transaction branch, or when this transaction branch is completed and the dialogue returns to coordination level of "none". In this way, the events can be handled as part of the normal procedures (e.g. the TPPM is in the ACTIVE state), rather than within the scope of the transaction termination procedures.

If the *last commit confirm was received*,

– invoke the "Completing commitment" procedure (see 11.5.1).

11.3.52 AF-ABORT (user, commitRC) indication or AF-ABORT-AND-HEURISTIC-REPORT (commitRC) indication

If a C-COMMIT request was issued and the Unchained Transactions functional unit was selected,

– issue an SAF-DETACH-ASSOCIATION (free) request;

– issue a TP-U-ABORT indication with the value of the Rollback parameter set to "false", if no TP-U-ABORT request was received;

– issue a TP-HEURISTIC-REPORT indication if this is an AF-ABORT-AND-HEURISTIC-REPORT indication;

– invoke the "Recording the heuristic condition" procedure (see 11.5.9) if this is an AF-ABORT-AND-HEURISTIC-REPORT indication;

– invoke the "Completing commitment" procedure (see 11.5.1) if the *last commit confirm was received*.

11.3.53 TP-ROLLBACK request

– Invoke the "Initiating rollback at TPPM" procedure (see 11.5.5).

11.3.54 C-ROLLBACK indication or AF-HEURISTIC-REPORT (rollbackRI) indication

If this is an AF-HEURISTIC-REPORT indication and the TPPM is in the ACTIVE state, then an AF-PREPARE request shall have been issued.

If the TPPM is in the

a) ACTIVE or READY state,

– invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);

b) ACTIVE state,

– *close the PSAP*, if this is a subordinate dialogue and the Unchained Transactions functional unit is selected on this dialogue;

c) any state, and this is an AF-HEURISTIC-REPORT indication,

– issue a TP-HEURISTIC-REPORT indication;

– invoke the "Recording the heuristic condition" procedure (see 11.5.9);

d) DECIDED (rollback) state,

1) if the dialogue is with the subordinate and a TP-U-ABORT request was received,

– issue an AF-ABORT (user, rollbackRC) request;

– issue an SAF-DETACH-ASSOCIATION (free) request;

2) if the dialogue is with the subordinate and a TP-U-ABORT request was not received,

– issue a C-ROLLBACK response;

– *close the PSAP*, if the Unchained Transactions functional unit is selected on this dialogue;

3) if either of the following are true:

i) the dialogue is with the superior and a *rollback request* has been issued to the superior, or

ii) the dialogue is with a subordinate, the *last rollback confirm was received*, this is an intermediate node, and the superior *dialogue has not been detached*,

then

– invoke the "Reporting rollback to superior" procedure (see 11.5.10);

4) if the *last rollback confirm was received* and the *superior dialogue is not chaining* and *rollback reporting has completed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6);

5) if the dialogue is with the superior and the *last rollback confirm was not received*,

– continue.

11.3.55 AF-ABORT (user/provider, rollbackRI) indication or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) indication

If this is an AF-ABORT (provider, rollbackRI) indication, then the Diagnostic parameter shall be set to "begin-transaction-reject", this shall be a subordinate dialogue, the Unchained Transactions functional unit shall have been selected, and a C-BEGIN confirm shall not have been received.

If the coordination level is "commitment" and the TPPM is in the

a) ACTIVE state and has a *dialogue establishment indication outstanding* and an AF-ABORT (user/provider, rollbackRI) indication is received,

– issue a TP-U-ABORT indication with the Rollback parameter set to "false" if the Type parameter is "user";

– issue a TP-P-ABORT indication with the Rollback parameter set to "false" if the Type parameter is "provider";

– issue a C-ROLLBACK response;

– issue an SAF-DETACH-ASSOCIATION (free) request;

NOTE – The procedure "Initiating rollback at TPPM" (see 11.5.5) is not triggered in this case because the transaction cannot have started at the subordinate's node.

b) ACTIVE or READY state and does not have a *dialogue establishment indication outstanding*,

– issue a TP-U-ABORT indication with the Rollback parameter set to "true" if the Type parameter is "user" or this is an AF-ABORT-AND-HEURISTIC-REPORT indication, and no TP-U-ABORT request was received;

– issue a TP-P-ABORT indication with the Rollback parameter set to "true" if the Type parameter is "provider" and no TP-U-ABORT request was received;

– invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);

– issue an SAF-DETACH-ASSOCIATION (free) request if an AF-ABORT (user/provider, rollbackRI) indication was received from a subordinate;

c) DECIDED (rollback) state,

1) if a TP-U-ABORT request was received,

– continue;

2) if no TP-U-ABORT request was received,

– issue a TP-P-ABORT indication with the Rollback parameter set to "false" if the type is "provider";

– issue a TP-U-ABORT indication with the Rollback parameter set to "false" if the type is "user" or this is an AF-ABORT-AND-HEURISTIC-REPORT indication;

3) if the dialogue is with a subordinate,

– issue a C-ROLLBACK response;

– issue an SAF-DETACH-ASSOCIATION (free) request;

d) any state, and this is an AF-ABORT-AND-HEURISTIC-REPORT indication,

– issue a TP-HEURISTIC-REPORT indication;

– invoke the "Recording the heuristic condition" procedure (see 11.5.9);

e) DECIDED (rollback) state,

1) if either of the following are true:

i) the dialogue is with the superior and a *rollback request* has been issued to the superior; or

ii) the dialogue is with a subordinate, the *last rollback confirm was received*, this is an intermediate node, and the superior *dialogue has not been detached*,

then

– invoke the "Reporting rollback to superior" procedure (see 11.5.10);

2) if the *last rollback confirm was received* and the *superior dialogue is not chaining* and *rollback reporting has completed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6).

11.3.56 C-ROLLBACK confirm or AF-HEURISTIC-REPORT (rollbackRC) indication

The TPPM shall be in the DECIDED (rollback) state.

If this was an AF-HEURISTIC-REPORT indication,

– issue a TP-HEURISTIC-REPORT indication;

– invoke the "Recording the heuristic condition" procedure (see 11.5.9).

If the *rollback confirm* was from the subordinate,

a) if a TP-U-ABORT request has been received and no AF-ABORT request was issued,

– issue an AF-ABORT (user, dataRI) request;

b) if the Unchained Transactions functional unit is selected on this dialogue and no TP-U-ABORT request was received,

– *close the PSAP*;

c) if the *last rollback confirm was received* and this is an intermediate node and the superior *dialogue has not been detached*,

– invoke the "Reporting rollback to superior" procedure (see 11.5.10);

d) if the *last rollback confirm was received* and the *superior dialogue is not chaining* and *rollback reporting has completed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6);

e) if a TP-U-ABORT request was received or a TP-U-ABORT indication was issued,

– issue an SAF-DETACH-ASSOCIATION (free) request;

f) if none of the above conditions is satisfied,

– continue.

If the *rollback confirm* was from the superior,

a) if the superior *dialogue is not chaining* and *a TP-DONE request is not owed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6);

b) if a TP-U-ABORT request was received,

– issue an AF-ABORT (user, dataRI) request if an AF-ABORT (user, rollbackRI) request has not been issued;

– issue an SAF-DETACH-ASSOCIATION (begin-fear) request if no AF-ABORT (user, rollbackRI) request was issued;

– issue an SAF-DETACH-ASSOCIATION (free) request if an AF-ABORT (user, rollbackRI) request was issued;

c) if the superior *dialogue has not been detached*, the Unchained Transactions functional unit is selected, and *a TP-DONE request is owed*,

– *close the PSAP*;

d) if none of the above conditions is satisfied,

– continue.

11.3.57 AF-ABORT (user/provider, rollbackRC) indication or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRC) indication

The TPPM shall be in the DECIDED (rollback) state and no AF-ABORT (user, rollbackRI) request shall have been issued on this dialogue.

If the coordination level is "commitment" and one of the following is true:

a) this is an AF-ABORT indication on a subordinate dialogue for which the Unchained Transactions functional unit has been selected, the Diagnostic parameter is "Begin-transaction-reject", the Type parameter is set to "provider", and a C-BEGIN confirm has not been received; or

b) this is an AF-ABORT indication and the Type parameter is set to "user"; or

c) this is an AF-HEURISTIC-REPORT-AND-ABORT indication;

then

a) always

– issue an SAF-DETACH-ASSOCIATION (free) request;

b) if this is an AF-ABORT-AND-HEURISTIC-REPORT indication,

– issue a TP-HEURISTIC-REPORT indication;

– invoke the "Recording the heuristic condition" procedure (see 11.5.9);

c) if a TP-U-ABORT request was received,

– continue;

d) if no TP-U-ABORT request was received,

– issue a TP-U-ABORT indication with the Rollback parameter set to "false" if the value of the Type parameter is "user" or this is an AF-ABORT-AND-HEURISTIC-REPORT indication;

– issue a TP-P-ABORT indication with the Rollback parameter set to "false" if the value of the Type parameter is "provider";

e) if the *last rollback confirm was received* and this is an intermediate node and the superior *dialogue has not been detached*,

– invoke the "Reporting rollback to superior" procedure (see 11.5.10);

f) if the indication was received from a subordinate, the *last rollback confirm was received*, and the *superior dialogue is not chaining* and *rollback reporting has completed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6);

g) if the indication was received from the superior and *a TP-DONE request is not owed*,

– invoke the "Initiating transaction after rollback" procedure (see 11.5.6).

11.3.58 CAF-RECOVER (ready) indication

If the TPPM is in the

a) READY state, and

1) if no other channel for this branch identifier already exists, by a local decision, either

– issue a C-RECOVER (retry-later) response;

– issue a CAF-DETACH (free) request; or

– continue;

NOTE 1 – The C-RECOVER (retry-later) response may be issued to release the channel while waiting for the *commit indication* from the superior.

2) if another channel for this branch identifier already exists, by a local decision, do either or both of

– issue a C-RECOVER (retry-later) response on the previously existing channel; and

– issue a CAF-DETACH (free) request on the previously existing channel; or

– issue a C-RECOVER (retry-later) response on the channel from which this indication was received; and

– issue a CAF-DETACH (free) request on the channel from which this indication was received;

NOTE 2 – This situation will arise when one of the channels has been aborted, but the abort has not yet been signalled to the TPPM. This protocol specification does not provide enough information to determine which channel has been aborted, so it is left to an implementation to make the choice of the channel to be released since the implementation may have local information to help determine which channel has been aborted. In addition, a local decision may be made to issue C-RECOVER (retry-later) responses and CAF-DETACH (free) requests on both channels while waiting for the *commit indication* from the superior.

b) DECIDED (commit) state,

1) if no channel for this branch identifier already exists,

– issue a C-RECOVER (commit) request;

2) if a channel for this branch identifier already exists,

– issue a C-RECOVER (retry-later) response on the channel from which this indication was received;

– issue a CAF-DETACH (free) request on the channel from which this indication was received;

c) DECIDED (rollback) state,

– issue a C-RECOVER (unknown) response;

– issue a CAF-DETACH (free) request.

If the *dialogue* corresponding to the value contained in the Branch Identifier parameter *has not been detached*, and the TPPM is in the

a) ACTIVE state and an AF-PREPARE request was sent,

- issue a TP-P-ABORT indication with the
  1) Diagnostic parameter set to "permanent-failure"; and
  2) Rollback parameter set to "true";
- issue an AF-ABORT (provider, abortRI) request on the dialogue, with the Diagnostic parameter set to "permanent-failure";
- issue a C-RECOVER (unknown) response on the channel;
- issue a CAF-DETACH (free) request on the channel;
- invoke the "Initiating rollback at TPPM" procedure (see 11.5.5);
- issue a TP-HEURISTIC-REPORT indication with the Heuristic-Report parameter set to "heuristic-hazard";
- invoke the "Recording the heuristic condition" procedure (see 11.5.9);

b) READY, DECIDED (commit), or DECIDED (rollback) state,

- issue a TP-P-ABORT indication if no TP-U-ABORT request was received, with the
  1) Diagnostic parameter set to "permanent-failure"; and
  2) Rollback parameter set to "false";
- issue an AF-ABORT (provider, abortRI) request on the dialogue;

c) DECIDED (rollback) state,

- issue a TP-HEURISTIC-REPORT indication with the Heuristic-Report parameter set to "heuristic-hazard";
- invoke the "Recording the heuristic condition" procedure (see 11.5.9);

d) DECIDED (commit) state,

- invoke the "Rollback next transaction" procedure (see 11.5.11) if a C-COMMIT+C-BEGIN request was issued.

11.3.59 C-RECOVER (ready) indication or AF-RECOVER (ready) indication (CPM)

If this is a two-way-recovery channel and an AF-TOKEN-PLEASE request was previously issued since the most recent CAF-PLEASE request was received,

- issue a CAF-FAIL indication to the TPPM with a branch corresponding to the Atomic Action Identifier and Branch Identifier specified in the previous CAF-PLEASE request.

If this is an AF-RECOVER (ready) indication, according to a local decision, either

- issue a C-RECOVER (retry-later) response; or

  NOTE – A C-RECOVER (retry-later) response may be issued if it is currently impossible to determine whether the log record exists [e.g. the portion of the set of log records identified by the recovery-context-handle (see 7.6) is currently inaccessible].

- attempt to locate a TPPM with an atomic action identifier, branch identifier, and recovery-context-handle corresponding to the parameters of the AF-RECOVER (ready) indication.

If this is a C-RECOVER (ready) indication,

- attempt to locate a TPPM with an atomic action identifier and branch identifier, corresponding to the parameters of the C-RECOVER (ready) indication.

If a TPPM is found,

- issue a CAF-RECOVER (ready) indication to the TPPM that has been found. Set the corresponding parameters of the CAF-RECOVER (ready) indication from the C-RECOVER (ready) indication or AF-RECOVER (ready) indication and set the Channel-Utilization parameter to that of the most recent AF-BEGIN-DIALOGUE request or indication on this channel.

If no TPPM is found and a C-RECOVER (retry-later) response was not issued,

– issue a C-RECOVER (unknown) response.

11.3.60 CAF-RECOVER (commit) indication

If the TPPM is in the

a) READY state,

– invoke the "Receiving commit order" procedure (see 11.5.8);

– invoke the "Sending commit order" procedure (see 11.5.12) if this node is an intermediate;

b) READY state, or DECIDED (commit) state and the *last commit confirm was not received*,

1) if no channel for this branch identifier already exists and, by a local decision, either

– issue a C-RECOVER (retry-later) response; and

– issue a CAF-DETACH (free) request; or

– continue;

NOTE 1 – The C-RECOVER (retry-later) response may be issued to release the channel while waiting for the *commit confirms* from the subordinates.

2) if a channel for this branch identifier already exists and the TPPM is in the READY state, by a local decision, either

– issue a CAF-DETACH (clean-up) request on the previously existing channel;

– issue a C-RECOVER (retry-later) response on the channel from which this indication was received; and

– issue a CAF-DETACH (free) request on the channel from which this indication was received; or

– issue a CAF-DETACH (clean-up) request on the previously existing channel;

NOTE 2 – The C-RECOVER (retry-later) response may be issued to release the channel while waiting for the *commit confirms* from the subordinates. In any case, the previously existing channel is *detached* because the TPPM now knows the outcome of the transaction is commit, so the reply from the previous channel is uninteresting.

3) if a channel for this branch identifier already exists and the TPPM is in the DECIDED (commit) state, by a local decision, do either or both of

– issue a C-RECOVER (retry-later) response on the previously existing channel; and

– issue a CAF-DETACH (free) request on the previously existing channel; or

– issue a C-RECOVER (retry-later) response on the channel from which this indication was received; and

– issue a CAF-DETACH (free) request on the channel from which this indication was received.

NOTE 3 – This situation will arise when one of the channels has been aborted, but the abort has not yet been signaled to the TPPM. This protocol specification does not provide enough information to determine which channel has been aborted, so it is left to an implementation to make the choice of the channel to be released since the implementation may have local information to help determine which channel has been aborted. In addition, a local decision may be made to *detach* both channels while waiting for the *commit confirms* from the subordinates.

If the *dialogue* corresponding to the value contained in the Branch Identifier parameter *has not been detached*,

– issue a TP-P-ABORT indication if no TP-U-ABORT request was issued, with the

1) Diagnostic parameter set to "permanent-failure"; and

2) Rollback parameter set to "false";

– issue an AF-ABORT (provider, abortRI) request on the dialogue, with the Diagnostic parameter set to "permanent-failure";

– invoke the "Rollback next transaction" procedure (see 11.5.11) if a C-COMMIT+C-BEGIN request was received on the dialogue.

11.3.61 C-RECOVER (commit) indication

The TPPM shall be in the READY state.

- Invoke the "Receiving commit order" procedure (see 11.5.8);
- invoke the "Sending commit order" procedure (see 11.5.12) if this node is an intermediate.

By a local decision, optionally

- issue a C-RECOVER (retry-later) response; and
- issue a CAF-DETACH (free) request.

NOTE – The C-RECOVER (retry-later) response may be issued to release the channel while waiting for the *commit confirms* from the subordinates.

11.3.62 C-RECOVER (commit) indication or AF-RECOVER (commit) indication (CPM)

If this is a two-way-recovery channel and an AF-TOKEN-PLEASE request was previously issued since the most recent CAF-PLEASE request was received,

- issue a CAF-FAIL indication to the TPPM with a branch corresponding to the Atomic Action Identifier and Branch Identifier specified in the previous CAF-PLEASE request.

If the most recent request from the TPPM on this channel was a CAF-DETACH (clean-up) request and this is a C-RECOVER (commit) indication,

- issue a C-RECOVER (retry-later) response;

If the most recent request from the TPPM on this channel was not a CAF-DETACH (clean-up) request

a) if this is an AF-RECOVER (commit) indication, according to a local decision, either
   - issue a C-RECOVER (retry-later) response; or

     NOTE – A C-RECOVER (retry-later) response may be issued if it is currently impossible to determine whether the log record exists [e.g. the portion of the set of log records identified by the recovery-context-handle (see 7.5) is currently inaccessible].

   - attempt to locate a TPPM with an atomic action identifier, branch identifier, and recovery-context-handle corresponding to the parameters of the AF-RECOVER (commit) indication;

b) if this is a C-RECOVER (commit) indication,
   - attempt to locate a TPPM with an atomic action identifier and branch identifier, corresponding to the parameters of the C-RECOVER (commit) indication;

c) if a TPPM is found,
   - issue a CAF-RECOVER (commit) indication to the TPPM that has been found. Set the corresponding parameters of the CAF-RECOVER (commit) indication from the C-RECOVER (commit) indication or AF-RECOVER (commit) indication and set the channel-utilization parameter to that of the most recent AF-BEGIN-DIALOGUE request or indication on this channel;

d) if no TPPM is found and a C-RECOVER (retry-later) response was not issued,
   - issue a C-RECOVER (done) response if no log-damage record exists;
   - issue an AF-HEURISTIC-REPORT (recoverDoneRC) request if a log-damage record exists; in this case, the Heuristic-Report parameter is set to the current value of the log-damage record.

11.3.63 C-RECOVER (done) confirm or AF-HEURISTIC-REPORT (recoverDoneRC) indication

If this is an AF-HEURISTIC-REPORT indication,

- issue a TP-HEURISTIC-REPORT indication;
- invoke the "Recording the heuristic condition" procedure (see 11.5.9).

For either service primitive

- issue a CAF-DETACH (free) request;
- invoke the "Completing commitment" procedure (see 11.5.1) if the *last commit confirm was received*.

11.3.64 C-RECOVER (unknown) confirm

- Issue a CAF-DETACH (free) request;
- invoke the "Initiating rollback at TPPM" procedure (see 11.5.5) if the TPPM is in the READY state.

11.3.65 C-RECOVER (unknown) confirm (CPM)

If the most recent request from the TPPM on this channel was a CAF-DETACH (clean-up) request,

- continue.

11.3.66 C-RECOVER (retry-later) confirm

- Issue a CAF-DETACH (free) request.

NOTE – The requirement to perform recovery is not absolved. The internal event "Retry recovery" (see 11.4.4) is used to initiate recovery, or recovery could be initiated by the partner, or both.

11.3.67 C-RECOVER (retry-later) confirm (CPM)

If the most recent request from the TPPM on this channel was a CAF-DETACH (clean-up) request,

- continue.

11.3.68 AF-TOKEN-GIVE (two-way-recovery) indication on a channel (TPPM)

If this is a two-way-recovery channel and the last service primitive on that channel was a C-RECOVER (commit) request,

- issue an AF-TOKEN-GIVE (two-way-recovery) request.

If this is a two-way-recovery channel and the last service primitive on that channel was a C-RECOVER indication or AF-RECOVER indication,

- continue.

11.3.69 AF-TOKEN-GIVE indication (CPM)

If there is an outstanding CAF-PLEASE request matching a channel owned by the CPM to the appropriate AEI, and two-way-recovery has been selected on the channel,

- issue a CAF-GIVE indication to the TPPM with a branch corresponding to the Atomic Action Identifier and Branch Identifier specified in the previous CAF-PLEASE request. Set the Channel-Utilization parameter to "two-way-recovery";

otherwise, if this is a two-way-recovery channel,

- continue.

11.3.70 AF-TOKEN-PLEASE indication on a channel (TPPM)

If this is a two-way-recovery channel,

- continue.

NOTE – The receipt of an AF-TOKEN-PLEASE indication by the TPPM will always be the result of a collision of an AF-TOKEN-PLEASE request issued by a CPM and a C-RECOVER request or AF-RECOVER request issued by the TPPM.

11.3.71 AF-TOKEN-PLEASE indication (CPM)

If this is a two-way-recovery channel,

- issue an AF-TOKEN-GIVE (two-way-recovery) request.

11.3.72 CAF-PLEASE request (CPM)

If there is already an established channel owned by the CPM to the appropriate AEI, which is a two-way-recovery channel or a one-way-recovery channel initiated by the CPM, and

a) if this is a

   1) one-way-recovery channel;

   2) two-way-recovery channel and the *token* is owned; or

   3) two-way-recovery channel and the last request received on the channel was a CAF-DETACH (not-used) request,

then

   – *transfer the* channel to the requesting TPPM;

   – issue a CAF-GIVE indication to the requesting TPPM;

b) if this is a two-way-recovery channel, the *token* is not owned, and the last request received on the channel was not a CAF-DETACH (not-used) request,

   – issue an AF-TOKEN-PLEASE request.

Otherwise,

– assign an association compatible with the AEI requirements for a channel and to the AE-Title as specified on the CAF-PLEASE request;

– issue an AF-BEGIN-DIALOGUE request with the value of the

   a) Functional-Units-Selected parameter set to “Recovery”;

   b) Channel-Utilization parameter set to either “one-way-recovery” or “two-way-recovery” based on a local decision.

11.3.73 CAF-GIVE indication

If the TPPM is in the

a) READY state, the recovery is to the superior, and no channel is *attached*,

   – issue a C-RECOVER (ready) request if no recovery-context-handle is present in the log-ready record;

   – issue an AF-RECOVER (ready) request if a recovery-context-handle is present in the log-ready record;

   – issue an AF-TOKEN-GIVE (two-way-recovery) request if this is a two-way-recovery channel;

b) DECIDED (commit) state and the recovery is to the superior,

   – issue a CAF-DETACH (not-used) request;

c) DECIDED (commit) state, the recovery is to a subordinate, no channel is *attached*, and a C-RECOVER (done) confirm was not received,

   – issue a C-RECOVER (commit) request if no recovery-context-handle is present in the log-commit record;

   – issue an AF-RECOVER (commit) request if a recovery-context-handle is present in the log-commit record;

   – issue an AF-TOKEN-GIVE (two-way-recovery) request if this is a two-way-recovery channel;

d) DECIDED (commit) state, the recovery is to a subordinate, and either a channel is *attached* or a C-RECOVER (done) was received,

   – issue a CAF-DETACH (not-used) request.

   NOTE – Between the time the TPPM requested the channel for recovering a particular branch, an incoming recovery indication for that branch might have occurred, removing the need for a channel.

11.3.74 CAF-FAIL indication

If the TPPM is in the

a) READY state, the recovery is to the superior, and no channel is *attached*,

– issue a CAF-PLEASE request with the AE-Title of the CAF-PLEASE request set to the value of the AE-Title taken from the branch identifier for the superior, contained in the log-ready record;

b) DECIDED (commit) state and the indication is from the superior,

– continue;

c) DECIDED (commit) state, the recovery is to a subordinate, no channel is *attached*, and a C-RECOVER (done) confirm was not received,

– issue a CAF-PLEASE request, with the AE-Title of the CAF-PLEASE request set to the value of the AE-Title taken from the branch identifier for the superior, contained in the log-ready record;

d) DECIDED (commit) state, the recovery is to a subordinate, and either a channel is *attached* or a C-RECOVER (done) confirm was received,

– continue.

11.3.75 CAF-DETACH request (CPM)

– *transfer the* channel to the CPM.

11.4 Internal event procedures

These procedures are invoked upon the receipt of an event local to a PM. The first paragraph of each procedure describes the conditions under which the procedure is invoked.

11.4.1 Delay recovery

This procedure is invoked when the TPPM will release the channel on which an AF-RECOVER indication or a C-RECOVER indication but no corresponding AF-RECOVER response or C-RECOVER response was issued.

– Issue a C-RECOVER (retry-later) response;

– issue a CAF-DETACH (free) request.

NOTES

1 In the absence of a TPPM state change, it is the partner's responsibility to initiate recovery. In the situation where the TPPM state changes from READY state to DECIDED (commit) state, the TPPM will initiate recovery.

2 This is used when it is undesirable for the TPPM to hold the channel while waiting for the conditions necessary to issue the C-RECOVER response.

11.4.2 Heuristic damage compensation for subtree

This procedure is invoked when it is known that heuristic damage compensation has occurred for the subtree. It causes the log-damage and log-heuristic records to be deleted since the damage was corrected. This prevents the reporting of this damage to the superior.

– Remove the log-damage record from secure storage.

If a log-heuristic record exists,

– remove the log-heuristic record from secure storage.

11.4.3 Restart after node crash (CPM)

The PM procedures assume that this procedure is entered before any other procedure after a node crash.

The MACF of a TPPM which cannot continue normal operation is deleted. The SAOs which were part of this TPPM have disappeared by an association abort or they are in a state such that arriving APDUs cannot interfere with the operation of the TPPM re-established after the node crash.

The CPM instantiates a TPPM for each log-ready record or log-commit record found, provided a TPPM within the AEI does not already exist for the log record, as follows:

NOTE – For each TPPM, the internal event "TPPM creation after node crash" (see 11.4.7) will occur.

a) if a log-commit record was found,

   – create the TPPM in the DECIDED (commit) state;

b) if a log-ready record was found,

   – create the TPPM in the READY state.

For all *TPPM bound data* for which no log record is found,

– set the *TPPM bound data* to the initial state.

11.4.4 Retry recovery

This procedure may be invoked at any time while the TPPM's responsibility to perform recovery is not yet absolved, and the TPPM has not issued a CAF-PLEASE request nor is it processing recovery of the branch.

NOTE – A timer is a typical mechanism used to invoke this procedure.

– Issue a CAF-PLEASE request with the AE-Title of the CAF-PLEASE request set to the value of the AE-Title taken from the branch identifier for the superior, contained in the log-ready record, if this is a branch to the superior, or set to the value of the AE-Title taken from the branch identifier for the subordinate, contained in the log-commit record, if this is a branch to a subordinate.

11.4.5 Taking a heuristic decision

This procedure is entered when the TPPM takes a heuristic decision.

A TPPM may take a heuristic decision only while in the ACTIVE state if an AF-PREPARE indication has been received, or while in the READY state.

– Part or all of the bound data is set to the initial, or final state;

– secure the heuristic decision by *writing the* log-heuristic record.

11.4.6 Terminating a channel (CPM)

This procedure is entered when the CPM terminates a channel according to a local decision.

If the *token* is owned and the channel is *attached* to the CPM,

– issue an AF-END-DIALOGUE request with the Confirmation parameter set to "false";

– issue an SAF-DETACH-ASSOCIATION (free) request.

11.4.7 TPPM creation after node crash

This procedure is invoked as the first one in a newly created TPPM after a node crash. This procedure is executed as an integral part of the creation of the TPPM.

NOTE – This internal event procedure is entered immediately after completion of the internal event procedure "Restart after node crash (CPM)", if a TPPM was created.

– Issue a TP-COMMIT indication if this is a root TPPM in the DECIDED (commit) state;

– issue a CAF-PLEASE request

   a) for each subordinate in the log-commit record, if the TPPM is in the DECIDED (commit) state; the AE-Title parameter of the CAF-PLEASE request is the AE-Title of the subordinate in the log-commit record;

   b) for the superior in the log-ready record, if the TPPM is in the READY state; the AE-Title parameter of the CAF-PLEASE request is the AE-Title of the superior's branch identifier in the log-ready record.

11.4.8 TPPM-initiated rollback

This procedure may be invoked without any preconditions in ACTIVE state except when a dialogue establishment indication is outstanding.

– Invoke the "Initiating rollback at TPPM" procedure (see 11.5.5).

11.5 Common procedures

These procedures are referenced by the main or internal event procedures.

Each procedure begins with a table that indicates the procedures that invoke the given procedure.

11.5.1 Completing commitment

Invoking Procedure Name	Reference (subclause)
AF-ABORT (user, commitRC) indication or AF-ABORT-AND-HEURISTIC-REPORT (commitRC) indication	11.3.52
TP-DONE request	11.3.50
C-COMMIT confirm or AF-HEURISTIC-REPORT (commitRC) indication	11.3.51
C-RECOVER (done) confirm or AF-HEURISTIC-REPORT (recoverDoneRC) indication	11.3.63

– *Forget the transaction*;

NOTE 1 – Before the transaction is forgotten, it is assumed that either the *TPPM bound data* are in the final state, or provisions have been made by the local system to achieve setting the *TPPM bound data* to the final state at a later time.

– issue a TP-COMMIT-COMPLETE indication.

Additionally,

a) if no TP-ROLLBACK indication is pending, and

1) any *dialogue is chaining*,

– enter the ACTIVE state;

2) no *dialogue is chaining*,

– cease to be part of the transaction;

3) the TPPM is an intermediate and the *dialogue* with the superior *is not chaining*,

– become a root node;

4) the TPPM is an intermediate and there are no *chaining subordinate dialogues*,

– become a leaf node;

b) if a TP-ROLLBACK indication is pending,

– issue a TP-ROLLBACK indication;

– make the TP-ROLLBACK indication no longer pending;

– enter the DECIDED (rollback) state;

c) for each subordinate dialogue that has *closed the PSAP*,

– *open the PSAP*;

If the TPPM is an intermediate or leaf node, and

a) if the superior *dialogue has not been detached*, take the first applicable actions of the following in the scope of the dialogue with the superior:

1) if a TP-U-ABORT request has been received, no AF-ABORT indication was received, the Unchained Transactions functional unit is selected, and a log-damage record exists,

NOTE 2 – An AF-ABORT (user) request cannot have been previously issued (in response to a TP-U-ABORT request after the ACTIVE state) because there was no opportunity to issue a request to the superior after the TPPM entered the READY state.

– issue an AF-ABORT-AND-HEURISTIC-REPORT (commitRC) request. When issued, the AF-ABORT-AND-HEURISTIC-REPORT request carries the Heuristic-Report parameter set to the current value of the log-damage record;

– issue an SAF-DETACH-ASSOCIATION (free) request;

2) if a TP-U-ABORT request has been received, no AF-ABORT indication was received, the Unchained Transactions functional unit is selected, and no log-damage record exists,

NOTE 3 – An AF-ABORT (user) request cannot have been previously issued (in response to a TP-U-ABORT request after the ACTIVE state) because there was no opportunity to issue a request to the superior after the TPPM entered the READY state.

– issue an AF-ABORT (user, commitRC) request;

– issue an SAF-DETACH-ASSOCIATION (free) request;

NOTE 4 – The case of TP-U-ABORT request to the superior with the Chained Transactions functional unit selected is handled as part of the rollback procedures since the only way a TP-U-ABORT request could be issued to the superior is if there was a failure causing a rollback of the next transaction. In this way, the AF-ABORT indication to the superior will be carried by the appropriate CCR service.

3) if a log-damage record exists,

– issue an AF-HEURISTIC-REPORT (commitRC) request with the Heuristic-Report parameter set to the current value of the log-damage record;

– issue an SAF-DETACH-ASSOCIATION (free) request if an AF-DEFER (end-dialogue) indication was received;

4) if none of the above conditions was met,

– issue a C-COMMIT response;

– issue an SAF-DETACH-ASSOCIATION (free) request if an AF-DEFER (end-dialogue) indication or AF-ABORT (user, commitRI) indication was received;

b) if the superior *dialogue has been detached*, and

1) a channel with the superior is *attached*,

– issue a C-RECOVER (done) response if no log-damage record exists;

– issue an AF-HEURISTIC-REPORT (recoverDoneRC) request, if a log-damage record exists. When issued, the AF-HEURISTIC-REPORT request carries the Heuristic-Report parameter set to the current value of the log-damage record;

– issue a CAF-DETACH (free) request;

2) no channel with the superior is *attached*,

– continue.

NOTE 5 – In this case, when the superior subsequently establishes a channel and the CPM receives the C-RECOVER (commit) or AF-RECOVER (commit) indication, it will issue a C-RECOVER (done) response.

11.5.2 Entering READY state

Invoking Procedure Name	Reference (subclause)
TP-COMMIT request	11.3.45
C-READY indication	11.3.47

If the TPPM is able to set the *TPPM bound data* in the ready-to-commit state,

– *write a log-ready record* atomically setting the *TPPM bound data* to the ready-to-commit state, if they are not already set to the ready-to-commit state;

– *write a log-ready record* if the *TPPM bound data* are already set to the ready-to-commit state;

NOTE 1 – An implementation may choose to set the *TPPM bound data* to the ready-to-commit state atomically with writing the log-ready record.

– enter the READY state;

– invoke the "First request/response" procedure (see 11.5.3), if an AF-BEGIN-DIALOGUE response has not been issued;

– issue a P-TOKEN-GIVE (sync-minor) request, if the *token* is owned by the node on the dialogue with the superior;

NOTE 2 – If the *token* was moved by the User-ASE to the subordinate, issuance of a P-TOKEN-GIVE (sync-minor) request is necessary to allow the superior to issue a *commit request*, if required.

– issue a C-READY request on the dialogue with the superior;

otherwise,

– invoke the "Initiating rollback at TPPM" procedure (see 11.5.5).

11.5.3 First request/response

Invoking Procedure Name	Reference (subclause)
TP-BEGIN-DIALOGUE response	11.3.3
TP-END-DIALOGUE request	11.3.11
TP-END-DIALOGUE response	11.3.14
TP-U-ERROR request	11.3.16
TP-U-ABORT request	11.3.19
TP-GRANT-CONTROL request	11.3.24
TP-REQUEST-CONTROL request	11.3.26
TP-HANDSHAKE request	11.3.28
TP-HANDSHAKE response	11.3.30
TP-HANDSHAKE-AND-GRANT-CONTROL request	11.3.32
TP-HANDSHAKE-AND-GRANT-CONTROL response	11.3.34
TP-DATA request	11.3.39
Entering READY state	11.5.2

NOTE – This procedure is not used for the DECIDED (rollback) state.

– Issue an AF-BEGIN-DIALOGUE (accepted, dataRI) response;

– issue a C-BEGIN response if a C-BEGIN indication was received;

– issue as many AF-U-ERROR responses as the number of AF-U-ERROR indications that have been received, if the Shared Control functional unit is selected.

11.5.4 Initiating a transaction branch

Invoking Procedure Name	Reference (subclause)
TP-BEGIN-DIALOGUE request	11.3.1
TP-BEGIN-TRANSACTION request	11.3.36

– Issue a C-BEGIN request with the value of the

a) Atomic Action Identifier parameter set to

1) a newly created value, if the TPPM is not in the ACTIVE state;

2) the value of the atomic action identifier of the most recent C-BEGIN indication, if this is an intermediate or leaf node in the ACTIVE state; or

3) the value of the atomic action identifier of the transaction, if this is a root node in the ACTIVE state;

b) Branch Identifier parameter set to a value that uniquely identifies the transaction branch within the scope of the atomic action identifier.

If the TPPM is a leaf node in the ACTIVE state,

– become an intermediate node.

If the TPPM is not in the ACTIVE state,

– become a root node;

– enter the ACTIVE state.

11.5.5 Initiating rollback at TPPM

Invoking Procedure Name	Reference (subclause)
AF-BEGIN-DIALOGUE (rejected, dataRI) confirm on a Dialogue	11.3.5
AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) confirm	11.3.6
SAF-ASSOCIATION-LOST indication	11.3.9
AF-END-DIALOGUE indication	11.3.12
AF-U-ERROR indication	11.3.17
TP-U-ABORT request	11.3.19
AF-ABORT (user, dataRI) indication	11.3.20
Protocol Error, Internal Error, A[-P]-ABORT indication, AF-ABORT (provider, abortRI) indication, A-ABORT request, A-RELEASE (Result= affirmative) response, or A-RELEASE (Result=affirmative) confirm on a Dialogue	11.3.21
AF-HANDSHAKE indication	11.3.29
U-ASE indication	11.3.40
AF-PREPARE indication	11.3.46
TP-ROLLBACK request	11.3.53
C-ROLLBACK indication or AF-HEURISTIC-REPORT (rollbackRI) indication	11.3.54
AF-ABORT (user/provider, rollbackRI) indication or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) indication	11.3.55
CAF-RECOVER (ready) indication	11.3.58
C-RECOVER (unknown) confirm	11.3.64
TPPM-initiated rollback	11.4.8
Making commitment decision	11.5.7
Entering READY state	11.5.2

NOTE 1 – A *rollback request* or *rollback response* is not sent to the superior until a TP-DONE request has been issued by the TPSUI and a rollback indication or confirm has been received from each subordinate. This allows for the propagation of any heuristic condition information to the root of the transaction tree. Sending the *rollback request* or *rollback response* to the superior is done in the "Reporting rollback to superior" procedure (see 11.5.10).

If the TPPM is in the ACTIVE state,

- enter the DECIDED (rollback) state;
- issue a TP-ROLLBACK indication, if no rollback initiating request has been received nor rollback initiating indication has been issued (by the calling procedure);

  NOTE 2 – The terms "rollback initiating request" and "rollback initiating indication" are defined in the TP Service, Recommendation X.861.

- set the *TPPM bound data*, if any, to the initial state;
- issue a C-ROLLBACK response if this is a *rollback indication* from a subordinate;
- issue a C-ROLLBACK request to each subordinate except the one, if any, to which a *rollback request* was issued or from which a *rollback indication* has been received or whose *dialogue has been detached*.

  NOTE 3 – The case of the *rollback request* being issued would occur only when the rollback is issued in the same action sequence by the calling procedure.

If the TPPM is in the READY state, and the *rollback indication* was from the superior,

- enter the DECIDED (rollback) state;
- issue a TP-ROLLBACK indication, if no rollback initiating indication has been issued (by the calling procedure);

  NOTE 4 – The term "rollback initiating indication" is defined in the TP Service, Recommendation X.861.

- set the *TPPM bound data*, if any, to the initial state, unless a heuristic decision has been taken;
- issue a C-ROLLBACK request to each subordinate for which no TP-U-ABORT request was received and whose *dialogue has not been detached*;
- issue an AF-ABORT (user, rollbackRI) request to each subordinate for which a TP-U-ABORT request was received and whose *dialogue has not been detached*;
- issue a C-RECOVER (unknown) response to each subordinate from which a CAF-RECOVER (ready) indication was received and to which no C-RECOVER (retry-later) response was issued;
- issue a CAF-DETACH (free) request to each subordinate from which a CAF-RECOVER (ready) indication was received and to which no C-RECOVER (retry-later) response was issued and whose channel is still *attached*;
- *write a log-damage record* with the value "heuristic-hazard" if one does not exist and a subordinate *dialogue has been detached*;
- *write a log-damage record* with a value of "heuristic-mix" if the bound data are set to a state other than the initial state as a result of a previously taken heuristic decision by the TPPM;
- *forget the transaction*.

11.5.6 Initiating transaction after rollback

Invoking Procedure Name	Reference (subclause)
AF-BEGIN-DIALOGUE (accepted) confirm on a Dialogue	11.3.4
AF-BEGIN-DIALOGUE (rejected, dataRI) confirm on a Dialogue	11.3.5
AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) confirm	11.3.6
AF-BEGIN-DIALOGUE (rejected(user), rollbackRC) confirm	11.3.7
SAF-ASSOCIATION-LOST indication	11.3.9
AF-END-DIALOGUE indication	11.3.12
AF-ABORT (user, dataRI) indication	11.3.20
AF-ABORT (user/provider, rollbackRI) indication or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) indication	11.3.55
AF-ABORT (user, rollbackRC) indication or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRC) indication	11.3.57
Protocol Error, Internal Error, A[-P]-ABORT indication, AF-ABORT (provider, abortRI) indication, A-ABORT request, A-RELEASE (Result= affirmative) response, or A-RELEASE (Result=affirmative) confirm on a Dialogue	11.3.21
C-BEGIN indication	11.3.37
TP-DONE request	11.3.50
C-ROLLBACK indication or AF-HEURISTIC-REPORT (rollbackRI) indication	11.3.54
C-ROLLBACK confirm or AF-HEURISTIC-REPORT (rollbackRC) indication	11.3.56

- Issue a TP-ROLLBACK-COMPLETE indication;
- *open the PSAP* for all subordinate dialogues for which the Unchained Transactions functional unit is selected;

If the *dialogue* with the superior *is not chaining*,

a) if the dialogue with the superior *has not been detached*,
   - *open the PSAP*, if it is closed;

b) if any subordinate *dialogue is chaining*,
   - become a root node;
   - issue a C-BEGIN request to each *chaining subordinate dialogue* with the value of the
     1) Atomic Action Identifier parameter set to a newly created value;
     2) Branch Identifier parameter set to a value that uniquely identifies the transaction branch within the scope of the atomic action identifier;
   - enter the ACTIVE state;

c) if no subordinate *dialogue is chaining*,
   - cease to be part of the transaction.

If the superior *dialogue* is *chaining*,

a) always
   - *open the PSAP* with the superior, if closed;

b) if any subordinate *dialogue is chaining*,

- issue a C-BEGIN request to each *chaining subordinate dialogue* with the value of the

  1) Atomic Action Identifier parameter set to the value of the atomic action identifier received on the most recent C-BEGIN indication;

  2) Branch Identifier parameter set to a value that uniquely identifies the transaction branch within the scope of the atomic action identifier;

- enter the ACTIVE state;

c) if no subordinate *dialogue is chaining*

- become a leaf node;
- enter the ACTIVE state.

11.5.7 Making commitment decision

Invoking Procedure Name	Reference (subclause)
TP-COMMIT request	11.3.45
C-READY indication	11.3.47

If the TPPM is able to set the *TPPM bound data* in the final state,

- *write a log-commit record*;

  NOTE – If the log-commit record cannot be written, a rollback is triggered. This implies that the action of writing a log-commit record in the above paragraph may fail. That is why there is a check for the success or failure of writing the log-commit record in the following paragraphs.

- begin setting the *TPPM bound data* to the final state, unless a heuristic decision has been taken. The *TPPM bound data* shall eventually be set to the final state; when this occurs is a local matter.

If the TPPM is unable to set the *TPPM bound data* in the final state or *write the log-commit record*,

- invoke the “Initiating rollback at TPPM” procedure (see 11.5.5).

If the log-commit record was written,

- issue a TP-COMMIT indication;
- enter the DECIDED (commit) state;
- invoke the “Sending commit order” procedure (see 11.5.12).

11.5.8 Receiving commit order

Invoking Procedure Name	Reference (subclause)
AF-ABORT (user, commitRI) indication	11.3.49
C-COMMIT indication or C-COMMIT+C-BEGIN indication	11.3.48
CAF-RECOVER (commit) indication	11.3.60
C-RECOVER (commit) indication	11.3.61

– Issue a TP-COMMIT indication;

– begin setting the *TPPM bound data* to the final state, unless a heuristic decision has been taken. The *TPPM bound data* shall eventually be set to the final state; when this occurs is a local matter;

– *write a log-damage record* with the value “heuristic-mix”, if the node took a heuristic decision to set its *TPPM bound data* in a state other than the final state;

NOTE – The TPPM of an intermediate or leaf node may or may not *write the log-commit record* at this time. Upon node crash recovery (”Restart after node crash”, see 11.4.3), if the log-commit record has not been written, the node will be in the READY state and will take the appropriate recovery actions.

– enter the DECIDED (commit) state.

11.5.9 Recording the heuristic condition

Invoking Procedure Name	Reference (subclause)
AF-ABORT (user, commitRC) indication or AF-ABORT-AND-HEURISTIC-REPORT (commitRC) indication	11.3.52
AF-ABORT (user/provider, rollbackRI) indication or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) indication	11.3.55
AF-ABORT (user, rollbackRC) indication or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRC) indication	11.3.57
TP-DONE request	11.3.50
C-COMMIT confirm or AF-HEURISTIC-REPORT (commitRC) indication	11.3.51
C-ROLLBACK indication or AF-HEURISTIC-REPORT (rollbackRI) indication	11.3.54
C-ROLLBACK confirm or AF-HEURISTIC-REPORT (rollbackRC) indication	11.3.56
CAF-RECOVER (ready) indication	11.3.58
C-RECOVER (done) confirm or AF-HEURISTIC-REPORT (recoverDoneRC) indication	11.3.63

If the Heuristic-report parameter is set to “heuristic-hazard”,

– *write a log-damage record* with the value “heuristic-hazard” if it has not already been created.

If the Heuristic-report parameter is set to “heuristic-mix”,

– *write a log-damage record* with the value “heuristic-mix” if it has not already been created, or update it to “heuristic-mix” if its current value is “heuristic-hazard”.

11.5.10 Reporting rollback to superior

Invoking Procedure Name	Reference (subclause)
AF-BEGIN-DIALOGUE (accepted) confirm on a Dialogue	11.3.4
AF-BEGIN-DIALOGUE (rejected, dataRI) confirm on a Dialogue	11.3.5
AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) confirm	11.3.6
AF-BEGIN-DIALOGUE (rejected(user), rollbackRC) confirm	11.3.7
SAF-ASSOCIATION-LOST indication	11.3.9
AF-END-DIALOGUE indication	11.3.12
AF-ABORT (user, dataRI) indication	11.3.20
AF-ABORT (user/provider, rollbackRI) indication or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) indication	11.3.55
AF-ABORT (user/provider, rollbackRC) indication or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRC) indication	11.3.57
Protocol Error, Internal Error, A[-P]-ABORT indication, AF-ABORT (provider, abortRI) indication, A-ABORT request, A-RELEASE (Result=affirmative) response, or A-RELEASE (Result=affirmative) confirm on a Dialogue	11.3.21
TP-DONE request	11.3.50
C-ROLLBACK indication or AF-HEURISTIC-REPORT (rollbackRI) indication	11.3.54
C-ROLLBACK confirm or AF-HEURISTIC-REPORT (rollbackRC) indication	11.3.56

If a log-ready record exists,

– *forget the transaction*.

If a *rollback indication* was received from the superior,

a) take the first applicable set of actions on the dialogue to the superior:

1) if a TP-U-ABORT request has been received for the superior and no AF-ABORT indication was received from the superior and a log-damage record exists,

– issue an AF-ABORT-AND-HEURISTIC-REPORT (rollbackRC) request. When issued, the AF-ABORT-AND-HEURISTIC-REPORT request carries the Heuristic-Report parameter set to the current value of the log-damage record;

– issue an SAF-DETACH-ASSOCIATION (free) request;

2) if a TP-U-ABORT request has been received for the superior and no AF-ABORT indication was received from the superior,

– issue an AF-ABORT (user, rollbackRC) request;

– issue an SAF-DETACH-ASSOCIATION (free) request;

3) if a log-damage record exists,

– issue an AF-HEURISTIC-REPORT (rollbackRC) request. When issued, the AF-HEURISTIC-REPORT request carries the Heuristic-Report parameter set to the current value of the log-damage record;

– issue an SAF-DETACH-ASSOCIATION (free) request if an AF-ABORT indication was received;

4) if no AF-ABORT indication was received from the superior and the Confirmation parameter of the AF-BEGIN-DIALOGUE indication was set to "always" and no AF-BEGIN-DIALOGUE response has been issued,

NOTE – The service definition "dialogue establishment indication outstanding" does not apply here.

– issue an AF-BEGIN-DIALOGUE (accepted, rollbackRC) response;

5) if none of the above conditions could be met,

– issue a C-ROLLBACK response;

– issue an SAF-DETACH-ASSOCIATION (free) request if an AF-ABORT indication was received;

b) if the Unchained Transactions functional unit is selected on this dialogue and *a TP-DONE request is owed*,

– *close the PSAP*.

If no *rollback indication* was received from the superior, issue the first applicable request of the following to the superior:

a) if a TP-U-ABORT request has been received for the superior and a log-damage record exists,

– issue an AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) request. When issued, the AF-ABORT-AND-HEURISTIC-REPORT request carries the Heuristic-Report parameter set to the current value of the log-damage record;

b) if a TP-U-ABORT request has been received for the superior,

– issue an AF-ABORT (user, rollbackRI) request;

c) if a log-damage record exists,

– issue an AF-HEURISTIC-REPORT (rollbackRI) request. When issued, the AF-HEURISTIC-REPORT request carries the Heuristic-Report parameter set to the current value of the log-damage record;

d) if none of the above conditions could be met,

– issue a C-ROLLBACK request.

11.5.11 Rollback next transaction

Invoking Procedure Name	Reference (subclause)
TP-U-ABORT request	11.3.19
Protocol Error, Internal Error, A[-P]-ABORT indication, AF-ABORT (provider, abortRI) indication, A-ABORT request, A-RELEASE (Result= affirmative) response, or A-RELEASE (Result=affirmative) confirm on a Dialogue	11.3.21
CAF-RECOVER (ready) indication	11.3.58
CAF-RECOVER (commit) indication	11.3.60

If a TP-ROLLBACK indication is not pending,

– make a TP-ROLLBACK indication pending.

NOTE – The pending TP-ROLLBACK indication is issued at the completion of this transaction in the "Completing commitment" procedure (see 11.5.1).

If the TPPM has no subordinates,

– continue.

For each subordinate *dialogue* that *has not been detached* that meets the following conditions:

a) a C-COMMIT+C-BEGIN request was issued and a *commit confirm* was received; and

b) no C-ROLLBACK request or AF-ABORT request was issued;

then

a) if no TP-U-ABORT request was received,

– issue a C-ROLLBACK request;

b) if a TP-U-ABORT request was received,

– issue an AF-ABORT (user, rollbackRI) request;

– issue an SAF-DETACH-ASSOCIATION (rollback-confirm-expected) request.

11.5.12 Sending commit order

Invoking Procedure Name	Reference (subclause)
AF-ABORT (user, commitRI) indication	11.3.49
C-COMMIT indication or C-COMMIT+C-BEGIN indication	11.3.48
CAF-RECOVER (commit) indication	11.3.60
C-RECOVER (commit) indication	11.3.61
Making commitment decision	11.5.7

For each subordinate dialogue:

a) if the subordinate *dialogue is chaining*, and

1) if this is a root node or the superior *dialogue is not chaining*,

– issue a C-COMMIT+C-BEGIN request with the value of the

i) Atomic Action Identifier parameter set to a newly created value;

ii) Branch Identifier parameter set to a value that uniquely identifies the transaction branch within the scope of the atomic action identifier;

2) if the superior *dialogue is chaining*,

– issue a C-COMMIT+C-BEGIN request with the value of the

i) Atomic Action Identifier parameter set to the value of the atomic action identifier of the most recent C-BEGIN indication;

ii) Branch Identifier parameter set to a value that uniquely identifies the transaction branch within the scope of the atomic action identifier;

b) if the subordinate *dialogue is not chaining*, and

1) if the subordinate *dialogue has not been detached*,

i) if a TP-U-ABORT request has been received for this subordinate,

– issue an AF-ABORT (user, commitRI) request to the subordinate;

ii) if a TP-U-ABORT request has not been received for this subordinate,

– issue a C-COMMIT request to the subordinate;

2) if the subordinate *dialogue has been detached*,

i) if a channel is not *attached*,

– issue a CAF-PLEASE request with the AE-Title of the CAF-PLEASE request set to the value of the AE-Title taken from the branch identifier for the subordinate, contained in the log-commit record.

ii) if a channel is *attached*,

– issue a C-RECOVER (commit) request if no recovery-context-handle is present in the log-ready record;

NOTE – Since the channel is *attached*, a CAF-RECOVER (ready) indication will have been received and CCR permits the issuance of a C-RECOVER (commit) request without the *token* when following a C-RECOVER (ready) indication. If the *token* is owned and the channel is two-way-recovery, it will be returned after the C-RECOVER (commit) request, as specified below.

– issue an AF-TOKEN-GIVE (two-way-recovery) request if the *token* is owned on the channel and this is a two-way-recovery channel.

12 Structure and encoding of TP APDUs

12.1 Abstract syntax of the TP-ASE APDUs

```
Transaction-Processing-APDUs

{ joint-iso-ccitt transaction-processing(10) modules(1) apdus-abstract-syntax(1) version1(0) }

DEFINITIONS IMPLICIT TAGS ::=

BEGIN

-- EXPORTS
-- all definitions --

IMPORTS
        APPLICATION-SERVICE-ELEMENT
         FROM    Remote-Operations-Notation-extension
         { joint-iso-ccitt remote-operation(4) notation-extension(2) }

-- object identifier assignments

id-as-tpase OBJECT IDENTIFIER ::=
        { joint-iso-ccitt transaction-processing(10) abstract-syntax(2) tp-apdus(1) }
            -- may be used to reference the abstract syntax of the
            -- transaction processing ASE APDUs

tpASE1 APPLICATION-SERVICE-ELEMENT ::=
        { joint-iso-ccitt transaction-processing(10) ase-id(0) tp-ase(1) version1(0) }
            -- may be used to identify the transaction processing ASE

-- top level APDU CHOICE

TPASE-APDU ::=  CHOICE
{
tp-begin-dialogue-ri                [1]  TP-BEGIN-DIALOGUE-RI,
tp-begin-dialogue-rc                [2]  TP-BEGIN-DIALOGUE-RC,
tp-bid-ri                           [3]  TP-BID-RI,
tp-bid-rc                           [4]  TP-BID-RC,
tp-end-dialogue-ri                  [5]  TP-END-DIALOGUE-RI,
tp-end-dialogue-rc                  [6]  TP-END-DIALOGUE-RC,
tp-u-error-ri                       [7]  TP-U-ERROR-RI,
tp-u-error-rc                       [8]  TP-U-ERROR-RC,
tp-abort-ri                         [9]  TP-ABORT-RI,
tp-grant-control-ri                 [10] TP-GRANT-CONTROL-RI,
tp-request-control-ri               [11] TP-REQUEST-CONTROL-RI,
tp-handshake-ri                     [12] TP-HANDSHAKE-RI,
tp-handshake-rc                     [13] TP-HANDSHAKE-RC,
tp-handshake-and-grant-control-ri   [14] TP-HANDSHAKE-AND-GRANT-CONTROL-RI,
tp-handshake-and-grant-control-rc   [15] TP-HANDSHAKE-AND-GRANT-CONTROL-RC,
tp-defer-ri                         [16] TP-DEFER-RI,
tp-prepare-ri                       [17] TP-PREPARE-RI,
tp-heuristic-report-ri              [18] TP-HEURISTIC-REPORT-RI,
tp-token-give-ri                    [19] TP-TOKEN-GIVE-RI,
```

```
tp-token-please-ri              [20] TP-TOKEN-PLEASE-RI,
tp-recover-ri                   [21] TP-RECOVER-RI,
tp-initialize-ri                [22] TP-INITIALIZE-RI,
tp-initialize-rc                [23] TP-INITIALIZE-RC
}

-- individual APDU definitions.

TP-BEGIN-DIALOGUE-RI ::= SEQUENCE
{           CHOICE
                { dialogue      [1] SEQUENCE
                    { initiating-tpsu-title     [1] TPSU-title OPTIONAL,
                      recipient-tpsu-title      [2] TPSU-title OPTIONAL,
                      functional-units          [3] FU-list DEFAULT {
                                                        shared-control,
                                                        commit-and-chained-transactions },
                    -- dialogue is always selected.
                    -- Only one (or neither) of "commit-and-chained-transactions"
                    -- "commit-and-unchained-transactions" shall be selected.
                    -- "recovery" shall not be selected.
                      begin-transaction                 [4] BOOLEAN OPTIONAL,
                      confirmation              [5] ENUMERATED
                                                        { always            (1),
                                                          negative          (2)
                                                        }   DEFAULT negative,
                      correlator                [6] Correlator,
                      last-partner-identifier   [7] Correlator OPTIONAL,
                      user-data                 [30] User-information OPTIONAL
                    },

                  channel       [2] SEQUENCE
                    { functional-units          [1] FU-list DEFAULT { recovery },
                    -- Only Recovery shall be selected.
                    -- Default is Recovery.
                      correlator                [2] Correlator,
                      channel-utilization       [3] ENUMERATED
                                                    { one-way-recovery      (1),
                                                      two-way-recovery      (2) }
                                                      DEFAULT one-way-recovery,
                      last-partner-identifier   [4] Correlator OPTIONAL
                    }
                }
}

TP-BEGIN-DIALOGUE-RC ::= SEQUENCE
{           CHOICE
                { dialogue      [1] SEQUENCE
                    { functional-units          [1] FU-list OPTIONAL,
                    -- "recovery" shall not be selected.
                      result                    [2] ENUMERATED
                                                    { accepted              (1),
                                                      rejected-provider     (2),
                                                      rejected-user         (3)
                                                    }   DEFAULT accepted,
                      diagnostic                [3] ENUMERATED
                                                    { recipient-tpsu-title-unknown              (1),
                                                      tpsu-not-available-permanent              (2),
                                                      tpsu-not-available-transient              (3),
                                                      recipient-tpsu-title-required             (4),
                                                      functional-unit-not-supported             (5),
                                                      functional-unit-combination-not-supported(6),
                                                      association-reserved                      (7),
                                                      no-reason-given                           (8)
                                                    }   OPTIONAL,
                      correlator                [4] Correlator,
                      user-data                 [30] User-information OPTIONAL
                    },
```

```
                    channel        [2]  SEQUENCE
                        { result                    [1]  ENUMERATED
                                                        { accepted                  (1),
                                                          rejected-provider         (2)
                                                        }     DEFAULT   accepted,
                          diagnostic                [2]  ENUMERATED
                                                        { functional-unit-not-supported          (1),
                                                          association-reserved                    (2),
                                                          tppm-recovery-not-available            (3),
                                                          two-way-recovery-not-supported         (4),
                                                          no-reason-given                        (5)
                                                        }     OPTIONAL,
                          correlator                [3]  Correlator
                        }
                    }
}

TP-BID-RI ::=  SEQUENCE
{                       ccr-token-requested       [1]  BOOLEAN  DEFAULT  FALSE,
                        last-partner-identifier   [2]  Correlator OPTIONAL
}

TP-BID-RC ::=  SEQUENCE
{                       result                    [1]  ENUMERATED
                                                        { accepted                  (1),
                                                          rejected                  (2)
                                                        }     DEFAULT   accepted
}

TP-END-DIALOGUE-RI ::=  SEQUENCE
{                       confirmation              [1]  BOOLEAN DEFAULT FALSE
}

TP-END-DIALOGUE-RC ::=  SEQUENCE
{
}

TP-U-ERROR-RI ::=  SEQUENCE
{
}

TP-U-ERROR-RC ::=  SEQUENCE
{
}

TP-ABORT-RI ::=  SEQUENCE
{           type CHOICE
                    { user          [1]  SEQUENCE
                        { user-data               [30] User-information   OPTIONAL
                        },
                      provider      [2]  SEQUENCE
                        { diagnostic              [1]  ENUMERATED
                                                        { permanent-failure         (1),
                                                          begin-transaction-reject          (2),
                                                          transient-failure         (3),
                                                          protocol-error            (4)
                                                        }
                        }
                    }
}

TP-GRANT-CONTROL-RI ::=  SEQUENCE
{
}

TP-REQUEST-CONTROL-RI ::=  SEQUENCE
{
}

TP-HANDSHAKE-RI ::=  SEQUENCE
{                        confirmation-urgency     [1]  Confirmation-urgency OPTIONAL
}
```

```
TP-HANDSHAKE-RC ::= SEQUENCE
{
}

TP-HANDSHAKE-AND-GRANT-CONTROL-RI ::= SEQUENCE
{                       confirmation-urgency    [1]  Confirmation-urgency
                                                     DEFAULT  urgent
}

TP-HANDSHAKE-AND-GRANT-CONTROL-RC ::= SEQUENCE
{
}

TP-DEFER-RI ::= SEQUENCE
{                       type                    [1]  ENUMERATED
                                                     { end-dialogue          (1),
                                                       grant-control         (2)
                                                     }   DEFAULT  end-dialogue
}

TP-PREPARE-RI ::= SEQUENCE
{                       data-permitted          [1]  BOOLEAN  OPTIONAL
                                                -- present if polarized-control
}

TP-HEURISTIC-REPORT-RI ::= SEQUENCE
{                       heuristic-report        [1]  ENUMERATED
                                                     { heuristic-mix         (1),
                                                       heuristic-hazard      (2)
                                                     }   DEFAULT  heuristic-mix
}

TP-TOKEN-GIVE-RI ::= SEQUENCE
{                       reason                  [1]  ENUMERATED
                                                     { regular               (1),
                                                       keep                  (2),
                                                       two-way-recovery      (3)
                                                     }   DEFAULT  regular,
                        correlator              [2]  Correlator OPTIONAL
}

TP-TOKEN-PLEASE-RI ::= SEQUENCE
{
}

TP-RECOVER-RI ::= SEQUENCE
{                       recovery-context-handle [1]  Recovery-context-handle
}

TP-INITIALIZE-RI ::= SEQUENCE
{                       protocol-version        [1]  Protocol-versions
                                                     DEFAULT { version1 },
                    contention-winner-assignment [2] BOOLEAN DEFAULT TRUE,
                        -- The value "TRUE" means that the association initiator is
                        -- the contention-winner. The value "FALSE" means that the
                        -- association acceptor is the contention-winner.
                        bid-mandatory           [3]  BOOLEAN DEFAULT TRUE,
                        -- The value "TRUE" means that the Bid mechanism must be used.
                        -- The value "FALSE" means that it may optionally be used.
                        recovery-context-handle [4]  Recovery-context-handle
                                                     OPTIONAL
}
```

```
TP-INITIALIZE-RC ::= SEQUENCE
{                       protocol-version            [1]  Protocol-versions
                                                         DEFAULT { version1 },
                        recovery-context-handle     [2]  Recovery-context-handle
                                                         OPTIONAL,
                        diagnostic                       [3]  BIT STRING
                                                         { ccr-version-2-not-available              (0),
                                                           tp-protocol-version-incompatibility      (1),
                                                           contention-winner-assignment-rejected    (2),
                                                           bid-mandatory-value-rejected             (3),
                                                           no-reason-given                          (4) }
                                                         OPTIONAL
                        -- the field is not present if the BIT STRING value is empty.
}

-- Supporting type definitions --

Confirmation-urgency    ::=  ENUMERATED
                             { urgent                    (1),
                               normal                          (2)
                             }

Correlator              ::=  INTEGER
                        --  unique within the scope of the association.

FU-list                 ::=  BIT STRING
                             { polarized-control                        (0),
                               shared-control                           (1),
                               commit-and-chained-transactions          (2),
                               commit-and-unchained-transactions        (3),
                               handshake                                (4),
                               recovery                                 (5)
                             }

Protocol-versions       ::=  BIT STRING { version1(0) }

Recovery-context-handle      ::=  OCTET STRING

TPSU-title              ::=  CHOICE
                             { T61String,        -- May be used as an AttributeValue
                               PrintableString,          -- for an RDN in a Directory Name.
                               INTEGER
                             }

User-information        ::=  SEQUENCE OF EXTERNAL

END -- of TP-ASE definitions.
```

12.2 Rules of extensibility

To provide for future compatibility, for the TP-INITIALIZE-RI/RC and TP-BEGIN-DIALOGUE-RI/RC APDUs, a receiving TPPM shall ignore a received field or field value that is not defined within the APDU in the ASN.1 description of this version of this protocol specification.

An APDU that is not defined in the ASN.1 description of the negotiated version of this protocol specification shall not be sent. If such an APDU is received, it shall be treated as a protocol error.

A received field or field value that is not defined within an APDU in the ASN.1 description of the negotiated version of this protocol specification (other than fields or field values of TP-INITIALIZE-RI/RC and TP-BEGIN-DIALOGUE-RI/RC APDUS) shall either be ignored or treated as a protocol error.

The abstract syntax name may be used when new fields or field values are defined within any TP-ASE-APDU.

13 Conformance

13.1 Static conformance requirements

13.1.1 Conformance classes

13.1.1.1 General requirements

The system shall support one or more of the following conformance classes:

a) Application Transaction Branches Class;

b) Unchained Provider-Supported Transaction Branches Class;

c) Chained Provider-Supported Transaction Branches Class.

Support for conformance classes is defined in terms of support for functional units in the subclauses of 13.1.1, "Conformance Classes". Support for each functional unit is defined in terms of support for sending and/or accepting particular APDUs as defined in 13.1.2, "Capabilities" and 13.1.3, "Functional Units".

13.1.1.2 Application transaction branches class

A system in conformance with the Application Transaction Branches Class shall support

a) the requirements of the Dialogue functional unit;

b) the Shared Control functional unit, or the Polarized control functional unit, or both; and

c) optionally, the Handshake functional unit.

13.1.1.3 Chained provider-supported transaction branches class

A system in conformance with the Chained Provider-Supported Transaction Branches Class shall support

a) the requirements of the Dialogue functional unit;

b) the Shared Control functional unit, or the Polarized Control functional unit, or both;

c) the Commit functional unit;

d) the Chained Transactions functional unit;

e) the Recovery functional unit; and

f) optionally, the Handshake functional unit.

13.1.1.4 Unchained provider-supported transaction branches class

A system in conformance with the Unchained Provider-Supported Transaction Branches Class shall support

a) the requirements of the Dialogue functional unit;

b) the Shared Control functional unit, or the Polarized Control functional unit, or both;

c) the Commit functional unit;

d) the Unchained Transactions functional unit;

e) the Recovery functional unit; and

f) optionally, the Handshake functional unit.

13.1.2 Capabilities

13.1.2.1 General capabilities

The system shall be capable of

a) initiating the establishment of an application association (by sending a TP-INITIALIZE-RI APDU and receiving a TP-INITIALIZE-RC APDU) (role "Ai"), or

accepting the establishment of an association (by receiving a TP-INITIALIZE-RI APDU and sending a TP-INITIALIZE-RC APDU) (role "Aa"), or

both initiating and accepting the establishment of an association (roles Ai and Aa);

b) functioning as a contention-winner of an association (role “Cw”), or

functioning as a contention-loser of an association (role “Cl”), or

functioning as both a contention-winner and contention-loser (roles “Cw” and “Cl”);

c) initiating a TP dialogue (role “Di”), or

accepting a TP dialogue (role “Da”), or

both initiating and accepting a TP dialogue (roles “Di” and “Da”);

d) when the Commit functional unit is supported,

initiating a transaction branch (role “Ti”), or

accepting a transaction branch (role “Ta”), or

both initiating and accepting a transaction branch (roles “Ti” and “Ta”);

e) when the Recovery functional unit is supported, the system shall have both capabilities, role Ai and Aa, stated in 13.1.2.1 a) above for the purpose of recovery;

NOTE – The following are required capabilities of all systems regardless of role.

f) rejecting a TP dialogue;

g) supporting the rules of extensibility specified in the “Rules of Extensibility” (see 12.2).

13.1.2.2 Constraints

A system in conformance with the role of initiating a transaction branch shall support initiating a TP dialogue with the Commit functional unit selected.

A system in conformance with the role of accepting a transaction branch shall support accepting a TP dialogue with the Commit functional unit selected.

13.1.3 Functional units

13.1.3.1 Definition

TP **functional units** are logical groupings of related TP protocol elements.

The TP functional units comprise

a) the functional units visible to the TP service, as defined in Recommendation X.861;

b) the Recovery functional unit, as defined below.

13.1.3.2 Description of Recovery functional unit

The Recovery functional unit is only used on a TP channel. It is internal to the TPPM and the CPM and therefore is not directly accessible to any TPSUI.

The Recovery functional unit provides the protocols necessary to allow a CPM to send a request for, accept a request for, reject a request for, normally terminate and abnormally terminate a TP channel.

The Recovery functional unit also provides the protocol necessary to allow a TPPM to effect the rollback or commitment of transactions that have been affected by a failure.

13.1.3.3 Requirements on TP APDUs

Table 42 shows whether support for sending/receipt of an APDU is necessary to support a given functional unit. When an APDU shall be supported, in the context of the functional unit where it appears, independently of any capability, then it is marked “M” (mandatory).

Where the requirements depend on the capabilities that are supported (see 13.1.2.1), the two-letter mnemonics identifying the roles (e.g. Ai) are used: the notation “Xy” means “The sending (or receipt) of the APDU shall be supported if the capability identified by Xy is supported”.

More complicated conditions are spelled out beneath the table. They are referred to in the table using the notation “(Cn)”.

A system that does not fulfill a condition expressed in the support column is not required to be capable of sending or receiving the corresponding TP APDUs.

TABLE 42/X.862

TP Functional Units and support for TP APDUs

Functional Units	TP APDU	Support	
		Sending	Receiving
Dialogue	TP-BEGIN-DIALOGUE-RI (“dialogue” structure)	Di	M
	TP-BEGIN-DIALOGUE-RC (accept)	Da	Di
	TP-BEGIN-DIALOGUE-RC (reject)	M	Di
	TP-END-DIALOGUE-RI	(C1)	(C1)
	TP-END-DIALOGUE-RC	(C1)	(C1)
	TP-U-ERROR-RI	M	M
	TP-ABORT-RI	M	M
	TP-BID-RI	(C5)	Cw
	TP-BID-RC	Cw	(C2)
	TP-INITIALIZE-RI	Ai	Aa
	TP-INITIALIZE-RC	Aa	Ai
Shared Control	TP-U-ERROR-RC	M	M
Polarized Control	TP-GRANT-CONTROL-RI	M	M
	TP-REQUEST-CONTROL-RI	M	M
Handshake	TP-HANDSHAKE-RI	M	M
	TP-HANDSHAKE-RC	M	M
Handshake and Polarized Control	TP-HANDSHAKE-AND-GRANT-CONTROL-RI	M	M
	TP-HANDSHAKE-AND-GRANT-CONTROL-RC	M	M
Commit	TP-PREPARE-RI	Ti	Ta
	TP-DEFER-RI	Ti	Ta
	TP-HEURISTIC-REPORT-RI	Ta	Ti
	TP-TOKEN-GIVE-RI	M	M
Unchained Transactions	(none)		
Chained Transactions	(none)		
Recovery	TP-BEGIN-DIALOGUE-RI (“channel” structure)	M	M
	TP-BEGIN-DIALOGUE-RC	M	M
	TP-BID-RI	(C5)	Cw
	TP-BID-RC	Cw	(C2)
	TP-RECOVER-RI	M	(C4)
	TP-TOKEN-PLEASE-RI	(C3)	(C3)
	TP-END-DIALOGUE-RI	M	M
	TP-INITIALIZE-RI	M	M
	TP-INITIALIZE-RC	M	M

(C1) The sending and receipt of both the TP-END-DIALOGUE-RI and TP-END-DIALOGUE-RC shall be supported when one, or both, of the Application Transaction Branches class or the Unchained Provider-supported Transaction Branches class are supported.

(C2) The receipt of the TP-BID-RC APDU shall be supported when the system is capable of sending the TP-BID-RI APDU.

(C3) Both the sending and the receipt of the TP-TOKEN-PLEASE-RI APDU shall be supported when the two-way-recovery facility is used.

(C4) The receipt of the TP-RECOVER-RI APDU shall be supported when the system supplies a recovery-context-handle on associations which it will use for initiating or accepting provider-supported transactions.

(C5) Sending TP-BID-RI is optional. To use a given association for either a dialogue or a channel, it may be necessary to bid. See clauses 8 and 10 for the specific circumstances under which bidding is required to use a particular association.

Where a TP APDU appears in both the Dialogue and the Recovery functional units, a system that supports both functional units shall meet the requirements of both sets of conditions.

NOTE – Implementations that are restricted in that they do not send all APDUs required by this subclause may be reasonable in specific application environments. Currently, these implementations are not conforming to this protocol specification.

However, it is under study within ISO as to whether such implementations in the future may claim conformance to the TP Protocol. This note does not modify any part of clause 13.

13.1.4 Dependencies on other standards

The system shall also implement the following standards:

a) The CCR protocol in conformance with ISO/IEC 9805/Amd 2, if the Commit functional unit is supported.

   The system shall support the role of a CCR superior if the system supports role Ti, and the system shall support the role of a CCR subordinate if the system supports role Ta.

   If the system supports both roles Ti and Ta, then the system shall support the combination of the roles of CCR superior and CCR subordinate as specified in the TP procedures (see clauses 9, 10 and 11);

b) The ACSE protocol in conformance with CCITT Recommendation X.227.

   The system shall support the normal mode.

   The system shall support the role of association initiator if the system supports role Ai and shall support the role of association responder if the system supports role Aa;

c) The Presentation protocol in conformance with ISO 8823/Amd 5.

   In addition to those services used by ACSE, the system shall support P-DATA service primitives.

   If the Commit functional unit is supported, then, in addition to those services used by CCR, the system shall support the use of the P-TOKEN-GIVE (synchronize-minor) service primitives. In addition, when the system supports the Recovery functional unit and uses the two-way-recovery facility, the system shall also support the P-TOKEN-PLEASE (synchronize-minor) service primitives;

d) The ASN.1 basic encoding rules in conformance with CCITT Recommendation X.209 (even if the system supports other encodings); and

e) The Session protocol in conformance with ISO 8327/Amd 3.

   The system shall support version 2.

   The system shall support the Kernel and Duplex functional units.

13.2 Dynamic conformance requirements

13.2.1 General requirements

a) The system shall correctly generate, accept, and respond to all valid protocol elements that support each class to which conformance is claimed;

b) The system shall respond to all incorrect sequences of TP protocol elements.

13.2.2 Specific requirements

For each conformance class to which conformance is claimed and for each option of the static conformance requirements implemented, the system shall exhibit external behaviour consistent with having implemented the following:

a) a TP Protocol Machine as specified in the “TP-ASE Description”, “SACF Description”, and “MACF Description” (see clauses 9, 10 and 11) interpreted in accordance with the “Execution Rules” (see clause 7);

b) the association management functions defined in the “Association Management” (see subclause 8.5);

c) the use of the Association Control Service Element and of the Presentation Layer, as specified in 8.2, “Use of ACSE Service Primitives”, and 8.4, “Use of the Presentation Layer”;

d) encoding of TP APDUs as specified in 12.1, “Abstract Syntax of the TP-ASE APDUs”; and

e) embedding of APDUs as described in 6.1.7, “Embedding”.

13.3 Protocol Implementation Conformance statement

The supplier of a protocol implementation for which conformance to CCITT Recommendations X.860, X.861, and X.862 is claimed shall complete a copy of the PICS proforma provided in Annex A of ISO/IEC 10026-4, and shall provide the information necessary to identify both the supplier and the implementation.

NOTE – The concepts of a PICS and a PICS proforma are defined in CCITT Recommendation X.290.

13.4 Receiving TP APDUs

The semantics of some optional fields of some TP APDUs only apply to certain conformance options.

The system shall accept the syntax of all validly formatted fields in received TP APDUs. However, the system may ignore the semantics of those fields referred to in the first sentence of this subclause, if the system does not support the corresponding static conformance options.

14 Compliance

This protocol specification complies with the service user rules of CCR, ISO/IEC 9804.

15 Precedence statement

The text of clauses 7 through 12 takes precedence over the description contained in Annex A.

Predicates, variables, and states in the state tables reflect both the text procedures (defined in the previous clauses) and the sequencing rules defined in Recommendation X.861. The text procedures are augmented with certain Service rules (see 7.2) to provide the same detection of illegal behaviour.

16 Index of Actions and Events

Annex A

OSI TP Protocol – state tables

(This annex forms an integral part of this Recommendation)

A.1 General

This annex describes the OSI TP Protocol in terms of state tables. The state tables show the state of both the TPPM and the CPM, the events that occur in the OSI TP Protocol, the actions taken, and the resulting states.

A.2 Introduction

A.2.1 States tables

The TP state tables used in the description of the OSI TP Protocol comprise:

a) the TPPM MACF state table, presented as four tables (see Tables A.13 to A.16);

NOTE 1 – The TPPM MACF state table is presented as four tables because of the difficulty of presenting all the states on a page.

b) the CPM MACF state table (see Table A.17);

c) the SACF state table (see Table A.18); and

d) the TPASE table (see Table A.8).

NOTE 2 – The TPASE (see Table A.8) encodes and decodes TP APDUs.

A.2.2 PM state machines

A.2.2.1 PM instance

A state machine is an instance of a state table. An instance of a PM consists of several instances of the state machines described in the following subclauses. The state machines that comprise a PM instance cooperate by the exchange of events (see A.2.3), the use of shared variables, and the counting mechanism [see A.3, rule f)].

A.2.2.2 TPPM

The state of a TPPM at any particular time is represented by the state in each of the:

a) TPPM MACF state machines. There is one state machine per dialogue branch or transaction branch, depending on the coordination level; and

b) SAO state machines. There is one SAO state machine per SAO in use by the TPPM, comprising:

1) an SACF state machine;

2) a TPASE state machine;

3) a CCRPM (refer to Recommendation X.852), if CCR is in the application context;

4) an ACPM (refer to Recommendation X.227); and

5) one or more U-ASE state machines.

The TPPM state consists of the combined set of states of each of the above state machines as well as additional context related to the entire TPPM.

NOTE – An example of this context is the node variables defined in A.2.5.

The TPPM MACF states are described in A.4.1.1. The SACF states are described in A.6.1.

A.2.2.3 CPM

The CPM MACF as described in 6.2.1 is represented by a CPM MACF state machine for each channel.

The state of a channel within the CPM at any particular time is represented by the state in each of the:

a) CPM MACF state machine; and

b) SAO state machine. There is one SAO state machine per SAO in use by the CPM, comprising:

1) an SACF state machine;

2) a TPASE state machine;

3) a CCRPM (refer to Recommendation X.852); and

4) an ACPM (refer to Recommendation X.227).

The CPM MACF states are described in A.4.1.2. The SACF states are described in A.6.1.

A.2.3 Events

PM input events are defined in 7.1.2.

State machines are affected by **incoming events** which comprise PM input events, internal events and synchronizing events. As a result of processing a single incoming event, a state machine may generate zero or more **outgoing events**, some of which may become incoming events to another state machine.

NOTE 1 – The following examples illustrate how events are received and generated by the state machines. Refer to Figures A.1 and A.2.

Example 1 – The state of the TPPM MACF state machine is assumed to be in state 1. Input event TP-BEGIN-DIALOGUE request is received by the TPPM MACF state machine (P1). The event is received according to Table A.13, state 1, and is processed by taking actions, among which outgoing event AF-BEGIN-DIALOGUE request is generated to the SACF state machine (P4).

Incoming event AF-BEGIN-DIALOGUE request is received by the SACF state machine (P4) according to Table A.18, state 1. As a result, the SACF state machine issues an outgoing event which is either an AF-BEGIN-DIALOGUE request or an AF-BID request to the TPASE (P5). The TPASE encodes the AF-Service request into a TP APDU, according to Table A.8, and generates an outgoing event: it issues (or the SACF may possibly concatenate with other TP APDUs – see 6.1.5) the corresponding Presentation-service request with the TP APDU as user-data (P9).

Example 2 – Input event P-DATA indication with a TP-BID-RI APDU as user-data is received from the PSAP (P3). The APDU is decoded by the TPASE according to Table A.8 and outgoing event AF-BID indication is generated to the SACF state machine (P10).

Incoming event AF-BID indication is received by the SACF state machine according to Table A.18. Assuming that it is accepted, the SACF machine generates outgoing event AF-BID response to the TPASE (P5). The TPASE encodes the AF-Service request into a TP APDU, according to Table A.8, and generates an outgoing event: it issues (or the SACF may possibly concatenate with other TP APDUs – see 6.1.5) the corresponding Presentation-service request with the TP APDU as user-data (P9).

This second example shows an input event being completely handled by the TPASE and the SACF state machine without the involvement of the TPPM MACF state machine.

In addition, this annex also uses the following event types.

An **internal event** is an event that is created as a result of some internal decision or occurrence (including internal or protocol errors). Internal events are described in A.4.3.1 and A.6.3.1.

A **synchronizing event** is an event used to convey node-related information across all MACF state machines with coordination level "commitment". A synchronizing event is generated as a result of processing a node-related state machine incoming event on a single branch (a single MACF state machine), and is a state machine incoming event to *all* MACF state machines (with coordination level "commitment"), including the state machine that generated the synchronizing event.

NOTE 2 – For example, upon the arrival of a *commit indication* on the superior dialogue, a *commit request* must be issued to each subordinate in the transaction tree. This is done by generating a synchronizing event to *all* TPPM MACF state tables with coordination level of "commitment"; where applicable, the TPPM MACF state machines (the ones representing subordinate dialogues or channels in this case) will take actions that include issuing the *commit request*.

A synchronizing event is generated only after the subcell (see A.2.8, Conventions) is completely processed, i.e. all actions are complete and the transition is made to the next state. If multiple synchronizing events are generated, they are generated (and processed) in sequence in the order requested and in the same action sequence [see A.3, rule b)].

A further distinction of events is whether the event is global or not. A **global event** is an event that is applied to all MACF state machines. The global events are TP-COMMIT request, TP-ROLLBACK request, TP-DONE request, all synchronizing events, and some internal events (see A.4.3.1 for the global internal events).

The order of processing by the affected state tables of a global event is arbitrary, but the rule of atomicity holds (see A.3).

Internal and synchronizing events are described in A.4.3 and A.6.3. All other state machine input events are TP-, ACSE-, CCR-, AF-, SAF-, CAF-, or U-ASE-Services.

A.2.4 States

A state machine is in one state at any given time. Upon initial creation, the state machines are all in state 1, except upon creation after node crash, in which case they are created in the appropriate state (as defined by A.4.4.5, "Actions after node crash").

MACF states are described in A.4.1 and SACF states in A.6.1.

A.2.5 Variables and predicates

Each state machine uses variables for keeping track of certain information, and uses variables and predicates as conditions and predicate expressions. The variables are of type Boolean, Integer, Octet String, and Record Types (whose names begin with "T", and are described in A.4.2.2).

There are six categories of variables:

a) dialogue variables (whose names begin with "D"), which are specific to each TPPM MACF state machine;

b) channel variables (whose names begin with "C"), which are specific to each CPM MACF state machine;

c) node variables (whose names begin with "N"), which are specific to the TPPM MACF state machines. These variables are shared between all TPPM MACF state machines for a node;

d) system variables (whose names begin with "S"), which are specific to the TPPM and CPM MACF state machines. These variables are accessible to any TPPM or CPM MACF state machine for the system. These variables also retain their value in the event of a node crash;

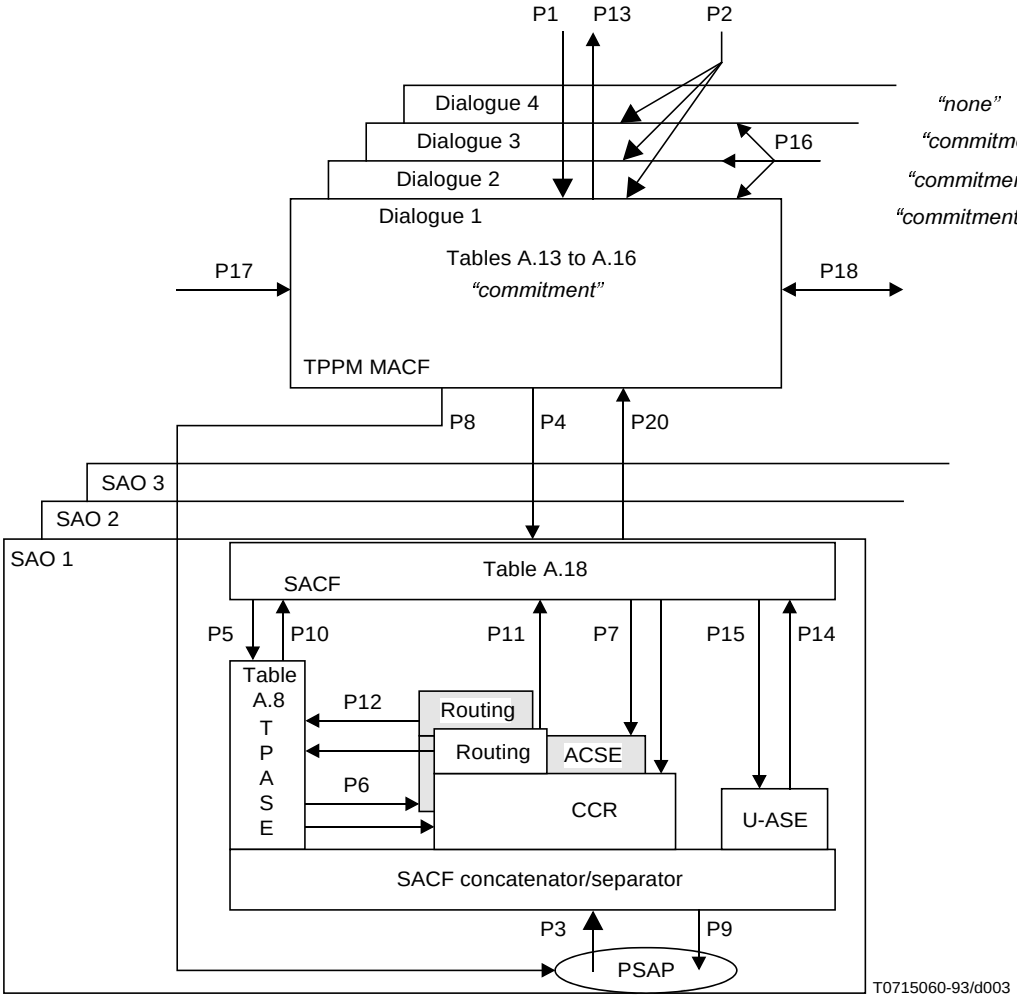
e) local decision variables (whose names begin with "Ld"), which represent local decisions and options. Successive evaluations of local decision variables may yield different values. This non-deterministic behavior models potential changes in system resources and local strategies; and

f) association variables (whose names begin with "A"), which are related to a particular association. These variables are used by the SACF, however, some of these variables are also shared with the TPPM or CPM MACF while the MACF is attached.

Predicates (whose names begin with "P") are inspected by any state machine and represent conditions outside of the TPPM.

Boolean functions which operate over sets of records are used to update and test membership in the system variables. These are described in A.4.4.1.

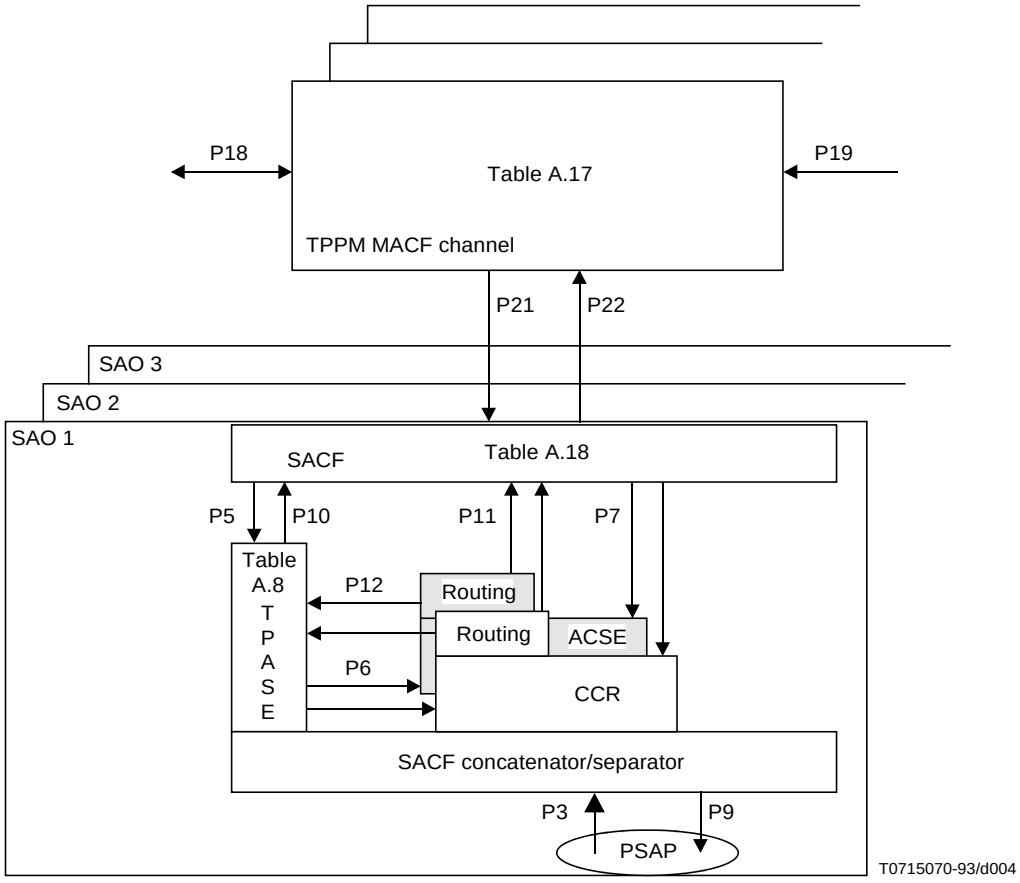
The Dialogue, Channel, Node, System, and some Local decision variables are described in A.4.2. The Association variables, and some Local decision variables are described in A.6.2. The Predicates are described in A.7.



P1 All TP- requests and responses except P2
P2 Global events: TP-COMMIT req, TP-ROLLBACK req, TP-DONE req
P3 All incoming APDUs
P4 All AF- requests and responses (except AF-BID request and response), C-requests and responses, U-ASE request and all SAF-DETACH requests
P5 All AF- requests and responses
P6 All C- and A- requests and responses carrying a TP APDU as user data
P7 All C- and A- requests and responses without a TP APDU as user data
P8 Open/close PSAP
P9 All outgoing APDUs
P10 All AF- indications and confirms
P11 All C- and A- indications and confirms without a TP APDU as user data
P12 All A- and C- indications and confirms which contain TP APDUs
P13 All TP- indications and confirms
P14 U-ASE indication
P15 U-ASE request
P16 All synchronizing events and global internal events
P17 TPPM internal events
P18 CAF- services
P20 All AF-, C-, A-, and U-ASE indications and confirms, and SAF-ASSOCIATION-LOST indication

FIGURE A.1/X.862

Flow of events through the TPPM state machines



P3 All incoming APDUs
P5 All AF- requests and responses
P6 All C- and A- requests and responses carrying a TP APDU as user data
P7 All C- and A- requests and responses without a TP APDU as user data
P9 All outgoing APDUs
P10 All AF- indications and confirms
P11 All C- and A- indications and confirms without a TP APDU as user data
P12 All A- and C- indications and confirms which contain TP APDUs
P18 CAF services
P19 CPM internal events
P21 AF-BEGIN-DIALOGUE and C-RECOVER requests and responses; AF-END-DIALOGUE, AF-RECOVER, AF-TOKEN-PLEASE and AF-TOKEN-GIVE requests
P22 AF-BEGINS-DIALOGUE, and C-RECOVER indications and confirms; AF-END-DIALOGUE, AF-RECOVER, AF-TOKEN-PLEASE and AF-TOKEN-GIVEN indications

FIGURE A.2/X.862

Flow of events through the CPM state machines

A.2.6 Actions

Actions are presented in the state tables' cells between brackets ("[ ]"). These actions are described in A.4.4, A.5.4, and A.6.4.

For each valid incoming event (see A.2.8, "Conventions" below), all applicable actions are taken. Actions with free-form names often have conditions embedded in them.

A.2.7 Notation

Incoming events are represented by their name, with one or more attributes, when required. Some specific attributes are represented by a predicate, as follows:

- AAI is a predicate which is the value of the *atomic-action identifier* parameter of the received service primitive; and
- BI is a predicate which is the value of the *atomic-action-branch identifier* parameter of the received service primitive.

States are represented by a number. The integer part of the state number refers to the corresponding TP-Service state.

Predicate expressions are noted in the form of a list of variable values and/or predicates separated by commas.

"^" means "not", and is applied to variables of type Boolean and to Predicates.

"=" means "equal to", and is applied to variables of type Integer and Octet String.

"^=" means "not equal to", and is applied to variables of type Integer and Octet String.

">" means "greater than", and is applied to variables of type Integer.

A.2.8 Conventions

In the state tables, the intersection of an incoming event (row) and a state (column) forms a cell.

A subcell is a subset of a cell enclosed in a box.

The elements of a subcell are the following (given in their order of appearance in the subcell):

a) optionally, a predicate expression;

b) zero or more actions; and

c) a resultant state.

When a predicate expression holds for all the subcells of a same column, it is indicated at the top of the column, and not repeated in the subcells of that column.

A blank cell, a non-existent cell for an event, or a cell with no subcells for which the evaluation of the predicate expressions is true, represents an invalid event (see A.2.9.3) for that state.

A cell with a subcell for which the evaluation of the predicate expressions is true, represents a valid event (see A.2.9.2) for that state.

Predicate expressions in a cell are such that only one or zero subcells in a cell applies.

When a service primitive contains parenthetical arguments, these are as described in 9.2, 10.3, and 11.2, augmented by the following additional arguments:

a) a service parameter (left argument) and its value (right argument), separated by an equals sign (=);

b) the words "transaction branch" and "no transaction branch", which indicate that the TP-BEGIN-DIALOGUE request has been specified with the Chained Transactions functional unit selected or with the Begin-Transaction parameter set to "true", or with the Begin-Transaction parameter either absent or set to "false", respectively;

c) the words "one-way-recovery" or "two-way-recovery", which indicate the value of the Channel-Utilization parameter;

d) the name of a functional unit selected on the dialogue or the channel, followed by the words “fu selected”;

e) the words “sync-minor”, which indicate the Session token value.

These arguments may appear in any location inside the parentheses.

A.2.9 Processing of events

A.2.9.1 Evaluating predicate expressions

An event is processed by evaluating predicate expressions in all the subcells of the cell for the current state. If any subcell’s predicate expression evaluates true (e.g. “^Aw, Ldres” is the predicate expression and Aw is FALSE and Ldres is TRUE), or no predicate expression exists for the subcell, the event is valid for the event/state combination, and the actions are taken and the transition made.

The evaluation of predicate expressions does not have any side effect; in particular, local decision variables retain their value during the evaluation of predicate expressions appearing in subcells of a same cell.

A.2.9.2 Processing valid events

For valid events, if the predicate expression (if any) is true, the following actions are taken:

a) the state machine performs the actions (if any) as shown in the cell; and

b) the state is changed to the specified resultant state (see also A.3, “Processing Rules”, for additional rules in processing valid events).

A.2.9.3 Processing invalid events

Depending on the nature of the input events or state machine incoming events, one of the following actions is taken:

a) if the input event corresponds to the receipt of an invalid OSI TP Service primitive from the TPSUI, either an internal error or node crash is triggered, depending on a local decision as described in 7.1.6; or

b) if the state machine incoming event corresponds to receipt an invalid APDU from the partner TPPM, a protocol error is triggered as described in 7.1.6.

A.3 Processing rules

The following rules complement the rules of normal processing of events described in A.2.9:

a) *Atomicity*

An input event is processed completely before any other input event is accepted. This means that any outgoing events created by actions that are state machine incoming events to other state machines are processed by those state machines, and so on, until the only unprocessed events are outgoing events which are not state machine incoming events (that is, they are events at the PSAP or TPSUI).

When processing a given input event, state machines may either execute in parallel provided exclusive access to variables which are shared between state machines is maintained, or they shall be executed serially.

b) *Routeing*

When a service primitive received from the separator contains a TP APDU as user-data (or User Information in the case of ACSE), the service primitive becomes an event to the TPASE state machine.

When a service primitive received from the separator does not contain a TP APDU as user-data (or User Information in the case of ACSE), the service primitive becomes an event to the SACF state machine.

c) *Service conditions assumption*

The TPSUI is assumed to have issued requests and responses in accordance with the TPSUI conditions specified in ISO/IEC 10026-2.

NOTE 1 – The state tables enforce the TPSUI constraints as specified in ISO/IEC 10026-2.

d) *Context mechanism*

When a subcell is executed, the actions taken by the subcell are related either to the dialogue, if attached, or the channel if no dialogue is available and a channel is attached. In some cases, there is both a dialogue and a channel or two channels attached during a single action sequence. A context mechanism is provided to identify whether the actions should occur on the dialogue or on the previously existing channel. This mechanism is implemented by the actions DIALOGUE and OLDCHANNEL. If actions include the detaching of a channel, the subsequent actions will be taken on the remaining channel. This context switching mechanism works only within a single subcell.

e) *Channel assignment*

When a CAF-PLEASE request is issued by a TPPM state machine, a CPM state machine which can accept the event is either created in state 1 or found in another state if the AE-title of the channel is the same as the AE-Title parameter of the CAF-PLEASE request.

f) *Counting mechanism*

For all conditions that depend on a certain number of events occuring, a counting mechanism is used. The counter is set to the number of events which must occur to cause the node transition. Each time an event which is to be counted occurs, the counter is decremented. When the counter becomes zero, the one-time actions associated with the node are done by the state machine in which the counter becomes zero (see COUNTRDY, COUNTCOM, and COUNTRB). These one-time actions include generation of the appropriate synchronizing events.

NOTE 2 – For example, when an intermediate node is to complete phase I of commitment, a C-READY indication must have been received on each subordinate branch and a TP-COMMIT request must have been received on each branch of the node. When the last of these events occur, the "Enter-ready" synchronizing event is generated, requesting the superior branch to issue the C-READY request. The counter would be set to the number of subordinate branches (for the C-READY indications) plus the total number of branches (for the TP-COMMIT requests).

The counting mechanism is used in the following three cases:

a) counting the events necessary to complete the first phase of commitment. These events are:

1) a C-READY indication for each subordinate branch; and

2) a TP-COMMIT request for each branch;

b) counting the events necessary to complete the second phase of commitment. These events are:

1) a *commit confirm* for each subordinate branch; and

2) a TP-DONE request for each branch;

c) counting the events necessary to complete the rollback. These events are:

1) a *rollback confirm* for each subordinate branch (except the subordinate branch from which a *rollback indication* has been received, if any); and

2) a TP-DONE request for each branch.

g) *Parameter inheritance*

As in the main text, the definition of parameter inheritance [see 7.2 a)] applies to the actions in this annex.

A.4 MACF state tables

A.4.1 MACF states

A.4.1.1 TPPM states

States are numbered with the following conventions:

a) the integer part of the state numbers corresponds to the state defined in 10026-2;

b) states 2 through 8 and states 12 through 14 correspond to a node handling either an application supported transaction or a provider supported transaction in the ACTIVE state;

c) states 9 through 11 are specific to a node handling an application supported transaction;

d) states 15 through 20.2 are specific to a node handling a provider supported transaction in the ACTIVE state;

e) state 20.3 corresponds to a transaction node in the READY state;

f) states 21.x correspond to a transaction node in the DECIDED (commit) state; and

g) states 23.x correspond to a transaction node in the DECIDED (rollback) state;

The following states are defined for the TPPM:

State 1

Idle state. No dialogue exists.

State 1.1

An AF-BEGIN-DIALOGUE indication has been received and the dialogue will have a coordination level of commitment. A C-BEGIN indication is awaited.

State 2

The TPSUI has control of the dialogue.

State 3

This state is valid only when the Polarized Control functional unit is selected. The dialogue is established and the TPSUI does not have control of the dialogue.

State 4

An AF-U-ERROR request was issued with the Shared Control functional unit selected or an AF-U-ERROR request was issued while the TPSUI did not have control of the dialogue.

State 5

This state is valid only when the Polarized Control functional unit is selected. The dialogue is established, the TPSUI has control of the dialogue, and an AF-U-ERROR indication has been received.

State 6

An AF-HANDSHAKE request has been issued. An AF-HANDSHAKE confirm is awaited.

State 7

An AF-HANDSHAKE indication has been received. A TP-HANDSHAKE response is awaited.

State 8

This state is valid only when both the Handshake and the Shared Control functional units are selected. An AF-HANDSHAKE indication has been received after an AF-HANDSHAKE request has been issued, or an AF-HANDSHAKE request has been issued after an AF-HANDSHAKE indication has been received.

State 9

This state is valid only when both the Handshake and the Shared Control functional units are selected. An AF-END-DIALOGUE (*confirmation* = TRUE) indication has been received after an AF-HANDSHAKE request has been issued.

State 10

This state is valid only when both the Handshake and the Shared Control functional units are selected. An AF-HANDSHAKE indication has been received after an AF-END-DIALOGUE (*confirmation* = TRUE) request has been issued.

State 11

An AF-END-DIALOGUE (*confirmation* = TRUE) request has been issued. An AF-END-DIALOGUE confirm is awaited.

State 12

An AF-END-DIALOGUE (*confirmation* = TRUE) indication has been received. A TP-END-DIALOGUE response is awaited.

State 13

An AF-HANDSHAKE-AND-GRANT-CONTROL request has been issued. An AF-HANDSHAKE-AND-GRANT-CONTROL confirm is awaited.

State 14

An AF-HANDSHAKE-AND-GRANT-CONTROL indication has been received. A TP-HANDSHAKE-AND-GRANT-CONTROL response is awaited.

State 15

This state is valid only for a dialogue with a subordinate. A TP-PREPARE request has been issued. A C-READY indication is awaited.

State 17

This state is valid only for a dialogue with a subordinate. A C-READY indication has been received. A TP-COMMIT request is awaited.

State 18

This state is valid only for the dialogue with the superior. An AF-PREPARE indication has been received. A TP-COMMIT request is awaited.

State 20.1

This state is valid only for a dialogue with a subordinate. A TP-COMMIT request has been received. A C-READY indication is awaited.

State 20.2

A TP-COMMIT request and a C-READY indication have been received. Synchronizing events “Continue-commit” (if a root node) or “Enter-ready” (if intermediate or leaf nodes) are awaited.

State 20.3

This state is valid only for an intermediate or a leaf node. The node is in the READY state. Synchronizing event “Enter-ready” has been received. A *commit indication* is awaited on the dialogue with the superior. Synchronizing event “Continue-commit” is awaited on dialogues with subordinates. Recovery may be in progress on dialogues with subordinates.

State 21.1

This state is valid only for a dialogue with a subordinate. A commit request has been issued. A *commit confirm* is awaited.

State 21.2

This state is valid only for a dialogue with a subordinate. A *commit confirm* is awaited. The next branch will not be rolled back if a C-COMMIT confirm or an AF-HEURISTIC-REPORT (commitRC) indication is received.

NOTE – An AF-ABORT (commitRC) indication is received only if the Unchained Transactions functional unit is selected.

State 21.3

This state is valid only for a dialogue with a subordinate that is chaining. A *commit confirm* has been received. Synchronizing event “Complete-commit” is awaited.

State 21.4

This state is valid only for a dialogue with a subordinate that is chaining. A *commit confirm* has been received. Rollback has been initiated on this branch. Synchronizing event “Complete-commit” is awaited.

State 21.5

This state is valid only for the dialogue with the superior. Synchronizing event "Complete-commit" is awaited.

State 21.6

This state is valid only for the dialogue with the superior that is chaining. The next branch will be rolled back. Synchronizing event "Complete-commit" is awaited if the association has not aborted.

State 23.1

This state is valid only for a dialogue with a subordinate. A *rollback request* has been issued. A rollback confirm is awaited.

State 23.2

This state is valid only for a dialogue with a subordinate. A *rollback indication* or a *rollback confirm* has been received. Synchronizing events "Report-rollback" or "Complete-rollback" are awaited.

State 23.3

This state is valid only for the dialogue with the superior. A TP-ROLLBACK request, Internal event "Rollback-by TPPM", or synchronizing event "Rollback-all" has been received. Synchronizing event "Report-rollback" is awaited.

State 23.4

This state is valid only for the dialogue with the superior. A *rollback indication* has been received. Synchronizing event "Report-rollback" is awaited.

State 23.5

This state is valid only for the dialogue with the superior. A rollback report has been issued to the superior. A *rollback confirm* or synchronizing event "Complete-rollback" is awaited.

State 23.6

This state is valid only for the dialogue with the superior. A rollback report has been issued to the superior, and confirmation has been received. The dialogue with the superior *is available for the next transaction*. A C-BEGIN indication or synchronizing event "Complete-rollback" is awaited.

State 23.7

This state is valid only for the dialogue with the superior. A rollback report has been issued to the superior, and confirmation has been received. The dialogue with the superior *is not available for the next transaction*. A TP-DONE request or synchronizing event "Complete-rollback" is awaited.

State 23.8

This state is valid only for the dialogue with the superior. The dialogue with the superior has failed and the conditions for reporting rollback have not been fulfilled. The synchronizing event "Complete-rollback" is awaited.

State 25

This state is valid for a dialogue with a subordinate. This dialogue, having a coordination level of "commitment", has been terminated during the active state of the transaction without causing a rollback. This "zombie" dialogue will participate in the termination of the transaction.

State 99

On the dialogue with the superior, the TPPM is in the READY state. A CAF-PLEASE request has been issued. A CAF-GIVE indication is awaited.

On a dialogue with a subordinate, the TPPM is in the DECIDED (commit) state. A CAF-PLEASE request has been issued. A CAF-GIVE indication is awaited.

A.4.1.2 CPM states

State 1

Idle state. No channel exists.

State 2

The channel is free and may be allocated to a TPPM. For a one-way-recovery channel, the channel was initiated by this CPM and the AF-BEGIN-DIALOGUE (accepted) confirm has been received. For a two-way-recovery channel, the token is owned (unless the token will arrive as part of the channel establishment procedures managed by the SACF).

State 3

The channel is not free and must not be allocated to a TPPM. For a one-way-recovery channel, the channel was not initiated by this CPM. For a two-way-recovery channel, the token is not owned (and is not expected to arrive as part of the channel establishment procedures managed by the SACF).

State 4

The channel is temporarily owned by a TPPM.

State 5

The channel is established in the two-way-recovery mode and the token is awaited to perform recovery.

State 6

A channel is being established. An AF-BEGIN-DIALOGUE confirm is awaited.

State 7

The channel has been detached by the TPPM while C-RECOVER (ready) request was outstanding.

A.4.2 MACF variables

A.4.2.1 Overview

Six categories of variables are defined for MACF:

a) variables that pertain to a dialogue. These variables are created at dialogue establishment time, and are destroyed at dialogue termination time, unless otherwise specified. Dialogue variables are prefixed by the letter “D”. They are listed in Table A.1;

b) variables that pertain to a channel. Channel variables are prefixed by the letter “C”. They are listed in Table A.2;

c) variables that pertain to a node. These variables are created at establishment time of the first dialogue that includes the node as part of the dialogue tree and are destroyed at termination time of the last dialogue, unless otherwise specified. Node variables are prefixed by the letter “N”. They are listed in Table A.3;

d) variables that model open system data. System variables are prefixed by the letter “S”. They are listed in Table A.4;

e) variables that model a decision local to the node, when there is a choice for the TPPM. Local decision variables are prefixed by the letter “L”. Local decision variables reflect a local decision made at the time of reference of the value of the variable. Therefore, the values of these variables are determined newly each time they are referenced. Local decision variables are listed in Table A.5; and

f) variables that are owned by SACF and shared with MACF when MACF is attached to the association. These variables are listed in Table A.6.

TABLE A.1/X.862

Dialogue variables

Name	Meaning
Da	dialogue establishment **a**ccepted
Dah	dialogue establishment **a**ccepted and **h**eld
Danyb	**a**n**y** a**b**ort received
Db	dialogue a**b**orted and not available
Dbcr	C-**B**EGIN **c**onfirm **r**eceived
Dbegdi	AF-**B**EGIN-**D**IALOGUE **i**ndication
Dbpart	a**b**ort issued to/received from **part**ner
Dbrid	current **br**anch **id**entifier
Dbridn	**br**anch **id**entifier for **n**ext transaction
Dc	**c**ontrol
Dch	**ch**aining dialogue with a subordinate
Dchat	**ch**annel **at**tached
Dcr	**c**onfirmation **r**equested
Dd	TP-**D**ONE request owed
Ddef	AF-**DEF**ER to be sent on prepare
Ddp	**d**ata **p**ermitted (polarized control mode)
De	defer **e**nd-dialogue
Denb	**n**um**b**er of outstanding TP-U-**E**RROR requests
Denbb	**n**um**b**er of outstanding TP-U-**E**RROR requests **b**efore TP-BEGIN-TRANSACTION request
Depnb	AF-U-**E**RROR res**p**onses **n**um**b**er
Dfdone	**f**irst TP-**DONE** request received
Dg	defer **g**rant-control
Dh	**H**andshake functional unit
Dl	coordination **l**evel
Dps	**p**repare **s**ent
Drbrep	**r**oll**b**ack **rep**orted to superior
Drvyp	**r**eco**v**er**y** pending
Dsh	**Sh**ared Control functional unit
Dsup	dialogue with **sup**erior
Dtb	a**b**ort received from **T**PSUI
Du	**U**nchained Transactions functional unit
Dx	transaction e**x**tended

TABLE A.2/X.862

Channel variables

Name	Meaning
Caaid	**a**tomic-**a**ction **id**entifier
Cbrid	atomic-action-**br**anch **id**entifier
Cinit	channel **init**iator

TABLE A.3/X.862

Node variables

Name	Meaning
Naaid	current **a**tomic-**a**ction **id**entifier
Naaidn	**a**tomic-**a**ction **id**entifier for **n**ext transaction
Nbrid	superior **br**anch **id**entifier
Nbridn	superior **br**anch **id**entifier for **n**ext transaction
Nch	**ch**aining dialogue with the superior
Ncnt	**c**ou**nt** of events
Ncr	**c**onfirmation **r**equested with superior
Nfa	**f**ailure **a**ctions allowed
Nfrb	**f**irst **r**oll**b**ack request
Ni	**i**ntermediate node
Nlf	**l**ea**f** node
Np	**p**repare indication received
Nr	**r**oot node
Nrn	**r**eject **n**ot allowed
Nrpend	**r**ollback **pend**ing
Nsubnb	**sub**ordinate **n**um**b**er
Nt	transaction **t**ermination
Ntpsui	**TPSUI** created

TABLE A.4/X.862

System variables

Name	Meaning
SldD	**l**og-**d**amage **d**ata
SlhD	**l**og-**h**euristic **d**ata
SnD	**n**ode **d**ata

TABLE A.5/X.862

MACF local decisions variables

Name	Meaning
Lddef	**d**ecision to delay AF-**DEF**ER request
Ldfail	**l**ocal **fail**ure in writing a log record
Ldperm	**d**ecision of **perm**anent failure
Ldrej	**d**ecision to **rej**ect the dialogue
Ldretry	**d**ecision to **retry**
Ldretryo	**d**ecision to **retry** on the **o**ld channel
Ldt	**d**ecision to **t**erminate the channel
Ldtwr	**d**ecision to have **t**wo-**w**ay-**r**ecovery
Ldunk	**d**ecision to reject, recipient **unk**nown

TABLE A.6/X.862

Shared variables with SACF

Name	Meaning
Arrh	**r**eceived **r**ecovery-context-**h**andle
Atokx	**tok**en e**x**pected
Atppm	attached to a **TPPM**
Atwr	**t**wo-**w**ay-**r**ecovery

A.4.2.2 Definitions of MACF types

Certain MACF variables contain sets of data which are structured into record types. These types are defined here. They are referred to only in A.4.2.3 which defines the MACF variables. Each type definition may be used as a set. Therefore, the type definition specifies the field(s) that uniquely identify the member of the set.

When a variable refers to a type definition, a field in the variable is referenced by the name of the variable, the value of the identifier field(s) in parenthesis (if the type is used as a set), a period, and the name of the field in the type definition.

NOTE – For example, suppose sbbr is a set of Tbranch. To reference the rch field for a branch with the brid of Dbrid, specify “sbbr (Dbrid).rch”.

Tbranch (branch): Tbranch is a record which contains all necessary information about a single transaction branch (which could be to the superior or a subordinate). This record contains the following fields:

brid: Contains the branch identifier for the specified branch.

aet: Contains the peer AE-title, if the branch is to a subordinate.

rch: Contains the peer partner recovery-context-handle for the branch, if provided.

The brid field identifies the record.

Tnode (node record): Tnode is a record which contains all of the information required for a node record. Tnode applies to any type of node record. This record contains the following fields:

aaid: Contains the atomic action identifier.

spbr: Contains a Tbranch record for the superior.

type: Contains the type of log record. Possible values are “heuristic-hazard”, “heuristic-mixed”, “heuristic-initial”, “heuristic-final”, “log-commit”, “log-ready”, or NULL.

sbbr: Contains a set of Tbranch records, one for each subordinate.

The aaid and spbr fields identify the record.

A.4.2.3 Definitions of MACF variables

The following variables are defined for the MACF state table. MACF variables are Boolean variables, unless otherwise specified.

Caaid (**a**tomic-**a**ction **id**entifier on channel): The value of Caaid indicates the atomic-action identifier used for recovery of the branch on the channel.

Cbrid (atomic-action-**br**anch **id**entifier on channel): The value of Cbrid indicates the atomic-action-branch identifier used for recovery of the branch on the channel.

Cinit (channel **init**iator): Set to TRUE when the channel is initiated by the CPM.

Da (dialogue establishment **a**ccepted): When related to a dialogue with the superior and set to TRUE, Da indicates that a first request or response has been issued to the superior. When related to a dialogue with a subordinate and set to TRUE, Da indicates that a first indication or confirm has been received.

Dah (dialogue establishment **a**ccepted and **h**eld): When set to TRUE, Dah indicates that a TP-BEGIN-DIALOGUE (accepted) response has been issued in the DECIDED (rollback) state, but its propagation has not occured yet, because a TP-DONE request is awaited.

Danyb (**any** a**b**ort received): When set to TRUE, Danyb indicates that the dialogue has been or will be detached, or that the SAO is no longer attached (an SAF-ASSOCIATION-LOST indication has been received, or an SAF-DETACH-ASSOCIATION request has been issued). Danyb is true when Db, Dbpart, or Dtb is true.

Db (dialogue a**b**orted and not available): When set to TRUE, Db indicates that the dialogue has been detached. Db is true when an SAF-DETACH-ASSOCIATION request has been issued or an SAF-ASSOCIATION-LOST indication has been received. Only one of Db, Dtb, or Dbpart may be true.

Dbcr (C-**B**egin **c**onfirm **r**eceived): When set to TRUE, Dbcr indicates that a C-BEGIN confirm has been received. Dbcr is used to check the validity of an AF-END-DIALOGUE indication and an AF-ABORT indication when the Unchained Transactions functional unit is selected.

Dbegdi (AF-**BEG**IN-**DI**ALOGUE indication): Dbegdi is used to save the AF-BEGIN-DIALOGUE indication so that the parameters from this indication are available when a TP-BEGIN-DIALOGUE indication is issued after the C-BEGIN indication arrives.

Dbpart (a**b**ort issued to/received from **part**ner): When set to TRUE, Dbpart indicates that an AF-ABORT (user) request/indication or an AF-ABORT-AND-HEURISTIC-REPORT request/indication has been issued to or received from the partner TPPM. Only one of Db, Dtb, or Dbpart may be true.

In the case of commitment Dbpart is used to detect protocol errors. In the case of rollback Dbpart is used to repeat the abort if necessary in the event of a rollback collision.

Dbrid (current **br**anch **id**entifier): The value of Dbrid indicates the atomic-action-branch identifier to a subordinate for the current transaction.

Dbridn (**br**anch **id**entifier for **n**ext transaction): The value of Dbridn indicates the atomic-action-branch identifier for the next transaction.

Dc (**c**ontrol): When set to TRUE, Dc indicates that the TPSUI had control at the beginning of the transaction branch. Dc denotes which TPSUI will acquire the control of the dialogue, upon completion of rollback, should rollback occur.

Dch (**ch**aining dialogue with a subordinate): When set to TRUE, Dch indicates that the dialogue *is chaining*.

Dchat (**ch**annel **at**tached): When set to TRUE, Dchat indicates that a channel is attached to the TPPM for recovery of a particular branch.

Dcr (**c**onfirmation **r**equested): When set to TRUE, Dcr denotes on a dialogue with a subordinate that the TPPM has received a TP-BEGIN-DIALOGUE (*confirmation* = "always") request and has not yet received an AF-BEGIN-DIALOGUE confirm.

Dd (TP-**D**ONE request owed): When set to TRUE, Dd indicates that a *TP-DONE request is owed*. When set to FALSE, Dd indicates that a *TP-DONE request is not owed* by the TPSUI.

Ddef (AF-**DEF**ER to be sent on prepare): When set to TRUE, an AF-DEFER request is to be issued when the AF-PREPARE request is issued. The type of the AF-DEFER request is determined by the values of De and Dg. When set to FALSE, no AF-DEFER request is issued when the AF-PREPARE request is issued.

Ddp (**d**ata **p**ermitted): When set to TRUE and if the Polarized Control functional unit is selected, Ddp indicates that a TP-DATA indication may be received by the superior TPSUI, after it has issued a TP-PREPARE request.

De (defer **e**nd-dialogue): When set to TRUE, De indicates that either an AF-DEFER (end-dialogue) request has been issued or an AF-DEFER (end-dialogue) indication has been received.

Denb (**n**um**b**er of outstanding TP-U-**E**RROR requests): Denb is a variable of type Integer, used in shared control mode only. Denb indicates the number of outstanding TP-U-ERROR requests.

Denb is incremented by 1 upon issuance of a TP-U-ERROR request. Denb is decremented by 1 upon receipt of an AF-U-ERROR confirm, AF-HANDSHAKE indication, or AF-END-DIALOGUE (*confirmation* = TRUE) indication. Denb is set to zero upon occurrence of a rollback.

Denbb (**n**um**b**er of outstanding TP-U-**E**RROR requests **b**efore TP-BEGIN-TRANSACTION requests): Denbb is a variable of type Integer, used in shared control mode and Unchained Transactions only.

Denbb indicates the number of TP-U-ERROR requests that were outstanding when the TP-BEGIN-TRANSACTION request was received. Denbb is set to the value of Denb when a TP-BEGIN-TRANSACTION request is received. Denbb is decremented whenever Denb is decremented.

Depnb (AF-U-**E**RROR res**p**onse **n**um**b**er): Depnb is a variable of type Integer, used in shared control mode only. Depnb indicates the number of TP-U-ERROR responses that shall be issued after an AF-BEGIN-DIALOGUE response is issued.

Dfdone (**f**irst TP-**DONE** request received): When set to TRUE, Dfdone indicates that the first TP-DONE request after TP-COMMIT indication or after a rollback initiating indication has been received. When set to FALSE, Dfdone indicates that a TP-DONE request with a heuristic-report parameter may be received, subject to the value of Dd.

Dg (defer **g**rant-control): When set to TRUE, Dg indicates that either an AF-DEFER (grant-control) request has been issued or an AF-DEFER (grant-control) indication has been received.

Dh (**H**andshake functional unit): When set to TRUE, Dh indicates that the Handshake functional unit is selected.

Dl (coordination **l**evel): Dl reflects the value of the coordination level. When set to TRUE, Dl indicates that the coordination level is “commitment”; when set to FALSE, Dl indicates that the coordination level is “none”.

Dps (**p**repare **s**ent): Dps is set to TRUE after an AF-PREPARE request is received. It is used for subordinate dialogues only.

Drbrep (**r**oll**b**ack **rep**orted to superior): When set to TRUE, Drbrep indicates that rollback has been reported to the superior. Drbrep is used by all transaction branches to avoid resetting Ncnt once rollback has been reported to the superior and a TP-DONE request becomes owed.

Drvyp (**r**eco**v**er**y** **p**ending): When set to TRUE, Drvyp enables the occurrence of internal event “Retry-recovery” for that branch.

Dsh (**Sh**ared Control functional unit): When set to TRUE, Dsh indicates that the Shared Control functional unit is selected. When set to FALSE, Dsh indicates that the Polarized Control functional unit is selected.

Dsup (dialogue with **sup**erior): When set to TRUE Dsup indicates that the dialogue or transaction branch is with the superior.

Dtb (a**b**ort received from **T**PSUI): When set to TRUE, Dtb indicates that the TPSUI has issued a TP-U-ABORT request, but the issuance of the AF-Service has not yet occurred. Once the AF-ABORT request has been issued or an AF-ABORT indication is received, Dtb is set to FALSE, and Db or Dbpart is set as appropriate. Only one of Db, Dtb or Dbpart may be true.

Du (**U**nchained Transactions functional unit): When set to TRUE, Du indicates that the Unchained Transactions functional unit is selected.

Dx (transaction e**x**tended): Dx is a variable of type Boolean which is set to TRUE when a TP-BEGIN-TRANSACTION request is received and is set to FALSE when a C-BEGIN confirm is received. Dx is used to determine if an AF-END-DIALOGUE indication or an AF-ABORT (user, dataRI) indication is valid for a subordinate dialogue with a coordination level “none”.

Lddef (**d**ecision to delay AF-**DEF**ER request): When set to TRUE, an AF-DEFER request will be issued when an AF-PREPARE request is issued. When set to FALSE, an AF-DEFER request is issued immediately.

Ldfail (**l**ocal **fail**ure in writing a log record): When set to TRUE, Ldfail indicates that the TPPM cannot write a log record or set the bound data to the proper state.

Ldperm (**d**ecision of **perm**anent failure): When set to TRUE, Ldperm indicates that the *diagnostic* parameter shall be set to "permanent-failure". When set to FALSE, Ldperm indicates that the *diagnostic* parameter shall be set to "transient-failure".

Ldrej (**d**ecision to **rej**ect the dialogue): When set to TRUE, Ldrej indicates that the TPPM takes a local decision to reject the dialogue establishment.

NOTE 1 – This definition applies to both the initiator side (local reject) and responder side.

Ldretry (**d**ecision to **retry**): When set to TRUE, Ldretry indicates:

a) for a TPPM that it may issue a C-RECOVER (retry-later) response when, either the transaction outcome is not yet known to respond to a CAF-RECOVER (ready) indication, or when all commit confirms have not yet been received to respond to a CAF-RECOVER (commit) indication; and

b) for a CPM that it may issue a C-RECOVER (retry-later) response when the value of the recovery-context-handle does not allow it to determine if a TPPM can be found.

Ldretryo (**d**ecision to **retry** on the **o**ld channel): When set to TRUE, Ldretryo indicates that a C-RECOVER (retry-later) rsp will be sent on the old channel. Since this variable is used in conjunction with Ldretry in cases where at least one C-RECOVER (retry-later) response shall be sent, this variable shall not be set to FALSE if Ldretry is set to FALSE in the same subcell.

Ldt (**d**ecision to **t**erminate the channel): When set to TRUE, Ldt indicates that channel utilization is to be terminated.

Ldtwr (**d**ecision to have **t**wo-**w**ay-**r**ecovery): When set to TRUE, Ldtwr indicates that the channel shall be established in the two-way-recovery mode. When set to FALSE, Ldtwr indicates that the channel shall be established in the one-way-recovery mode.

Ldunk (**d**ecision to reject, recipient **unk**nown): When set to TRUE, Ldunk indicates that the dialogue is to be rejected because an association could not be established and the diagnostic parameter to be issued on the TP-BEGIN-DIALOGUE confirm is to be "recipient-unknown". When set to FALSE, the dialogue is rejected for other reasons and the diagnostic parameter of the TP-BEGIN-DIALOGUE confirm is "no-reason-given".

Naaid (current-**a**tomic **a**ction **id**entifier): The value of Naaid indicates the atomic action identifier for the current transaction.

Naaidn (**a**tomic-**a**ction **id**entifier for **n**ext transaction): The value of Naaidn indicates the atomic action identifier for the next transaction.

Nbrid (superior **br**anch **id**entifier): The value of Nbrid indicates the atomic-action-branch identifier to the superior.

Nbridn (superior **br**anch **id**entifier for **n**ext transaction): The value of Nbridn indicates the atomic-action-branch identifier to the superior for the next transaction.

Nch (**ch**aining dialogue with the superior): When set to TRUE, Nch indicates that the dialogue with the superior *is chaining.*

Ncnt (**c**ou**nt** of events): The number of events that must occur before the next node state transition can occur. Ncnt is decremented for each relevant event [see A.3, rule f), counting mechanism].

Ncr (**c**onfirmation **r**equested with the superior): When set to TRUE, Ncr indicates that a dialogue establishment indication is outstanding on the dialogue with the superior and therefore that a TP-BEGIN-DIALOGUE response is awaited.

Nfa (**f**ailure **a**ctions allowed): When set to TRUE, Nfa indicates that TP-U-ABORT requests are authorized during transaction termination.

Nfrb (**f**irst **r**oll**b**ack): Used to determine that a TP-ROLLBACK request or TPPM initiated rollback request is processed so specific actions may be taken only once. Set to TRUE when a TP-ROLLBACK request or TPPM initiated rollback request is received by the first branch state machine.

Ni (**i**ntermediate node): When set to TRUE, Ni indicates that the node is an intermediate node of the transaction tree.

Nlf (**l**ea**f** node): When set to TRUE, Nlf indicates that the node is a leaf node of the transaction tree.

Np (**p**repare indication received): When set to TRUE, Np means that an AF-PREPARE indication is received from the superior.

Nr (**r**oot node): When set to TRUE, Nr indicates that the node is the root node of the transaction tree.

Nrn (**r**eject **n**ot allowed): When set to TRUE, Nrn denotes that the TPSUI has issued a request or response on any dialogue, and thus indicates that the dialogue with the superior can no longer be rejected.

Nrpend (**r**ollback **pend**ing): When set to TRUE, Nrpend indicates that the synchronizing event "Rollback-next-trans" has been received.

Nsubnb (**sub**ordinate **n**um**b**er): Nsubnb is a variable of type Integer. Nsubnb indicates the number of subordinates.

Nt (transaction **t**ermination): When set to TRUE, Nt indicates that the transaction branch has entered the termination phase, and that the transaction tree can no longer grow.

Ntpsui (**TPSUI** created): When set to TRUE, Ntpsui indicates that the TPSUI corresponding to the TPPM has been created.

SldD (**l**og-**d**amage-**d**ata): SldD is a variable of type Set Of Tnode. SldD represents the set of log-damage records that are kept by an open system for appropriate heuristic reporting.

NOTE 2 – To reference the value of the log record for a member of this set with an "aaid" value of Naaid and an "spbr" value of Nbrid, specify "SldD (Naaid, Nbrid).type".

SlhD (**l**og-**h**euristic **d**ata): SlhD is a variable of type Set Of Tnode. SlhD represents the set of log-heuristic records that are kept by an open system for appropriate heuristic reporting.

NOTE 3 – To reference the value of the log record for a member of this set with an "aaid" value of Naaid and an "spbr" value of Nbrid, specify "SlhD (Naaid, Nbrid).type".

Snd (**n**ode **d**ata): SnD is a variable of type Set Of Tnode. SnD represents the system data attached to transactions that have been initiated and that are not yet complete.

NOTE 4 – To reference the value of the log record for a member of this set with an "aaid" value of Naaid and an "spbr" value of Nbrid, specify "SnD (Naaid, Nbrid).type". To reference the value of the "aei" field for a subordinate branch identified by Dbrid, specify "Snd (Naaid, Nbrid).sbbr (Dbrid).aei".

A.4.2.4 Initialization of MACF variables

MACF variables are initialized as follows:

Danyb and Db: Initialized to TRUE after a transaction node crash.

All other variables are initialized as follows:

a) variables of type Boolean are initialized to FALSE;

b) variables of type Integer are initialized to zero; and

c) variables of type Octet String are initialized to EMPTY.

A.4.3 MACF events

A.4.3.1 Internal events

The following internal events, defined for the MACF state table, occur within the scope of a single branch:

Delay-recovery: Abbreviation for "Delay Recovery" as defined in 11.4.1.

Internal error: Abbreviation for "Internal Error", as defined in 11.3.21, 11.3.22, and 11.3.23.

Protocol error: Abbreviation for "Protocol Error", as defined in 11.3.21, 11.3.22, and 11.3.23.

Retry-recovery: Abbreviation for "Retry Recovery", as defined in 11.4.4

Terminate-channel: Abbreviation for "Terminating a Channel", as defined in 11.4.6.

The following internal events, defined for the MACF state table, occur on all branches of a TPPM of a transaction tree:

Heuristic-damage-comp: Abbreviation for "Heuristic damage compensation for subtree", as defined in 11.4.2.

Heuristic-decision: Abbreviation for "Taking a Heuristic Decision" as defined in 11.4.5. Heuristic decision carries one parameter, called "heuristic-report", which can take the value of either "heuristic-final", "heuristic-initial", "heuristic-hazard", or "heuristic-mix".

Restart-TPPM: Abbreviation for "TPPM creation after node crash" as defined in 11.4.7.

Rollback-by-TPPM: Abbreviation for "TPPM initiated rollback" as defined in 11.4.8.

A.4.3.2 Synchronizing events

The following synchronizing events are defined for the MACF state table:

Complete-commit: This event is generated when commitment is completed at a node. When the superior receives this, it issues a *commit response*. When the subordinates see this, they complete the transaction.

Complete-rollback: This event is generated when rollback is complete and the next transaction may begin (if the Chained Transactions functional unit is selected on any dialogue). C-BEGIN request is sent on any dialogue with a subordinate that is available for the next transaction. Other branches involved in the rollback transaction are deleted from the transaction tree.

Continue-commit: "Continue-commit" is used by each dialogue with a subordinate to issue a *commit request*.

Enter-ready: This event is used by the dialogue to the superior to issue a C-READY request.

Report-rollback: This event is generated when all the conditions required to report the rollback to the superior are fulfilled. The dialogue to the superior uses this event to issue a *rollback response* or *rollback request* to the superior.

Rollback-all: This event is generated when a rollback occurs at a node. It is used by dialogues with subordinates to issue a *rollback request*.

Rollback-next-trans: This event is generated by a subordinate during commitment upon either receipt of A(-P)-ABORT indication, TP-U-ABORT request when a C-COMMIT+C-BEGIN indication has previously been received. All dialogues with subordinates must issue a *rollback request* if the *commit confirm* has been received.

Set-done-true: Indicates to all dialogues that a *TP-DONE request is* now *owed*. Each dialogue sets Dd to TRUE.

A.4.4 MACF actions

A.4.4.1 Functions

Variables which contain sets are manipulated by the functions decribed below. These functions are used to add and delete members of the set and to determine if a given member of a set exists.

addBranch (variable, brid): Adds a new member of a set of type Tbranch. The variable parameter specifies a variable (or field of a variable) which is a Set Of Tbranch. The brid parameter specifies the value of the "brid" field of Tbranch which identifies the branch in the set.

addNode (variable, aaid, spbrid): Adds a new member of a set of type Tnode. The variable parameter specifies a variable (or field of a variable) which is a Set Of Tnode. The aaid parameter specifies the value of the "aaid" field of Tnode, and the value of spbrid specifies the value of the "spbr.brid" field of Tnode. The aaid and the spbrid parameters identify the node record.

delBranch (A, X): Deletes a member of a set of type Tbranch. The variable parameter specifies a variable (or field of a variable) which is a Set Of Tbranch. The brid parameter specifies the value of the "brid" field of Tbranch which identifies the branch in the set.

delNode (variable, aaid, spbrid): Deletes a member of a set of type Tnode. The variable parameter specifies a variable (or field of a variable) which is a Set Of Tnode. The aaid parameter specifies the value of the "aaid" field of Tnode, and the value of spbrid specifies the value of the "spbr.brid" field of Tnode. The aaid and the spbrid parameters identify the node record.

memsb (variable, aaid, sbbrid): Determines if a node record in the specified variable exists which refers to the specified *atomic-action-identifier* and subordinate *atomic-action-branch-identifier*. The aaid parameter specifies the value of the "aaid" field of Tnode which identifies the node record in the set. The sbbrid parameter specifies the value of a "sbbr.brid" field which identifies a branch within the node record. If the specified record is found, TRUE is returned; otherwise, FALSE is returned.

memsp (variable, aaid, spbrid): Determines if a node record in the specified variable exists which refers to the specified *atomic-action-identifier* and superior *atomic-action-branch-identifier*. The aaid parameter specifies the value of the "aaid" field of Tnode which identifies the node record in the set. The spbrid parameter specifies the value of a "spbr.brid" field which identifies the branch with the superior within the node record. If the specified record is found, TRUE is returned; otherwise, FALSE is returned.

A.4.4.2 Actions on services

Table A.7 lists actions that issue service primitives. These actions are named according to the following convention:

First character

A	AF-
C	C- or CAF-
P	P-
S	SAF-
T	TP-
U	U-

Next characters

AB	ABORT
AHR	ABORT-AND-HEURISTIC-REPORT
ASE	ASE
BD	BEGIN-DIALOGUE
BE	BEGIN
BT	BEGIN-TRANSACTION
DE	DEFERRED (end-dialogue)
DET	DETACH
DG	DEFERRED (grant-control)
DT	DATA
ED	END-DIALOGUE
GC	GRANT-CONTROL
GIV	GIVE
HR	HEURISTIC-REPORT
HS	HANDSHAKE
HSGC	HANDSHAKE-AND-GRANT-CONTROL
PAB	P-ABORT
PL	PLEASE
RB	ROLLBACK
PR	PREPARE
RC	REQUEST-CONTROL
RE	RECOVER

RY READY

TOKG TOKEN-GIVE

TOKP TOKEN-PLEASE

UAB U-ABORT

UE U-ERROR

Service Primitive type

rq Request

i Indication

rs Response

c Confirm

Miscellaneous parameter values

A result = **A**ccepted

F confirmation = **F**alse

RU result = **R**ejected (**u**ser)

RP result = **R**ejected (**p**rovider)

SB **S**u**b**ordinate

SP **S**u**p**erior

X Inherited parameter value

TWR reason = **T**wo-**w**ay-**r**ecovery

Mapping parameter values

a abortRI

d dataRI

r rollbackRI

rbc rollbackRC

rd recoverDoneRC

c commitRI

crc commitRC

Source parameter

SAVE uses the parameters as specified in the service primitive contained in a variable

The remaining characters qualify the action in a manner specific to the service being issued.

NOTE – For example, TUABiR issues a TP-U-ABORT indication with the rollback parameter set to TRUE.

A.4.4.3 Actions on variables

For actions that manipulate MACF variables, the following conventions apply:

First character: V

The name of the variable being set begins at the second character.

The final characters are either:

DEC (decrement by one);

F (set to FALSE);

INC (increment by one);

SAVE (save the most recently received or issued specified service primitive in the specified variable); or

T (set to TRUE).

NOTE – An example is “VdaT”, for “set Da to TRUE”.

Superseded by a more recent version

TABLE A.7/X.862

MACF actions on services

Action name	Parameter settings/service primitive issued
AABrqPa	AF-ABORT (provider, abortRI) req on the dialogue
AABrqPrTR	– Set the *diagnostic* parameter to "begin-transaction-reject" AF-ABORT (provider, rollbackRI) req
AABrqUd	AF-ABORT (user, dataRI) req
AABrqUr	AF-ABORT (user, rollbackRI) req
AABrqUrbc	AF-ABORT (user, rollbackRC) req
ABDrq	AF-BEGIN-DIALOGUE (Dialogue fu selected) req
ABDrqRO	AF-BEGIN-DIALOGUE (Recovery fu selected, one-way-recovery) req
ABDrqRT	AF-BEGIN-DIALOGUE (Recovery fu selected, two-way-recovery) req
ABDrsAd	AF-BEGIN-DIALOGUE (accepted, dataRI) rsp
ABDrsArbc	AF-BEGIN-DIALOGUE (accepted, rollbackRC) rsp
ABDrsRPd	AF-BEGIN-DIALOGUE (rejected (provider), dataRI) rsp
ABDrsRUd	AF-BEGIN-DIALOGUE (rejected (user), dataRI) rsp
ABDrsRUr	AF-BEGIN-DALOGUE (rejected (user), rollbackRI) rsp
ABDrsRUrbc	AF-BEGIN-DIALOGUE (rejected (user), rollbackRC) rsp
ADErq	AF-DEFER (end-dialogue) req
ADGrq	AF-DEFER (grant-control) req
AEDrq	AF-END-DIALOGUE req
AEDrqF	AF-END-DIALOGUE (confirmation = FALSE) req
AEDrs	AF-END-DIALOGUE rsp
AGCrq	AF-GRANT-CONTROL req
AHRrqHrdC	– Set the *atomic-action-identifier* parameter to AAI – Set the *atomic-action-branch-identifier* parameter to BI – Set the *heuristic-report* parameter to SldD (AAI, BI).type AF-HEURISTIC-REPORT (recoverDoneRC) req
AHSrq	AF-HANDSHAKE req
AHSrs	AF-HANDSHAKE rsp
AHSGCrq	AF-HANDSHAKE-AND-GRANT-CONTROL req
AHSGCrs	AF-HANDSHAKE-AND-GRANT-CONTROL rsp
APRrq	AF-PREPARE req
ARCrq	AF-REQUEST-CONTROL req
ATOKGrqTWR	AF-TOKEN-GIVE (two-way-recovery) req
ATOKPrq	AF-TOKEN-PLEASE req
AUErq	AF-U-ERROR req
AUErs	AF-U-ERROR rsp
CAFDETrqCU	– Set the *type* parameter to "clean-up" CAF-DETACH req
CAFDETrqF	– Set the *type* parameter to "free" CAF-DETACH req
CAFDETrqNU	– Set the *type* parameter to "not-used" CAF-DETACH req
CAFFAILi	CAF-FAIL ind to the transaction branch identified by the *atomic-action-identifier* value of Caaid and the *atomic-action-branch-identifier* value of Cbrid
CAFGIVi	CAF-GIVE ind to the transaction branch identified by the *atomic-action-identifier* value of Caaid and the *atomic-action-branch-identifier* value of Cbrid
CAFPLrqSB	– Set the *AE-title* parameter to SnD (Naaid, Nbrid).sbbr (Dbrid).aet – Set the *atomic-action-identifier* parameter to Naaid – Set the *atomic-action-branch-identifier* parameter to Nbrid CAF-PLEASE req

TABLE A.7/X.862 *(cont.)*

MACF actions on services

Action name	Parameter settings/service primitive issued
CAFPLrqSP	– Set the *AE-title* parameter to the *AE-title* of the superior (extractable from Nbrid) – Set the *atomic-action-identifier* parameter to Naaid – Set the *atomic-action-branch-identifier* parameter to Nbrid CAF-PLEASE req
CAFREiC	CAF-RECOVER (commit) ind to the transaction branch identified by the *atomic-action-identifier* value of AAI and the *atomic-action-branch-identifier* value of BI
CAFREiR	CAF-RECOVER (ready) ind to the transaction branch identified by the *atomic-action-identifier* value of AAI and the *atomic-action-branch-identifier* value of BI
CBErq	– Set the *atomic-action-identifier* parameter to Naaid – Set the *atomic-action-branch-identifier* parameter to Dbrid C-BEGIN req
CRBrq	C-ROLLBACK req
CRBrs	C-ROLLBACK rsp
CRErsDC	– Set the *atomic-action-identifier* parameter to AAI – Set the *atomic-action-branch-identifier* parameter to BI C-RECOVER (done) rsp
CRErsRT	– Set the *atomic-action-identifier* parameter to Naaid – Set the *atomic-action-branch-identifier* parameter to Nbrid C-RECOVER (retry-later) rsp
CRErsRTC	– Set the *atomic-action-identifier* parameter to AAI – Set the *atomic-action-branch-identifier* parameter to BI C-RECOVER (retry-later) rsp
CRErsU	– Set the *atomic-action-identifier* parameter to AAI – Set the *atomic-action-branch-identifier* parameter to BI C-RECOVER (unknown) rsp
CRYrq	C-READY req
PTOKgrq	P-TOKEN-GIVE (sync-minor) req
SDETrqBF	SAF-DETACH-ASSOCIATION (begin-fear) req
SDETrqCB	SAF-DETACH-ASSOCIATION (begin-indication-expected) req
SDETrqF	SAF-DETACH-ASSOCIATION (free) req
SDETrqRB	SAF-DETACH-ASSOCIATION (rollback-indication-expected) req
SDETrqRBC	SAF-DETACH-ASSOCIATION (rollback-confirm-expected) req
TBDcRP	– Set the *rollback* parameter to FALSE – Set the *diagnostic* parameter to “no-reason-given” TP-BEGIN-DIALOGUE (reject (provider)) cnf
TBDcRPr	– Set the *rollback* parameter to TRUE – Set the *diagnostic* parameter to “no-reason-given” TP-BEGIN-DIALOGUE (reject (provider)) cnf
TBDcRPru	– Set the *rollback* parameter to TRUE – Set the *diagnostic* parameter to “recipient-unknown” TP-BEGIN-DIALOGUE (reject (provider)) cnf
TBDcRPu	– Set the *rollback* parameter to FALSE – Set the *diagnostic* parameter to “recipient-unknown” TP-BEGIN-DIALOGUE (reject (provider)) cnf
TBDcX	– Set the *rollback* parameter to FALSE TP-BEGIN-DIALOGUE cnf
TBDcXr	– Set the *rollback* parameter to TRUE TP-BEGIN-DIALOGUE cnf
TBDi	TP-BEGIN-DIALOGUE ind
TBDiSAVE	– Set the parameters to those in the AF-BEGIN-DIALOGUE ind saved in Dbegdi TP-BEGIN-DIALOGUE ind
TBTi	TP-BEGIN-TRANSACTION ind

TABLE A.7/X.862 *(end)*

MACF actions on services

Action name	Parameter settings/service primitive issued
TDEi	TP-DEFERRED-END-DIALOGUE ind
TDGi	TP-DEFERRED-GRANT-CONTROL ind
TDTi	TP-DATA ind
TEDc	TP-END-DIALOGUE cnf
TEDi	TP-GRANT-DIALOGUE ind
TGCi	TP-GRANT-CONTROL ind
THRi	TP-HEURISTIC-REPORT ind
THRiH	– Set the *heuristic-report* parameter = "heuristic-hazard" TP-HEURISTIC-REPORT ind
THSc	TP-HANDSHAKE cnf
THSi	TP-HANDSHAKE ind
THSGCc	TP-HANDSHAKE-AND-GRANT-CONTROL cnf
THSGCi	TP-HANDSHAKE-AND-GRANT-CONTROL ind
TPABi	– Set the *rollback* parameter to FALSE TP-P-ABORT ind
TPABiBTED	– Set the *rollback* parameter to FALSE – Set the *diagnostic* parameter to "begin-transaction-end-dialogue-collision" TP-P-ABORT ind
TPABiBTEDr	– Set the *rollback* parameter to TRUE – Set the *diagnostic* parameter to "begin-transaction-end-dialogue-collision" TP-P-ABORT ind
TPABiBTR	– Set the *rollback* parameter to FALSE – Set the *diagnostic* parameter to "begin-transaction-reject" TP-P-ABORT ind
TPABiED	– Set the *rollback* parameter to FALSE – Set the *diagnostic* parameter to "end-dialogue-collision" TP-P-ABORT ind
TPABiR	– Set the *rollback* parameter to TRUE TP-P-ABORT ind
TPRi	TP-PREPARE ind
TRBi	TP-ROLLBACK ind
TRCi	TP-REQUEST-CONTROL ind
TRYi	TP-READY ind
TUABi	– Set the *rollback* parameter to FALSE TP-U-ABORT ind
TUABiR	– Set the *rollback* parameter to TRUE TP-U-ABORT ind
TUEi	TP-U-ERROR ind
UASErq	U-ASE req

A.4.4.4 Actions with free-form names

[ABDET] (association **ab**orted or **det**ached)

Invoked when the association has been aborted or detached.

- set Db and Danyb to TRUE.
- set Dtb and Dbpart to FALSE.

[ABPTNR] (**ab**orted dialogue with **p**ar**tn**e**r**)

Invoked either when notification of a dialogue abort is received from or issued to the partner TPPM.

- set Dbpart and Danyb to TRUE.
- set Dtb to FALSE.

[ABTPSUI] (**ab**orted by **TPSUI**)

Invoked upon receipt of a TP-U-ABORT request from TPSUI.

- set Dtb and Danyb to TRUE.

[ADDBRSB] (**add br**anch **s**u**b**ordinate)

Invoked when a branch with a subordinate is added to a transaction. Adds one for the C-READY indication and one for the TP-COMMIT request.

- set Dl to TRUE.
- if ^Nr and ^Ni and ^Nlf,
  - set Nr to TRUE,
  - set Naaid to a new unique value,
  - set Nbrid to NULL,
  - addNode (SnD, Naaid, Nbrid).
- if Nlf,
  - set Nlf to FALSE,
  - set Ni to TRUE.
- add 2 to Ncnt.
- add one unit to Nsubnb.
- set Dc to TRUE.
- if ^Du,
  - set Dch to TRUE.
- set Dbrid to a new unique value.
- addBranch (SnD (Naaid, Nbrid).sbbr, Dbrid).
- set SnD (Naaid, Nbrid).sbbr (Dbrid).rch to Arrh.

[ADDBRSP] (**add br**anch **s**u**p**erior)

Invoked when a transaction is created upon indication from the superior. Sets the counter to account for a TP-COMMIT request.

- set Dl to TRUE.
- set Nlf to TRUE.
- set Ncnt to 1.
- set Naaid to the *atomic-action-identifier* parameter.
- set Nbrid to the *atomic-action-branch-identifier* parameter.
- addNode (SnD, Naaid, Nbrid).
- set SnD (Naaid, Nbrid).spbr.rch to Arrh.
- if ^Du,
  - set Nch to TRUE.
- if Da,
  - issue a C-BEGIN rsp.

[BEGTRANS] (TP-**BEG**IN-**TRANS**ACTION)

Invoked to flag that a TP-BEGIN-TRANSACTION request has been issued and to record the number of TP-U-ERROR requests that are outstanding at that time.

- set Denbb to Denb.
- set Dx to TRUE.

[CBEAFTRB] (**C-BE**GIN **aft**er **r**oll**b**ack)

Invoked upon receipt of a C-BEGIN indication.

- issue a C-BEGIN rsp.
- delNode (SnD, Naaid, Nbrid).
- set Naaid to the *atomic-action-identifier* parameter.
- set Nbrid to the *atomic-action-branch-identifier* parameter.
- addNode (SnD, Naaid, Nbrid).
- set SnD (Naaid, Nbrid).spbr.rch to Arrh.

[CMPCOMSB] (**c**o**mp**leting **com**mitment with **s**u**b**ordinate)

Completes the commitment processing for a single branch with a subordinate.

- if Dg, set Dc to FALSE.
- if ^Dg, set Dc to TRUE.
- if Dch, set Dbrid to Dbridn.
- open the PSAP.

[CMPCOMSP] (**c**o**mp**leting **com**mitment with **s**u**p**erior)

Completes the commitment processing for the branch with the superior.

- if Dg, set Dc to TRUE.
- if ^Dg, set Dc to FALSE.
- if Nch, set Nbrid to Nbridn.

[CMPRBSB] (**c**o**mp**leting **r**oll**b**ack with **s**u**b**ordinate)

Completes the rollback processing for a single branch with a subordinate.

- set Dbrid to a new unique value.
- addBranch (SnD (Naaid, Nbrid).sbbr, Dbrid).
- set SnD (Naaid, Nbrid).sbbr (Dbrid).rch to Arrh.

[COMREQ] (issue **com**mit **req**uest)

Invoked to issue the correct type of *commit request* to a single subordinate.

- if Dch,
  - set Dbridn to a unique value,
  - set the *atomic-action-identifier* parameter to Naaidn,
  - set the *atomic-action-branch-identifier* parameter to Dbridn,
  - issue a C-COMMIT+C-BEGIN req,
  - addBranch (SnD (Naaidn, Nbridn).sbbr, Dbridn),
  - set SnD (Naaidn, Nbridn).sbbr (Dbridn).rch to Arrh.
- if Dtb,
  - issue a AF-ABORT (user, commitRI) req,
  - set Dbpart to TRUE,
  - set Dtb to FALSE.
- if ^Dch and ^Dtb,
  - issue a C-COMMIT req.

[COMRSP] (issue **com**mit **resp**onse)

Invoked to issue the correct type of *commit response* to the superior.

- if ^memsp (SldD, Naaid, Nbrid),
  - if Dtb and Du,
    - issue an AF-ABORT (user, commitRC) req.
  - if ^Dtb or (Dtb and ^Du),
    - issue a C-COMMIT rsp.
- if memsp (SldD, Naaid, Nbrid),
  - if Dtb and Du,
    - set *heuristic-report* parameter to SldD (Naaid, Nbrid).type,
    - issue an AF-ABORT-AND-HEURISTIC-REPORT (commitRC) req.
  - if ^Dtb or (Dtb and ^Du),
    - set *heuristic-report* parameter to SldD (Naaid, Nbrid).type,
    - issue an AF-HEURISTIC-REPORT (commitRC) req.
- if Dtb and ^Du,
  - set Dbpart to TRUE,
  - set Dtb to FALSE.

[COUNTCOM] (**count com**mitment confirm event)

Counts an event to complete commitment phase 2 processing for the node. Used to count a *commit confirm* or a TP-DONE request. When all events have been received, completes the one-time actions associated with commitment processing for a node. Also handles starting the rollback of the next transaction if that is to occur.

If the next transaction rolls back and commitment is complete, the counter is set to the number of subordinates from which a *rollback confirm* will be received plus the number of branches from which a TP-DONE request must be received.

If the next transaction does not rollback and commitment is complete, the counter is set to the number of subordinates from which a C-READY indication will be received plus the number of branches from which a TP-COMMIT request must be received.

- subtract one unit from Ncnt.

Begin the next transaction

- if Ncnt = 0,
  - issue TP-COMMIT-COMPLETE ind,
  - delNode (SnD, Naaid, Nbrid),
  - set Nfa and Np to FALSE,
  - if Nr,
    - set Naaid to Naaidn,
    - set Nbrid to Nbridn.
  - generate “Complete-commit”,
  - if ^Nrpend,
    - set Nt to FALSE.

      Set the counter for phase one of commitment for the next transaction; one C-READY ind from each subordinate; a TP-COMMIT req for each branch.

      - if Nr or Ni,
    - set Ncnt to Nsubnb + Nsubnb.
      - if Ni, add one unit to Ncnt,
      - if Nlf, set Ncnt to 1.

- if Nrpend,
  - issue a TP-ROLLBACK ind,
  - set Nt and Nfa to TRUE.

    Set the counter to owe a TP-DONE req and a rollback confirm from each subordinate.
  - set Ncnt to Nsubnb,
  - if Nr or Ni, add Nsubnb to Ncnt,
  - if Ni or Nlf, add one unit to Ncnt,
  - generate “Set-done-true”.

[COUNTRB] (**count r**oll**b**ack confirm event)

Counts a *rollback confirm* event and performs the actions associated with completing rollback when all events have been received. When all events have arrived, the synchronizing event to report rollback to the superior is generated. If this is a root node, the one-time actions necessary to begin the next transaction are done including generating the synchronizing event.

- subtract one unit from Ncnt.

Begin the next transaction for the root

- if Ncnt = 0 and Nr,
  - issue a TP-ROLLBACK-COMPLETE ind,
  - delNode (SnD, Naaid, Nbrid),
  - set Nfa, Np, Nt, Nrpend, and Nfrb to FALSE,
  - set Ncnt to Nsubnb + Nsubnb,
  - set Naaid to a unique value,
  - addNode (SnD, Naaid, Nbrid),
  - generate “Complete-rollback”.

Initiate reporting of rollback to the superior if not a root

- if Ncnt = 0 and ^Nr,
  - generate “Report-rollback”.

[COUNTRDY] (**count r**ea**dy** event)

Counts the events needed to complete phase I of commitment, this includes a TP-COMMIT request to each branch and a C-READY indication from each subordinate. When all events have been received, does the one-time actions associated with completing phase I. For the root, makes the commitment decision and sets the counter to account for receiving a TP-DONE request and a *commit confirm* from each subordinate. For the intermediate node, enters the READY state and generates the synchronizing event to propagate the ready.

- subtract one unit from Ncnt.
- if (Ncnt = 0) and Nr and ^Ldfail,

  set the counter to owe a TP-DONE req and a *commit confirm* from each subordinate.
  - set Ncnt to Nsubnb + Nsubnb,
  - issue a TP-COMMIT ind,
  - begin setting the *TPPM bound data* to the final state, unless a heuristic decision was taken; the *TPPM bound data* shall eventually be set to the final state; when this occurs is a local matter,
  - set SnD (Naaid, Nbrid).type to “log-commit”,
  - set Naaidn to a new unique value,
  - set Nbridn to NULL,
  - addNode (SnD, Naaidn, Nbridn),

- generate “Set-done-true”,
- generate “Continue-commit”.

– if (Ncnt = 0) and ^Nr and ^Ldfail,

NOTE – Setting the *TPPM bound data* to the ready-to-commit state may be done atomically with writing the log-ready record.

- set the *TPPM bound data* to the ready-to-commit state,
- set SnD (Naaid, Nbrid).type to “log-ready”,
- generate “Enter-ready”.

– if (Ncnt = 0) and Ldfail,

- issue a TP-ROLLBACK ind,

  set the counter to *owe a TP-DONE request* for each branch and owe a *rollback confirm* from each subordinate.
- if Nr or Ni,
- set Ncnt to Nsubnb + Nsubnb.
- if Ni, add one unit to Ncnt,
- if Nlf, set Ncnt to 1,
- set Nfrb and Nfa to TRUE,
- generate “Set-done-true”,
- generate “Rollback-all”.

[CPSAP] (**c**lose the **PSAP**)

- close the PSAP.

[DECDENB] (**Dec**rement **Denb**)

Invoked to decrement Denb and also Denbb, whenever applicable.

- subtract one unit from Denb.
- if Denbb > 0,
  - subtract one unit from Denbb.

[DEFREQ] (send AF-**DEF**ER **req**uest)

Issues an AF-DEFER request that has been held pending receipt of a TP-PREPARE request or a TP-COMMIT request from the TPSUI.

- if De,
  - issue an AF-DEFER (end-dialogue) req.
- if ^De and Dg,
  - issue an AF-DEFER (grant-control) req.

[DELBR] (**del**ete **br**anch)

Removes a transaction branch and adjusts the node variables accordingly.

- set Dl to FALSE.
- if Dsup,
  - set Nch to FALSE,
  - if Ni,
    - set Ni to FALSE,
    - set Nr to TRUE.
  - if Nlf,
    - set Nlf to FALSE.

- if ^Dsup,
  - subtract one unit from Nsubnb,
  - set Dch to FALSE,
  - if Nsubnb = 0 and Ni,
    - set Ni to FALSE,
    - set Nlf to TRUE.
  - if Nsubnb = 0 and Nr,
    - set Nr to FALSE.

    Reduce the counter for the C-READY ind
  - subtract one unit from Ncnt.

    Reduce the counter for the TP-COMMIT req
  - subtract one unit from Ncnt.

[DELBRANCH] (**del**ete **branch** in system variable)

Removes a transaction branch from sbbr for a dialogue which is terminated during the ACTIVE state without causing a rollback.

- delBranch (SnD (Naaid, Nbrid).sbbr, Dbrid).

[DELIMIT] (**delimit** dialogue)

Handles the AF-BEGIN-DIALOGUE (accepted, dataRI) response which occurs before any requests are issued by the subordinate.

- if Dsup and ^Da,
  - issue an AF-BEGIN-DIALOGUE (accepted, dataRI) rsp,
  - set Ncr to FALSE,
  - set Da and Nrn to TRUE,
  - if Dl,
    - issue a C-BEGIN rsp.
  - while (Depnb > 0),
    - issue AF-U-ERROR rsp,
    - subtract one unit from Depnb.

[DIALOGUE] (operate on **dialogue**)

Executes all subsequent actions on the dialogue.

[INITMACF] (**init**ialize **MACF**)

Invoked upon the first TP-BEGIN-DIALOGUE request from the root node.

- set all node variables to their initial values, as specified in A.4.2.4.

[INITDIASB] (**init**ialize **dia**logue with **s**u**b**ordinate)

Invoked when an AF-BEGIN-DIALOGUE request is issued.

- if Handshake functional unit is selected,
  - set Dh to TRUE.
- if Unchained Transactions functional unit is selected,
  - set Du to TRUE.
- if Shared Control functional unit is selected,
  - set Dsh to TRUE.
  - set Nrn to TRUE.
- if (*confirmation* = “always”),
  - set Dcr to TRUE.

[INITDIASP] (**init**ialize **dia**logue with **s**u**p**erior)

Invoked when an AF-BEGIN-DIALOGUE indication is received.

- if Handshake functional unit is selected,
  - set Dh to TRUE.
- if Unchained Transactions functional unit is selected,
  - set Du to TRUE.
- if Shared Control functional unit is selected,
  - set Dsh and Dc to TRUE.
  - set Dsup to TRUE.
- if (*confirmation* = "always"),
  - set Ncr to TRUE.

[INITRB] (**init**iate **r**oll**b**ack)

Initiates rollback at this node. Sets the counter to account for a *rollback confirm/indication* from each subordinate.

- set the bound data to the initial state.
- set Nfrb to TRUE.
- set Ncnt to Nsubnb.
- set Nt to TRUE.
- set SnD (Naaid, Nbrid).type to NULL.
- generate "Rollback-all".

[LOGDAM] (**log dam**age)

Updates the log-damage record according to the value of the *heuristic-report* parameter of either a TP-DONE request or an AF-[ABORT-AND-]HEURISTIC-REPORT indication.

- if the value of the heuristic-report parameter is "heuristic-hazard",
  - if ^memsp (SldD, Naaid, Nbrid),
    - addNode (SldD, Naaid, Nbrid),
    - set SldD (Naaid, Nbrid).type to "heuristic-hazard".
- if the value of the heuristic-report parameter is "heuristic-mix",
  - if ^memsp (SldD, Naaid, Nbrid),
    - addNode (SldD, Naaid, Nbrid),
    - set SldD (Naaid, Nbrid).type to "heuristic-mix".
  - if memsp (SldD, Naaid, Nbrid),
    - if (SldD (Naaid, Nbrid).type = "heuristic-hazard"),
      - set SldD (Naaid, Nbrid).type to "heuristic-mix".

[LOGDAMH] (**log dam**age **h**azard)

Creates a the log-damage record with the value of "heuristic-hazard".

- if ^memsp (SldD, Naaid, Nbrid),
  - addNode (SldD, Naaid, Nbrid),
  - set SldD (Naaid, Nbrid).type to "heuristic-hazard".

[LOGDAMRB] (**log dam**age **r**oll**b**ack)

Updates the log-damage as necessary in the event of a rollback.

- if memsp (SlhD, Naaid, Nbrid),
  - if SlhD (Naaid, Nbrid).type ^= "heuristic-initial",
    - addNode (SldD, Naaid, Nbrid),
    - set SldD (Naaid, Nbrid).type to "heuristic-mix".

[LOGHD] (**log h**euristic **d**ecision)

Updates the log-heuristic record according to the value of the *heuristic-report* parameter from the heuristic decision.

- if ^memsp (SlhD, Naaid, Nbrid),
  - addNode (SlhD, Naaid, Nbrid),
  - set SlhD (Naaid, Nbrid).type to the *heuristic-report* parameter.
- if memsp (SlhD, Naaid, Nbrid),
  - if (SlhD (Naaid, Nbrid).type ^= *heuristic-report*),
    - set SlhD (Naaid, Nbrid).type to "heuristic-mix".

[LOGREMOVE] (**log**-heuristic, log-damage **remove**)

Removes the log-damage and log-heuristic records.

- delNode (SldD, Naaid, Nbrid).
- if memsp (SlhD, Naaid, Nbrid),
- delNode (SlhD, Naaid, Nbrid).

[NOTCHAIN] (**not chain**ing)

Invoked when the dialogue is no longer *chaining transaction branches*.

- if Dsup, set Nch to FALSE.
- if ^Dsup, set Dch to FALSE.

[NEXTAAID] (**next a**tomic **a**ction **id**entifier)

Sets the atomic action identifier to the new value for the next transaction after commitment.

- set Naaid to Naaidn.
- set Nbrid to Nbridn.

[NXTTRAN] (**next tran**saction)

Does the one time actions for a leaf or intermediate node when rollback is complete and the next transaction after a rollback is to begin.

- issue a TP-ROLLBACK-COMPLETE ind.
- set Nfa, Np, Nt, Nrpend and Nfrb to FALSE.
- if Ni,
  - set Ncnt to Nsubnb + Nsubnb,
  - add one unit to Ncnt.
- if Nlf, set Ncnt to 1.
- if ^Nch,
  - delNode (SnD, Naaid, Nbrid),
  - set Naaid to a new unique value,
  - set Nbrid to NULL,
  - addNode (SnD, Naaid, Nbrid).
- generate "Complete-rollback".

[OLDCHANNEL] (operate on **old channel**)

Executes all subsequent actions in this subcell on the channel that was already attached to the TPPM before a CAF-RECOVER indication was received on a different channel.

[OPSAP] (**o**pen **PSAP**)

- open the PSAP.

[OWEDONE] (**owe** a TP-**DONE** request)

Makes a *TP-DONE request owed* and allows failure related actions. If a *TP-DONE request is not owed,* adjust the count of events expected.

- set Nfa to TRUE.
- if ^Dd,
  - generate “Set-done-true”,
  - if ^Drbrep,
    - if Nr or Ni, add Nsubnb to Ncnt,
    - if Ni or Nlf, add one unit to Ncnt.

[OWEDONECO] (**owe** a TP-**DONE** request after **co**mmit indication) and adjust the count of events expected.

Makes a *TP-DONE request owed*.

- generate “Set-done-true”.
- if Nr or Ni, add Nsubnb to Ncnt.
- if Ni or Nlf, add one unit to Ncnt.

[PREPREQ] (issue AF-**PREP**ARE **req**)

- if Dsh,
  - issue an AF-PREPARE req.
- if ^Dsh,
  - issue an AF-PREPARE (data-permitted = FALSE) req.

[RBNEXTSB] (**r**oll**b**ack **next** transaction **su****b**ordinate)

Invoked when it is determined that the next transaction will rollback and the dialogue is chaining.

- if ^Nrpend,
  - set Nrpend to TRUE,
  - generate “Rollback-next-trans”.

[RBREQ] (issue **r**oll**b**ack **req**uest)

Invoked to issue a *rollback request* of the correct form.

- if ^Dtb and (^Dsup or (^memsp (SldD, Naaid, Nbrid) and Dsup)),
  - issue C-ROLLBACK req.
- if Dtb and (^Dsup or (^memsp (SldD, Naaid, Nbrid) and Dsup)),
  - issue an AF-ABORT (user, rollbackRI) req.
- if Dsup and memsp (SldD, Naaid, Nbrid) and ^Dtb,
  - set *heuristic-report* parameter to SldD (Naaid, Nbrid).type,
  - issue an AF-HEURISTIC-REPORT (rollbackRI) req.
- if Dsup and memsp (SldD, Naaid, Nbrid) and Dtb,
  - set *heuristic-report* parameter to SldD (Naaid, Nbrid).type,
  - issue an AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) req.

- if Dtb,
  - set Dbpart to TRUE,
  - set Dtb to FALSE.

[RBRSPNOAB] (issue **r**oll**b**ack **resp**onse **no ab**ort)

Invoked to issue a *rollback response* if no abort is included. Danyb is FALSE when this procedure is invoked.

- if ^Dsup or (^memsp (SldD, Naaid, Nbrid) and Dsup),
  - issue C-ROLLBACK rsp.
- if Dsup and memsp (SldD, Naaid, Nbrid),
  - set *heuristic-report* parameter to SldD (Naaid, Nbrid).type,
  - issue an AF-HEURISTIC-REPORT (rollbackRC) req.

[RBRSPAB] (issue **r**oll**b**ack **resp**onse with **ab**ort)

Invoked to issue a *rollback response* together with a user abort. Either Dtb or Dbpart is TRUE when this procedure is invoked.

- if ^Dsup or (^memsp (SldD, Naaid, Nbrid) and Dsup),
  - issue an AF-ABORT (user, rollbackRC) req.
- if Dsup and memsp (SldD, Naaid, Nbrid),
  - set *heuristic-report* parameter to SldD (Naaid, Nbrid).type,
  - issue an AF-ABORT-AND-HEURISTIC-REPORT (rollbackRC) req.

[RECCOM] (**rec**eive **com**mit indication)

Receives the *commit indication*. Sets the counter to account for receiving a *commit confirm* from each subordinate.

- set Ncnt to Nsubnb.
- issue a TP-COMMIT ind.
- begin setting the *TPPM bound data* to the final state, unless a heuristic decision has been taken; the *TPPM bound data* shall eventually be set to the final state; when this occurs is a local matter.
- if Nch,
  - set Naaidn to the *atomic-action-identifier* parameter,
  - set Nbridn to the *atomic-action-branch-identifier* parameter,
  - addNode (SnD, Naaidn, Nbridn),
  - set SnD (Naaidn, Nbridn).spbr.rch to Arrh.
- if ^Nch,
  - set Naaidn to a new unique value,
  - set Nbridn to NULL,
  - addNode (SnD, Naaidn, Nbridn).
- if memsp (SlhD, Naaid, Nbrid),
  - if (SlhD (Naaid, Nbrid).type ^= “heuristic-final”),
    - addNode (SldD, Naaid, Nbrid),
    - set SldD (Naaid, Nbrid).type to “heuristic-mix”.
- generate “Continue-commit”.

[RECVRCOMI] (issue C-**REC**OVE**R** (**com**m**i**t) request)

Invoked to issue the correct type of C-RECOVER (commit) request to the subordinate.

- set the *atomic-action-identifier* parameter to Naaid.
- set the *atomic-action-branch-identifier* parameter to Dbrid.
- if SnD (Naaid, Nbrid).sbbr (Dbrid).rch = NULL,
  - issue C-RECOVER (commit) req.
- if SnD (Naaid, Nbrid).sbbr (Dbrid).rch ^= NULL,
  - set the *recovery-context-handle* parameter to SnD (Naaid, Nbrid).sbbr (Dbrid).rch,
  - issue an AF-RECOVER (commit) req.
- if Atwr,
  - issue an AF-TOKEN-GIVE (two-way-recovery) req.

[RECVRCOMR] (issue C-**REC**OVE**R** (**com**mit) request after CAF-RECOVER (ready) ind)

Invoked to issue C-RECOVER (commit) request to the subordinate when a CAF-RECOVER (ready) indication was received.

- set the *atomic-action-identifier* parameter to Naaid.
- set the *atomic-action-branch-identifier* parameter to Dbrid.
- issue a C-RECOVER (commit) req.
- if Atwr,
  - issue an AF-TOKEN-GIVE (two-way-recovery) req.

[RECVRDONE] (issue C-**REC**OVE**R** (**done**) response)

Invoked to issue the correct type of C-RECOVER (done) response to the superior.

- set the *atomic-action-identifier* parameter to Naaid.
- set the *atomic-action-branch-identifier* parameter to Nbrid.
- if ^memsp (SldD, Naaid, Nbrid),
  - issue C-RECOVER (done) rsp.
- if memsp (SldD, Naaid, Nbrid),
  - set the heuristic-report parameter to SldD (Naaid, Nbrid).type,
  - issue an AF-HEURISTIC-REPORT (recoverDoneRC) req.

[RECVRRDY] (issue C-**REC**OVE**R** (**r**ea**dy**) request)

Invoked to issue the correct type of C-RECOVER (ready) request to the superior.

- set the *atomic-action-identifier* parameter to Naaid.
- set the *atomic-action-branch-identifier* parameter to Nbrid.
- if SnD (Naaid, Nbrid).spbr.rch = NULL,
  - issue C-RECOVER (ready) req.
- if SnD (Naaid, Nbrid).spbr.rch ^= NULL,
  - set the *recovery-context-handle* parameter to SnD (Naaid, Nbrid).spbr.rch,
  - issue an AF-RECOVER (ready) req.
- if Atwr,
  - issue an AF-TOKEN-GIVE (two-way-recovery) req.

[RESETD] (**reset d**ialogue variables)

Resets dialogue variables for the next transaction.

- set Dfdone, Dd, Ddp, De, Dg, Ddef and Drbrep to FALSE.
- set Denb, Denbb and Depnb to zero.
- set Dps and Dx to FALSE.
- if Du,
  - set Dbcr to FALSE.

[SETAAID] (**set T**PPM **a**tomic-**a**ction and **a**tomic-**a**ction-branch **id**entifiers)

Sets the *atomic-action identifier* and *atomic-action-branch identifier* required to find the TPPM which requested the channel.

- set Caaid to the *atomic-action-identifier* parameter.
- set Cbrid to the *atomic-action-branch-identifier* parameter.

[SETDIAG] (**set diag**nostic)

Sets the *diagnostic* parameter of the next AF- or TP-service primitive issued by the TPPM.

- if this is a protocol error,
  - set the *diagnostic* parameter to “protocol-error”.
- if this is an internal error,
  - if Ldperm,
    - set the *diagnostic* parameter to “permanent-failure”.
  - if ^Ldperm,
    - set the *diagnostic* parameter to “transient-failure”.

[SETDIAGBD] (**set diag**nostic on AF-**B**EGIN-**D**IALOGUE response)

- if the Dialogue functional unit is selected, set the *diagnostic* parameter to, as appropriate, one of:
  - “recipient-tpsu-title-unknown”
  - “tpsu-not-available (permanent)”
  - “tpsu-not-available (transient)”
  - “recipient-tpsu-title-required”
  - “functional-unit-not-supported”
  - “functional-unit-combination-not-supported”
  - “no-reason-given”
- if the Recovery functional unit is selected, set the *diagnostic* parameter to, as appropriate, one of:
  - “functional-unit-not-supported”
  - “tppm-recovery-not-available”
  - “two-way-recovery-not-supported”
  - “no-reason-given”
- if the *diagnostic* parameter is set to “functional-unit-not-supported”,
  - set the *functional-units* parameter to the functional units that are supported.

[SETDIAGTP] (**set diag**nostic on **T**P-**P**-ABORT-indication)

- if this is a Protocol error,
  - set the *diagnostic* parameter to “protocol-error”.

- if this is an Internal error,
  - if Ldperm,
    - set the *diagnostic* parameter to “permanent-failure”.
  - if ^Ldperm,
    - set the *diagnostic* parameter to “transient-failure”.
- if this is an A-RELEASE rsp or A-RELEASE cnf,
  - set the *diagnostic* parameter to “permanent-failure”.
- if this is an A-ABORT ind,
  - set the *diagnostic* parameter to “permanent-failure”.
- if this is an A-P-ABORT ind,
  - set the *diagnostic* parameter to “permanent-failure”.
- if this is an A-ABORT req,
  - set the *diagnostic* parameter to “permanent-failure”.
- if this is a CAF-RECOVER (ready) req or a CAF-RECOVER (commit) req,
  - set the *diagnostic* parameter to “permanent-failure”.

[SETTOKX] (**set** A**tokx** to TRUE)

Sets Atokx to TRUE after a C-RECOVER indication or a CAF-RECOVER indication has been received on a two-way-recovery channel.

- if Atwr,
  - set Atokx to TRUE.

A.4.4.5 Actions after node crash

After a node crash, action REBUILDTPPMS is executed.

[REBUILDTPPMS] (**Rebuild TPPMs** after node crash)

Creates one TPPM per each element included in SnD after a node crash has occured.

- for each element of SnD where type ^= NULL,
  - create a new MACF and for this new MACF do,
    - set Naaid to aaid,
    - set Nbrid to spbr.brid,
    - set Nt to TRUE,

  create branch to superior
  - if Nbrid ^= NULL,
    - add a new state machine and for this new branch do,
      - set Dsup to TRUE,
      - set Db, Dl, and Danyb to TRUE,
      - if type = “log-commit”,
        - set Dd to TRUE,
        - set state to 21.5.
      - if type = “log-ready”,
        - set state to 20.3.

create branches to subordinates

- for each element of sbbr,
  - add one unit to Nsubnb,
  - add a new state machine and for this new branch do,
    - set Dbrid to brid,
    - set Db, Dl, and Danyb to TRUE,
    - if type = “log-commit”,
      - set Dd to TRUE,
      - set state to 21.1.
    - if type = “log-ready”,
      - set state to 20.3.
- if Nbrid = NULL,
  - set Nr to TRUE.
- if Nbrid ^= NULL and Nsubnb = 0,
  - set Nlf to TRUE.
- if Nbrid ^= NULL and Nsubnb ^= 0,
  - set Ni to TRUE.
- if type = “log-commit”,

count commit confirms from each subordinate

- set Ncnt to Nsubnb,

count TP-DONE requests (like OWEDONE)

- if Nr or Ni,
  - add Nsubnb to Ncnt.
- if Ni or Nlf,
  - add one unit to Ncnt.
- issue a TP-COMMIT ind.
- generate “Restart-TPPM”.

A.5 TPASE

A.5.1 TPASE states

There is no state defined for the TPASE.

A.5.2 TPASE variables

There is no variable defined for the TPASE.

A.5.3 TPASE events

There is no Internal event and no synchronizing event defined for the TPASE .

A.5.4 TPASE actions

The following actions are defined for the TPASE:

Dec

- decode the TP APDU.
- issue the AF-service primitive corresponding to the received TP APDU to the SACF.

MapA (**Map** to **A**-ABORT service)

- encode the TP APDU.
- issue an A-ABORT request, with the TP APDU carried by the *user data* parameter.

MapC (**Map** to **C**CR)

- encode the TP APDU.
- issue the CCR req/rsp specified by the *mapping* parameter, with the TP APDU carried by the *user data* parameter.

MapPd (**Map** to **P-D**ATA service)

- encode the TP APDU.
- issue a P-DATA request, with the TP APDU carried by the *user data* parameter.

  NOTE – The actual Presentation service which will be used to carry the APDU is determined according to the rules contained in 9.5 "Mapping" and 10.7 "Concatenation".

MapPp (**Map** to **P**-TOKEN-**P**LEASE service)

- encode the TP APDU.
- issue a P-TOKEN-PLEASE request, with the TP APDU carried by the *user data* parameter.

MapPg (**Map** to **P**-TOKEN-**G**IVE service)

- encode the TP APDU.
- issue a P-TOKEN-GIVE request, with the TP APDU carried by the *user data* parameter.

MapS (**Map** to **S**ACF)

- decode the TP APDU carried by the *user data* parameter.
- set the *mapping* parameter to the value corresponding to the received CCR ind/cnf or A-ABORT ind.
- issue the AF-service primitive corresponding to the received TP APDU to the SACF.

Table A.8 lists the actions taken for each event received by the TPASE.

A.6 SACF

A.6.1 SACF states

The names for SACF states in the main text are shown after the corresponding state number.

State 1 (FREE)

The SAO is in the FREE state.

State 1.1

This state is valid only for a contention-winner. An AF-BID (*token-requested* = TRUE) indication has been received. The *token* is not available and the SACF waits for the *token* before accepting or rejecting the bid.

State 1.2

This state is valid only for a contention-winner. An AF-BID indication has been received, and the TPPM accepted the bid. The SACF waits for an AF-BEGIN-DIALOGUE indication from the contention-loser.

State 2 (STRAY)

AF-BEGIN-DIALOGUE req has been issued.

State 3 (BIDDING)

An AF-BID request has been issued.

State 4 (BID CONFIRM RECEIVED)

An AF-BID (accepted) confirm has been received.

State 6 (BUSY)

One of the following situations has occurred:

a) an AF-BEGIN-DIALOGUE indication has been received by a contention-loser, or has been received by a contention-winner while no AF-BEGIN-DIALOGUE req has been issued;

b) an AF-BEGIN-DIALOGUE confirm with a valid *correlator* parameter has been received; or

c) a C-ROLLBACK indication or confirm has been received.

State 7 (CLEANUP ROLLBACK INDICATION EXPECTED)

A superior has issued a C-BEGIN request and received a non confirmed dialogue termination AF indication.

State 8 (CLEANUP BEGIN INDICATION EXPECTED)

A subordinate provider has rejected a dialogue with coordination level COMMITMENT.

State 9 (CLEANUP ROLLBACK CONFIRM EXPECTED)

A superior has issued a C-ROLLBACK request and received a non confirmed dialogue termination AF indication.

A.6.2 SACF variables

A.6.2.1 Overview

Two categories of variables are defined for the SACF:

a) variables that pertain to an association. These variables are created at association establishment time, and are destroyed at association termination time. Association variables are prefixed by the letter "A". They are listed in Table A.9; and

b) variables that model a decision local to the node, when there is a choice. Local decision variables are prefixed by the letter "L". They are listed in Table A.10.

NOTE – An important subcategory are the A-variables shared with the MACF [see A.4.2.1 f)].

A.6.2.2 Definitions of SACF variables

The following variables are defined for the SACF state table. SACF variables are Boolean variables, unless otherwise specified.

Abm (**b**id **m**andatory): When set to TRUE, Abm indicates that bidding is mandatory.

Abtr (**b**egin-**t**ransaction-**r**eject): When set to TRUE, Abtr indicates that an AF-ABORT (provider, begin-transaction-reject, rollbackRI) request has been received.

Acbegq (**C**-**BEG**IN re**q**uest received): When set to TRUE, Acbegq indicates that a C-BEGIN request has been received and queued.

Acopy (**copy** issued AF-service): Acopy contains the issued AF-service, in the cases where either an AF-ABORT (rollbackRI) req or an AF-BEGIN-DIALOGUE (rejected (user), rollbackRI) rsp has been issued.

Adc (**d**ialogue **c**orrelator): Adc is a variable of type Integer. Adc is used to check whether an AF-BEGIN-DIALOGUE confirm is valid. The initiator sets Adc to a unique value and copies that value into the *correlator* parameter of the AF-BEGIN-DIALOGUE request. At the recipient, Adc takes the value of the *correlator* parameter provided by the AF-BEGIN-DIALOGUE indication. Upon sending an AF-BEGIN-DIALOGUE response, the *correlator* parameter carries the value kept by Adc.

Adru (**d**ialogue **r**ejected by **u**ser): When set to TRUE, Adru indicates that an AF-BEGIN-DIALOGUE (rejected (user), rollbackRI) response has been received.

Adt (SAF-**D**E**T**ACH-ASSOCIATION request received): When set to TRUE, Adt indicates that an SAF-DETACH-ASSOCIATION request has been received.

Af (C-BEGIN **f**ear): When set to TRUE, Af denotes that a stray C-BEGIN indication may be received.

Alpi (**l**ast **p**artner **i**dentifier): Alpi is a variable of type Integer. For a contention-winner, Alpi indicates the valid value of the *correlator* parameter to be received during the next dialogue establishment. For a contention-loser, Alpi indicates the valid value of the *correlator* parameter to be sent during the next dialogue establishment.

Anfd (**n**ot the **f**irst **d**ialogue on association): When set to TRUE, Anfd indicates that either an AF-BEGIN-DIALOGUE request has been issued by a contention-winner or that an AF-BEGIN-DIALOGUE indication has been received by a contention-loser.

Aq (**q**ueue): When set to TRUE, Aq indicates that a queue is established.

Arrh (**r**eceived **r**ecovery-context-**h**andle): Arrh is a variable of type Octet string. Arrh contains the recovery-context-handle received on the association.

Arvyrs (**r**eco**v**er**y** **r**e**s**ponse awaited): When set to TRUE, Arvyrs indicates that a C-RECOVER (ready) indication was received and a response is awaited.

Atokr (**tok**en **r**equested): When set to TRUE, Atokr indicates that the contention-loser SACF has issued an AF-BID request with *token-requested* parameter set to TRUE, and has received an AF-BID (accepted) confirm, but has not yet received the *token*. Atokr is also used by the contention-winner to indicate that the token must be sent to the contention-loser when it arrives (after an AF-BEGIN-DIALOGUE indication without an AF-BID indication).

Atokx (**tok**en e**x**pected): When set to TRUE, Atokx indicates that a C-RECOVER indication or an AF-RECOVER indication has been received on a two-way-recovery channel and that the *token* is awaited.

Atppm (attached to a **TPPM**): When set to TRUE, Atppm indicates that the SACF is attached to a TPPM. When set to FALSE, Atppm indicates that the SACF is attached to a CPM.

Atwr (**t**wo **w**ay **r**ecovery): When set to TRUE, Atwr indicates that the channel is established in the two-way-recovery mode. When set to FALSE, this variable indicates that the channel is established in the one-way-recovery mode.

Aw (contention-**w**inner): When set to TRUE, Aw indicates that the AEI is the contention-winner.

Ldbid (**d**ecision to **bid**): When set to TRUE, Ldbid indicates that the SACF will bid, although bidding is not mandatory.

Lddel (**d**ecision to **del**ay bid response): When set to TRUE, Lddel indicates that the contention-winner that does not own the *token* will delay its response to an AF-BID (*token-requested* = TRUE) indication until receipt of a P-TOKEN-GIVE (sync-minor) indication.

Ldres (**d**ecision to **res**erve the association): When set to TRUE, Ldres indicates that the association is reserved by the contention-winner.

A.6.2.3 Initialization of SACF variables

SACF variables of type Boolean are initialized to FALSE, except for the following variables:

Abm: Initialized to TRUE if the *Bid-Mandatory* parameter of the TP-INITIALIZE-RI APDU is set to TRUE.

Aw: Initialized to TRUE if the the *Contention-winner-assignment* parameter is set to “initiator” upon sending the TP-INITIALIZE-RI APDU, or if the *Contention-winner-assignment* parameter is set to “recipient” upon receipt of the TP-INITIALIZE-RI PDU.

SACF variables of type Integer are initialized to zero.

SACF variables of type Octet String are initialized to EMPTY, except for the following variables:

Arrh: Initialized to the value of the *Recovery-context-handle* parameter upon receipt of either the TP-INITIALIZE-RI, or TP-INITIALIZE-RC APDU. If the *Recovery-context-handle* parameter is not specified, Arrh is initialized to NULL.

Superseded by a more recent version

TABLE A.8/X.862

TPASE actions

Event	Action
AF-BEGIN-DIALOGUE req	MapPd
TP-BEGIN-DIALOGUE-RI	Dec
AF-BEGIN-DIALOGUE rsp	MapPd
TP-BEGIN-DIALOGUE-RC	Dec
C-ROLLBACK (TP-BEGIN-DIALOGUE-RC) cnf	MapS
AF-BID req	MapPd
TP-BID-RI	Dec
AF-BID rsp	MapPd
TP-BID-RC	Dec
AF-END-DIALOGUE req	MapPd
TP-END-DIALOGUE-RI	Dec
AF-END-DIALOGUE rsp	MapPd
TP-END-DIALOGUE-RC	Dec
AF-U-ERROR req	MapPd
TP-U-ERROR-RI	Dec
AF-U-ERROR rsp	MapPd
TP-U-ERROR-RC	Dec
AF-ABORT (user, dataRI) req	MapPd
TP-ABORT-RI	Dec
AF-ABORT (provider, abortRI) req	MapA
A-ABORT (TP-ABORT-RI) ind	MapS
AF-GRANT-CONTROL req	MapPd
TP-GRANT-CONTROL-RI	Dec
AF-REQUEST-CONTROL req	MapPd
TP-REQUEST-CONTROL-RI	Dec
AF-HANDSHAKE req	MapPd
TP-HANDSHAKE-RI	Dec
AF-HANDSHAKE rsp	MapPd
TP-HANDSHAKE-RC	Dec
AF-HANDSHAKE-AND-GRANT-CONTROL req	MapPd
TP-HANDSHAKE-AND-GRANT-CONTROL-RI	Dec
AF-HANDSHAKE-AND-GRANT-CONTROL rsp	MapPd
TP-HANDSHAKE-AND-GRANT-CONTROL-RC	Dec
AF-DEFER req	MapPd
TP-DEFER-RI	Dec
AF-PREPARE req	MapC
C-PREPARE (TP-PREPARE-RI) ind	MapS
AF-ABORT (user, commitRI) req	MapC
C-COMMIT (TP-ABORT-RI) ind	MapS
AF-ABORT (user, commitRC) req	MapC
C-COMMIT (TP-ABORT-RI) cnf	MapS
AF-HEURISTIC-REPORT (commitRC) req	MapC
C-COMMIT (TP-HEURISTIC-REPORT-RI) cnf	MapS
AF-ABORT-AND-HEURISTIC-REPORT (commitRC) req	MapC
C-COMMIT (TP-ABORT-RI, TP-HEURISTIC-REPORT-RI) cnf	MapS
AF-ABORT (user, rollbackRI) req	MapC
C-ROLLBACK (TP-ABORT-RI) ind	MapS

TABLE A.8/X.862 *(end)*

TPASE actions

Event	Action
AF-HEURISTIC-REPORT (rollbackRI) req	MapC
C-ROLLBACK (TP-HEURISTIC-REPORT-RI) ind	MapS
AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) req	MapC
C-ROLLBACK (TP-ABORT-RI, TP-HEURISTIC-REPORT-RI) ind	MapS
AF-ABORT (user, rollbackRC) req	MapC
C-ROLLBACK (TP-ABORT-RI) cnf	MapS
AF-HEURISTIC-REPORT (rollbackRC) req	MapC
C-ROLLBACK (TP-HEURISTIC-REPORT-RI) cnf	MapS
AF-ABORT-AND-HEURISTIC-REPORT (rollbackRC) req	MapC
C-ROLLBACK (TP-ABORT-RI, TP-HEURISTIC-REPORT-RI) cnf	MapS
AF-TOKEN-GIVE req	MapPg
TP-TOKEN-GIVE-RI	Dec
AF-TOKEN-PLEASE req	MapPp
TP-TOKEN-PLEASE-RI	Dec

TABLE A.9/X.862

Association variables

Name	Meaning
Abm	**b**id **m**andatory
Abtr	**b**egin-**t**ransaction-**r**eject
Acbegq	**C**-**BEG**IN re**q**uest received
Acopy	**copy** issued AF-service
Adc	**d**ialogue **c**orrelator
Adru	**d**ialogue **r**ejected by **u**ser
Adt	SAF-**D**E**T**ACH-ASSOCIATION request received
Af	C-BEGIN **f**ear
Alpi	**l**ast **p**artner **i**dentifier
Anfd	**n**ot the **f**irst **d**ialogue on association
Aq	**q**ueue
Arrh	**r**eceived **r**ecovery-context-**h**andle
Arvyrs	**r**eco**v**er**y** **r**e**s**ponse awaited
Atokr	**tok**en **r**equested
Atokx	**tok**en e**x**pected (two-way-recovery only)
Atppm	attached to a **TPPM**
Atwr	**t**wo-**w**ay-**r**ecovery
Aw	contention-**w**inner

TABLE A.10/X.862

SACF local decision variables

Name	Meaning
Ldbid	**d**ecision to **bid**
Lddel	**d**ecision to **del**ay bid rsp
Ldres	**d**ecision to **res**erve the association

A.6.3 SACF events

A.6.3.1 Internal events

Reject-bid: Abbreviation used for "Unsolicited BID reject", as defined in 10.6.1.

A.6.3.2 Synchronizing events

There is no synchronizing event defined for the SACF state table.

A.6.4 SACF actions

A.6.4.1 Actions on services

Table A.11 lists actions that issue service primitives. These actions are named according to the following convention:

First character

A	AF-
C	C-
S	SAF-

Next caracters

AB	ABORT
AL	ASSOCIATION-LOST
BD	BEGIN-DIALOGUE
BID	BID
RB	ROLLBACK
TOKG	TOKEN-GIVE

Service primitive type

rq	request
i	indication
rs	response

Source parameter

P	Provider
U	User

Type parameter

A	Accepted
R	Rejected
RG	Regular
KP	Keep

Mapping parameter

d	dataRI
rbc	rollbackRC

Diagnostic parameter

AR	association-reserved

The remaining characters qualify the action in a manner specific fo the service being issued.

NOTE – For example, ABIDrsA issues an AF-BID response with the Type parameter set to "accepted".

A.6.4.2 Actions on variables

For actions that manipulate SACF variables, the following conventions apply:

First character: V

TABLE A.11/X.862

SACF actions on services

Action name	Parameter settings/service primitive issued
AABrqPa	AF-ABORT (provider, abortRI) req
ABDrsRPdAR	– set the *diagnostic* parameter to "association-reserved" AF-BEGIN-DIALOGUE (rejected(provider), dataRI) rsp
ABIDrsA	AF-BID (accepted) rsp
ABIDrsR	AF-BID (rejected) rsp
ATOKGrqKP	AF-TOKEN-GIVE (keep) req
ATOKGrqRG	AF-TOKEN-GIVE (regular) req
CRBrq	C-ROLLBACK req
CRBrs	C-ROLLBACK rsp
SALi	SAF-ASSOCIATION-LOST ind

The name of the variable being set begins at the second character.

The final characters are either:

CORR (set the *correlator* parameter);

F (set to FALSE);

NEW (set to a new unique value); or,

T (set to TRUE);

NOTE – An example is "VAbtrF", for "set Abtr to FALSE".

A.6.4.3 Actions with free-form names

[BIDREQ] (issue an AF-**BID req**uest)

Issues the correct type of AF-BID request.

- if Anfd, set *Last-Partner-Identifier* parameter to Alpi.
- if CFU, issue AF-BID (*token-requested* = TRUE) req.
- if ^CFU, issue AF-BID (*token-requested* = FALSE) req.

[COPY] (copy issued service)

- copy the issued service to Acopy.

[**ATTACHMACF]** (**attach** to the **MACF**)

- if an AF-BEGIN-DIALOGUE (Dialogue fu selected) ind was received,
  - create a new TPPM MACF,
  - attach to the TPPM.
- if an AF-BEGIN-DIALOGUE (Recovery fu selected) ind was received,
  - attach to the CPM.

[DISCARDQ] (discard the **q**ueue)

- if Aq,
  - discard the queue.

[FLUSHALL] (flush all of the queue)

- flush the queue.

[FLUSHPAR] (flush part of the queue)

- flush the queue up to and excluding the C-BEGIN req.

[PASSTHRU] (pass the service primitive **throu**gh)

- pass the service primitive through.

[PASSTOKEN] (pass the **token** to the U-ASE)

- pass the received P-TOKEN-GIVE (sync-minor) ind to the U-ASE.

[QUEUE] (queue the service primitive)

- queue the service primitive received from the MACF.

[REPREQ] (Repeat AF-**REQ**UEST)

- issue the primitive that is in Acopy with the mapping parameter changed into rollbackRC.

[RESETS]

- set Acbegq, Adt, Aq and Atokr to FALSE.

[RETTOKEN] (return **token**)

Returns the *token* to the contention winner.

- if Ptok and ^Aw,
  - issue AF-TOKEN-GIVE (regular) req.

[SETCORR] (set Correlator parameter)

- set the *correlator* parameter to Adc.

[SETDIAG] (set diagnostic)

Sets the *diagnostic* parameter of the next AF- service primitive issued by the SACF.

- set the *diagnostic* parameter to “protocol-error”.

[SETLPI] (Set Last-**P**artner-**I**dentifier parameter)

- if Anfd, set the *Last-Partner-Identifier* parameter to Alpi.

A.6.5 Notational conventions

In Table A.18, the following notational conventions are used:

CFU is a predicate which is TRUE if the functional units parameter of the service primitive in the respective event column contains the Commit functional unit or the Recovery functional unit.

DC is a predicate which is the value of the *correlator* parameter of the service primitive in the respective event column.

LPI is a predicate which is the value of the *Last-Partner-Identifier* parameter of the service primitive in the respective event column.

* is used instead of a state number if as a result of a state transition the association ceases to exist.

A.7 Predicates

In addition to those variables defined in A.4.2 and A.6.2 the state tables make use of predicates which reflect some state of the local system. These predicates do not have to be initialized nor modified by the PM. Table A.12 lists such predicates.

TABLE A.12/X.862

Predicates

Name	Meaning
Pnew	**new** TPSUI
Ptok	**tok**en owned

Pnew (**new** TPSUI): When TRUE, Pnew indicates that the TPSUI is issuing its first TP-BEGIN-DIALOGUE request and that a new TPPM has been created and is to be initialized.

Ptok (**tok**en owned): When set to TRUE, Ptok indicates that the *token* is owned. This predicate is maintained outside of this Recommendation.

TABLE A.13/X.862 *(sheet 1 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control	S.C. or P.C. w/o control	S.C. or P.C. w/ control	S.C. or P.C. w/ control
Event		Dsup		^Dsh		^Dsh	^Dcr or ^Ncr ^Dl	^Dcr or ^Ncr ^Dl	Dl, ^Dsup	^Dcr Dl, ^Dsup
TP-BEGIN-DIALOGUE (No transaction branch) req	^Ldrej, Pnew [INITMACF] [INITDIASB] [VNtpsuiT] [VAtppmT] [ABDrq] 2									
	^Ldrej, ^Pnew Ntpsui, ^Ncr [INITDIASB] [VAtppmT] [ABDrq] 2									
	Ldrej, Ldunk [TBDcRPu] 1									
	Ldrej, ^Ldunk [TBDcRP] 1									
TP-BEGIN-DIALOGUE (Transaction branch) req	^Ldrej, Pnew [INITMACF] [INITDIASB] [ADDBRSB] [VNtpsuiT] [VAtppmT] [ABDrq] [CBErq] 2									
	^Ldrej, ^Pnew Ntpsui, ^Ncr ^Nt [INITDIASB] [ADDBRSB] [VAtppmT] [ABDrq] [CBErq] 2									
	Ldrej, Ldunk [TBDcRPu] 1									
	Ldrej, ^Ldunk [TBDcRP] 1									

TABLE A.13/X.862 *(sheet 2 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control	S.C. or P.C. w/o control	S.C. or P.C. w/ control	S.C. or P.C. w/ control
Event		Dsup		^Dsh		^Dsh	^Dcr or ^Ncr ^Dl	^Dcr or ^Ncr ^Dl	Dl, ^Dsup	^Dcr Dl, ^Dsup
AF-BEGIN-DIALOGUE (Dialogue fu selected, Polarized Control fu selected, Commit fu selected, No transaction branch) ind	^Ldrej [INITDIASP] [VNtpsuiT] [VAtppmT] [TBDi] 3 Ldrej [SETDIAGBD] [ABDrsRPd] [SDETrqBF] 1									
AF-BEGIN-DIALOGUE (Dialogue fu selected, Polarized Control fu selected, Commit fu not selected, No transaction branch) ind	^Ldrej [INITDIASP] [VNtpsuiT] [VAtppmT] [TBDi] 3 Ldrej [SETDIAGBD] [ABDrsRPd] [SDETrqF] 1									
AF-BEGIN-DIALOGUE (Dialogue fu selected, Shared Control fu selected, Commit fu selected, No transaction branch) ind	^Ldrej [INITDIASP] [VNtpsuiT] [VAtppmT] [TBDi] 2 Ldrej [SETDIAGBD] [ABDrsRPd] [SDETrqBF] 1									
AF-BEGIN-DIALOGUE (Dialogue fu selected, Shared Control fu selected, Commit fu not selected, No transaction branch) ind	^Ldrej [INITDIASP] [VNtpsuiT] [VAtppmT] [TBDi] 2 Ldrej [SETDIAGBD] [ABDrsRPd] [SDETrqF] 1									

TABLE A.13/X.862 *(sheet 3 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates		S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control Dl, ^Dsup	S.C. or P.C. w/ control ^Dcr Dl, ^Dsup	
Event		Dsup	^Dsh		^Dsh					
AF-BEGIN-DIALOGUE (Dialogue fu selected, Polarized Control fu selected, Transaction branch) ind or AF-BEGIN-DIALOGUE 1.1	^Ldrej [INITDIASP] [VAtppmT] [VDbegdiSAVE] 1.1							[SETDIAGTP]		
(Dialogue fu selected, Shared Control fu selected, Transaction branch) ind	Ldrej [SETDIAGBD] [ABDrsRPd] [SDETrqCB] 1									
TP-BEGIN-DIALOGUE (accepted) rsp			Dsup Ncr [DELIMIT] 2	Dsup Ncr [DELIMIT] 3		Dsup Ncr [DELIMIT] 5				
TP-BEGIN-DIALOGUE (rejected) rsp			^Du, ^Dl, Dsup ^Nrn, ^Da [ABDrsRUd] [SDETrqF] 1	^Du, ^Dl, Dsup ^Nrn, ^Da [ABDrsRUd] [SDETrqF] 1		^Du, ^Dl, Dsup ^Nrn, ^Da [ABDrsRUd] [SDETrqF] 1		Dsup ^Nrn, ^Da [ABDrsRUd] [SDETrqF] 1		
			Du, ^Dl, Dsup ^Nrn, ^Da [ABDrsRUd] [SDETrqBF] 1	Du, ^Dl, Dsup ^Nrn, ^Da [ABDrsRUd] [SDETrqBF] 1		Du, ^Dl, Dsup ^Nrn, ^Da [ABDrsRUd] [SDETrqBF] 1				
			Dl, Dsup ^Nrn, ^Da [ABDrsRUr] [SDETrqRBC] [DELBR] 1	Dl, Dsup ^Nrn, ^Da [ABDrsRUr] [SDETrqRBC] [DELBR] 1		Dl, Dsup ^Nrn, ^Da [ABDrsRUr] [SDETrqRBC] [DELBR] 1				
AF-BEGIN-DIALOGUE (accepted, dataRI) cnf			^Dsup Dcr [TBDcX] [VDcrF] [VDaT] 2	^Dsup Dcr [TBDcX] [VDcrF] [VDaT] 3	^Dsup Dcr [TBDcX] [VDcrF] [VDaT] 4				^Dsup Dcr [TBDcX] [VDcrF] [VDaT] 15	
			^Dsup ^Dcr [VDaT] 2	^Dsup ^Dcr [VDaT] 3	^Dsup ^Dcr [VDaT] 4		^Dsup [VDaT] 11		^Dsup ^Dcr [VDaT] 15	[VDaT] 20.1

TABLE A.13/X.862 *(sheet 4 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr	S.C. or P.C. w/o control ^Dcr or ^Ncr	S.C. or P.C. w/ control	S.C. or P.C. w/ control ^Dcr
Event		Dsup		^Dsh		^Dsh	^Dl	^Dl	Dl, ^Dsup	Dl, ^Dsup
AF-BEGIN-DIALOGUE (rejected(provider), dataRI) cnf			^Dl, ^Dsup [TBDcX] [SDETrqF] 1	^Dl, ^Dsup [TBDcX] [SDETrqF] 1	^Dl, ^Dsup [TBDcX] [SDETrqF] 1		^Dsup [TBDcX] [SDETrqF] 1			
			Dl, ^Dsup [TBDcX] [SDETrqRB] [ABDET] [DELBRANCH] 25	Dl, ^Dsup [TBDcX] [SDETrqRB] [ABDET] [DELBRANCH] 25	Dl, ^Dsup [TBDcX] [SDETrqRB] [ABDET] [DELBRANCH] 25				[TBDcX] [SDETrqRB] [ABDET] [DELBRANCH] 25	[TBDcXr] [SDETrqRB] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2
AF-BEGIN-DIALOGUE (rejected(user), dataRI) cnf			^Dl, ^Dsup [TBDcX] [SDETrqF] 1	^Dl, ^Dsup [TBDcX] [SDETrqF] 1	^Dl, ^Dsup [TBDcX] [SDETrqF] 1		^Dsup [TBDcX] [SDETrqF] 1			
			Du, Dl, ^Dsup [TBDcX] [SDETrqRB] [ABDET] [DELBRANCH] 25	Du, Dl, ^Dsup [TBDcX] [SDETrqRB] [ABDET] [DELBRANCH] 25	Du, Dl, ^Dsup [TBDcX] [SDETrqRB] [ABDET] [DELBRANCH] 25				Du [TBDcX] [SDETrqRB] [ABDET] [DELBRANCH] 25	Du [TBDcXr] [SDETrqRB] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2
AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) cnf			Dl, ^Dsup [TBDcX] [CRBrs] [SDETrqF] [ABDET] [DELBRANCH] 25	Dl, ^Dsup [TBDcX] [CRBrs] [SDETrqF] [ABDET] [DELBRANCH] 25	Dl, ^Dsup [TBDcX] [CRBrs] [SDETrqF] [ABDET] [DELBRANCH] 25				[TBDcX] [CRBrs] [SDETrqF] [ABDET] [DELBRANCH] 25	[TBDcXr] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2
SAF-ASSOCIATION-LOST ind			^Dl [TBDcRP] 1	^Dl [TBDcRP] 1	^Dl [TBDcRP] 1		[TBDcRP] 1			
			Dl [TBDcRP] [ABDET] [DELBRANCH] 25	Dl [TBDcRP] [ABDET] [DELBRANCH] 25	Dl [TBDcRP] [ABDET] [DELBRANCH] 25				[TBDcRP] [ABDET] [DELBRANCH] 25	[TBDcRPr] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2

TABLE A.13/X.862 *(sheet 5 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control	S.C. or P.C. w/ control ^Dcr
Event		Dsup		^Dsh		^Dsh			Dl, ^Dsup	Dl, ^Dsup
TP-END-DIALOGUE (confirmation = FALSE) req			^Du, ^Dl, Dsup ^Ncr [DELIMIT] [AEDrq] [SDETrqF] 1		Dsh, Du, ^Dl, Dsup [AEDrq] [SDETrqF] 1					
			Du, ^Dl, Dsup ^Ncr [DELIMIT] [AEDrq] [SDETrqBF] 1		Dsh, Du, ^Dl, Dsup [AEDrq] [SDETrqBF] 1					
			^Dl, ^Dsup ^Dcr [AEDrq] [SDETrqF] 1		Dsh, ^Dl, ^Dsup ^Dcr [AEDrq] [SDETrqF] 1					
TP-END-DIALOGUE (confirmation = TRUE) req			^Dl, Dsup ^Ncr [DELIMIT] [AEDrq] 11		Dsh, ^Dl, Dsup ^Ncr [AEDrq] 11					
			^Dl, ^Dsup ^Dcr [AEDrq] 11		Dsh, ^Dl, ^Dsup ^Dcr [AEDrq] 11					
AF-END-DIALOGUE (confirmation = FALSE) ind			Dsh, ^Dl, Dsup ^Ncr [TEDi] [SDETrqF] 1	^Dl, Dsup ^Ncr [TEDi] [SDETrqF] 1	^Dl, Dsup ^Ncr [TEDi] [SDETrqF] 1		Dsh [TEDi] [SDETrqF] 1			
			Dsh, ^Dl, ^Dsup ^Dcr [TEDi] [SDETrqF] 1	^Dl, ^Dsup ^Dcr [TEDi] [SDETrqF] 1	^Dl, ^Dsup ^Dcr [TEDi] [SDETrqF] 1					
			Dsh, Dx [TPABiBTED] [SDETrqRB] [ABDET] [DELBRANCH] 25		Dsh, Dx [TPABiBTED] [SDETrqRB] [ABDET] [DELBRANCH] 25				Dsh, Dx [TPABiBTED] [SDETrqRB] [ABDET] [DELBRANCH] 25	Dsh, Dx [TPABiBTEDr] [SDETrqRB] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2

TABLE A.13/X.862 *(sheet 6 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control	S.C. or P.C. w/ control ^Dcr
Event		Dsup		^Dsh		^Dsh			Dl, ^Dsup	Dl, ^Dsup
AF-END-DIALOGUE (confirmation = TRUE) ind			Dsh, ^Dl, Dsup ^Ncr [TEDi] 12	^Dl, Dsup ^Ncr [TEDi] 12	Dsh, ^Dl Denb=1 [DECDENB] 2		Dsh Denb=0 [TPABiED] [SDETrqF] 1		Dsh, Dx Denbb=0 [TPABiBTED] [SDETrqRB] [ABDET] [DELBRANCH] 25	Dsh, Dx Denbb=0 [TPABiBTEDr] [SDETrqRB] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2
			Dsh, ^Dl, ^Dsup ^Dcr [TEDi] 12	^Dl, ^Dsup ^Dcr [TEDi] 12	Dsh, ^Dl Denb>1 [DECDENB] 4		Dsh Denb>0 [DECDENB] 11			
			Dsh, Dx [TPABiBTED] [SDETrqRB] [ABDET] [DELBRANCH] 25		Dsh, Dx Denbb=0 [TPABiBTED] [SDETrqRB] [ABDET] [DELBRANCH] 25				Du, Dsh ^Dcr, ^Dbcr Denbb>0 [DECDENB] 15	Du, Dsh ^Dbcr Denbb>0 [DECDENB] 20.1
					Dsh, Dx Denbb>0 [DECDENB] 4					
					^Dsh, ^Dl [TEDi] 2					
TP-END-DIALOGUE rsp								[DELIMIT] [AEDrs] [SDETrqF] 1		
AF-END-DIALOGUE cnf							[TEDc] [SDETrqF] 1			

TABLE A.13/X.862 *(sheet 7 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control	S.C. or P.C. w/ control ^Dcr
Event		Dsup		^Dsh		^Dsh			Dl, ^Dsup	Dl, ^Dsup
TP-U-ERROR req			Dsh, Dsup ^Ncr [DELIMIT] [AUErq] [VDenbINC] 4		Dsh, Dsup [AUErq] [VDenbINC] 4			[DELIMIT] [AUErq] 2		
			Dsh, ^Dsup [AUErq] [VDenbINC] 4		Dsh, ^Dsup [AUErq] [VDenbINC] 4					
			^Dsh, Dsup ^Ncr [DELIMIT] [AUErq] 2	Dsup ^Ncr [DELIMIT] [AUErq] 4						
			^Dsh, ^Dsup [AUErq] 2	^Dsup [AUErq] 4						
AF-U-ERROR ind			Dsh, Dsup ^Da [TUEi] [VDepnbINC] 2		Dsh, Dsup [TUEi] [AUErs] 4		Dsh Denb=0 [TUEi] 2			
			Dsh, Dsup Da [TUEi] [AUErs] 2				Dsh Denb>0 [TUEi] 4			
			Dsh, ^Dsup ^Dcr [TUEi] [AUErs] 2		Dsh, ^Dsup ^Dcr [TUEi] [AUErs] 4					
			^Dsh, Dsup [TUEi] 5	Dsup [TUEi] 3	^Dsh, Dsup 4		^Dsh [TUEi]			
			^Dsh, ^Dsup ^Dcr [TUEi] 5	^Dsup ^Dcr [TUEi] 3	^Dsh, ^Dsup ^Dcr 4		3		^Dcr [TRBi] [INITRB] [OWEDONE] 15	[TRBi] [INITRB] [OWEDONE] 20.1

TABLE A.13/X.862 *(sheet 8 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control	S.C. or P.C. w/o control	S.C. or P.C. w/ control	S.C. or P.C. w/ control
Event		Dsup		^Dsh		^Dsh	^Dcr or ^Ncr ^Dl	^Dcr or ^Ncr ^Dl	Dl, ^Dsup	^Dcr Dl, ^Dsup
AF-U-ERROR cnf					Dsh Denb=1 [DECDENB] 2		Dsh Denb>0 [DECDENB] 11		Dsh Denb>0 [DECDENB] 15	Dsh Denb>0 [DECDENB] 20.1
					Dsh Denb>1 [DECDENB] 4					
TP-U-ABORT req			^Du, ^Dl, Dsup ^Ncr [DELIMIT] [AABrqUd] [SDETrqF] 1	^Du, ^Dl, Dsup ^Ncr [DELIMIT] [AABrqUd] [SDETrqF] 1	^Du, ^Dl, Dsup [AABrqUd] [SDETrqF] 1	^Du, ^Dl, Dsup ^Ncr [DELIMIT] [AABrqUd] [SDETrqF] 1	^Du, Dsup [AABrqUd] [SDETrqF] 1	^Du, Dsup [DELIMIT] [AABrqUd] [SDETrqF] 1		
			Du, ^Dl, Dsup ^Ncr [DELIMIT] [AABrqUd] [SDETrqBF] 1	Du, ^Dl, Dsup ^Ncr [DELIMIT] [AABrqUd] [SDETrqBF] 1	Du, ^Dl, Dsup [AABrqUd] [SDETrqBF] 1	Du, ^Dl, Dsup ^Ncr [DELIMIT] [AABrqUd] [SDETrqBF] 1	Du, Dsup [AABrqUd] [SDETrqBF] 1	Du, Dsup [DELIMIT] [AABrqUd] [SDETrqBF] 1		
			^Dl, ^Dsup [AABrqUd] [SDETrqF] 1	^Dl, ^Dsup [AABrqUd] [SDETrqF] 1	^Dl, ^Dsup [AABrqUd] [SDETrqF] 1	^Dl, ^Dsup [AABrqUd] [SDETrqF] 1	^Dsup [AABrqUd] [SDETrqF] 1	^Dsup [AABrqUd] [SDETrqF] 1		
			Dl, Dsup ^Ncr [DELIMIT] [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 2	Dl, Dsup ^Ncr [DELIMIT] [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 3	Dl, Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 4	Dl, Dsup ^Ncr [DELIMIT] [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 5				
			Dl, ^Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 2	Dl, ^Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 3	Dl, ^Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 4	Dl, ^Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 5			[ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 15	

TABLE A.13/X.862 *(sheet 9 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control	S.C. or P.C. w/o control	S.C. or P.C. w/ control	S.C. or P.C. w/ control
Event		Dsup		^Dsh		^Dsh	^Dcr or ^Ncr ^Dl	^Dcr or ^Ncr ^Dl	Dl, ^Dsup	^Dcr Dl, ^Dsup
AF-ABORT (user, dataRI) ind			^Dl, Dsup [TUABi] [SDETrqF] 1	^Dl, Dsup [TUABi] [SDETrqF] 1	^Dl, Dsup [TUABi] [SDETrqF] 1	^Dl [TUABi] [SDETrqF] 1	[TUABi] [SDETrqF] 1	[TUABi] [SDETrqF] 1		
			^Dl, ^Dsup ^Dcr [TUABi] [SDETrqF] 1	^Dl, ^Dsup ^Dcr [TUABi] [SDETrqF] 1	^Dl, ^Dsup ^Dcr [TUABi] [SDETrqF] 1					
			Dl, ^Dsup ^Dcr, ^Dbcr [TUABi] [SDETrqRB] [ABDET] [DELBRANCH] 25	Dl, ^Dsup ^Dcr, ^Dbcr [TUABi] [SDETrqRB] [ABDET] [DELBRANCH] 25	Dl, ^Dsup ^Dcr, ^Dbcr [TUABi] [SDETrqRB] [ABDET] [DELBRANCH] 25	Dl, ^Dsup ^Dbcr [TUABi] [SDETrqRB] [ABDET] [DELBRANCH] 25			^Dcr, ^Dbcr [TUABi] [SDETrqRB] [ABDET] [DELBRANCH] 25	^Dbcr [TUABiR] [SDETrqRB] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2

Superseded by a more recent version

TABLE A.13/X.862 *(sheet 10 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates Event		Dsup	S.C. or P.C. w/ control	P.C. w/o control ^Dsh	S.C. or P.C. w/o control	P.C. w/ control ^Dsh	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control Dl, ^Dsup	S.C. or P.C. w/ control ^Dcr Dl, ^Dsup
AF-ABORT (provider, abortRI) ind or A-ABORT ind or A-ABORT req or A-P-ABORT ind or A-RELEASE (result = affirmative) rsp or A-RELEASE (result = affirmative) cnf		1	^Dl [SETDIAGTP] [TPABi] 1	^Dl [SETDIAGTP] [TPABi] 1	^Dl [SETDIAGTP] [TPABi] 1	^Dl [SETDIAGTP] [TPABi] 1	[SETDIAGTP] [TPABi] 1	[SETDIAGTP] [TPABi] 1		
			Dl, Dsup Ncr [SETDIAGTP] [TPABi] 1	Dl, Dsup Ncr [SETDIAGTP] [TPABi] 1		Dl, Dsup Ncr [SETDIAGTP] [TPABi] 1				
			Dl, Dsup ^Ncr [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dl, Dsup ^Ncr [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dl, Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dl, Dsup ^Ncr [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8				
			Dl, ^Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2			[SETDIAGTP] [TPABiR] [THRiH] [LOGDAMH] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	[SETDIAGTP] [TPABiR] [THRiH] [LOGDAMH] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2

Superseded by a more recent version

TABLE A.13/X.862 *(sheet 11 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END- DIALOGUE (conf=TRUE) req issued	AF-END- DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates Event		Dsup	S.C. or P.C. w/ control	P.C. w/o control ^Dsh	S.C. or P.C. w/o control	P.C. w/ control ^Dsh	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control Dl, ^Dsup	S.C. or P.C. w/ control ^Dcr Dl, ^Dsup
Protocol error or Internal error		[SETDIAG] [AABrqPa] 1	^Dl [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1	^Dl [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1	^Dl [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1	^Dl [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1	[SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1	[SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1		
			Dl, Dsup Ncr [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1	Dl, Dsup Ncr [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1		Dl, Dsup Ncr [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1				
			Dl, Dsup ^Ncr [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dl, Dsup ^Ncr [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dl, Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dl, Dsup ^Ncr [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8				
			Dl, ^Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2			[SETDIAGTP] [TPABiR] [THRiH] [LOGDAMH] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	[SETDIAGTP] [TPABiR] [THRiH] [LOGDAMH] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2
TP-GRANT-CONTROL req			^Dsh, Dsup ^Ncr [DELIMIT] [AGCrq] 3			Dsup ^Ncr [DELIMIT] [AGCrq] 3				
			^Dsh, ^Dsup [AGCrq] 3			^Dsup [AGCrq] 3				

TABLE A.13/X.862 *(sheet 12 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control	S.C. or P.C. w/ control ^Dcr
Event		Dsup		^Dsh		^Dsh			Dl, ^Dsup	Dl, ^Dsup
AF-GRANT-CONTROL ind				Dsup [TGCi] 2	^Dsh, Dsup [TGCi] 2					
				^Dsup ^Dcr [TGCi] 2	^Dsh, ^Dsup ^Dcr [TGCi] 2					
TP-REQUEST-CONTROL req				Dsup ^Ncr [DELIMIT] [ARCrq] 3						
				^Dsup [ARCrq] 3						
AF-REQUEST-CONTROL ind			^Dsh, Dsup [TRCi] 2		^Dsh		^Dsh			
			^Dsh, ^Dsup ^Dcr [TRCi] 2	3	4		11		^Dsh ^Dcr 15	^Dsh 20.1
TP-HANDSHAKE req			Dh, Dsup ^Ncr [DELIMIT] [AHSrq] 6		Dh, Dsh, Dsup [AHSrq] 6					
			Dh, ^Dsup [AHSrq] 6		Dh, Dsh, ^Dsup [AHSrq] 6					

TABLE A.13/X.862 *(sheet 13 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control	S.C. or P.C. w/ control ^Dcr
Event		Dsup		^Dsh		^Dsh			Dl, ^Dsup	Dl, ^Dsup
AF-HANDSHAKE ind			Dh, Dsh, Dsup [THSi] 7	Dh, Dsup [THSi] 7	Dh, Dsh, Dsup Denb=1 [DECDENB] 2		Dh, Dsh Denb=0 [THSi] 10			
					Dh, Dsh, Dsup Denb>1 [DECDENB] 4		Dh, Dsh Denb>0 [DECDENB] 11			
					Dh, ^Dsh, Dsup [THSi] 2					
			Dh, Dsh, ^Dsup ^Dcr [THSi] 7	Dh, ^Dsup ^Dcr [THSi] 7	Dh, Dsh, ^Dsup ^Dcr Denb=1 [DECDENB] 2				Dsh ^Dcr [TRBi] [INITRB] [OWEDONE] 15	Dsh [TRBi] [INITRB] [OWEDONE] 20.1
					Dh, Dsh, ^Dsup ^Dcr Denb>1 [DECDENB] 4					
					Dh, ^Dsh, ^Dsup ^Dcr [THSi] 2					
TP-HANDSHAKE-AND-GRANT-CONTROL req			Dh, ^Dsh, Dsup ^Ncr [DELIMIT] [AHSGCrq] 13							
			Dh, ^Dsh, ^Dsup [AHSGCrq] 13							
AF-HANDSHAKE-AND-GRANT-CONTROL ind				Dh, Dsup [THSGCi] 14	Dh, ^Dsh, Dsup [THSGCi] 2					
				Dh, ^Dsup ^Dcr [THSGCi] 14	Dh, ^Dsh, ^Dsup ^Dcr [THSGCi] 2					

TABLE A.13/X.862 *(sheet 14 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control	S.C. or P.C. w/ control ^Dcr
Event		Dsup		^Dsh		^Dsh			Dl, ^Dsup	Dl, ^Dsup
TP-BEGIN-TRANSACTION req			Du, ^Dl, ^Dsup ^Nt, ^Da [ADDBRSB] [BEGTRANS] [CBErq] 2		Du, Dsh, ^Dl, ^Dsup ^Nt, ^Da [ADDBRSB] [BEGTRANS] [CBErq] 4					
			Du, ^Dl, ^Dsup ^Nt, Ptok, Da [ADDBRSB] [BEGTRANS] [CBErq] 2		Du, Dsh, ^Dl, ^Dsup ^Nt, Ptok, Da [ADDBRSB] [BEGTRANS] [CBErq] 4					
C-BEGIN ind		Dsh [TBDiSAVE] [ADDBRSP] [VNtpsuiT] 2	Du, Dsh, ^Dl, Dsup Nr [TPABiBTR] [AABrqPrTR] [SDETrqRBC] 1	Du, ^Dl, Dsup Nr [TPABiBTR] [AABrqPrTR] [SDETrqRBC] 1	Du, ^Dl, Dsup Nr [TPABiBTR] [AABrqPrTR] [SDETrqRBC] 1		Du, Dsh, Dsup [TPABiBTED] [CRBrq] [SDETrqRBC] 1			
		^Dsh [TBDiSAVE] [ADDBRSP] [VNtpsuiT] 3	Du, Dsh, ^Dl, Dsup ^Nr [TBTi] [ADDBRSP] 2	Du, ^Dl, Dsup ^Nr [TBTi] [ADDBRSP] 3	Du, ^Dl, Dsup ^Nr [TBTi] [ADDBRSP] 4					
C-BEGIN cnf			Dl, ^Dsup [VDbcrT] [VDxF] 2	Dl, ^Dsup [VDbcrT] [VDxF] 3	Dl, ^Dsup [VDbcrT] [VDxF] 4	Dl, ^Dsup [VDbcrT] [VDxF] 5			[VDbcrT] [VDxF] 15	[VDbcrT] [VDxF] 20.1
TP-DATA req			Dsup ^Ncr [DELIMIT] [UASErq] 2		Dsh, Dsup [UASErq] 4					
			^Dsup [UASErq] 2		Dsh, ^Dsup [UASErq] 4					

TABLE A.13/X.862 *(sheet 15 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control	S.C. or P.C. w/ control ^Dcr
Event		Dsup		^Dsh		^Dsh			Dl, ^Dsup	Dl, ^Dsup
U-ASE ind			Dsh, Dsup [TDTi] 2	Dsup [TDTi] 3			Dsh Denb=0 [TDTi] 11			
			Dsh, ^Dsup ^Dcr [TDTi] 2	^Dsup ^Dcr [TDTi] 3	4		Dsh Denb>0 11		Dsh ^Dcr [TDTi] 15	Dsh [TRBi] [INITRB] [OWEDONE] 20.1
									^Dsh ^Dcr, Ddp [TDTi] 15	^Dsh Ddp [TRBi] [INITRB] [OWEDONE] 20.1
TP-DEFERRED-END-DIALOGUE req			Dl, ^Dsup ^De ^Lddef [ADErq] [VDeT] 2		Dsh, Dl, ^Dsup ^De ^Lddef [ADErq] [VDeT] 4					
			Dl, ^Dsup ^De Lddef [VDdefT] [VDeT] 2		Dsh, Dl, ^Dsup ^De Lddef [VDdefT] [VDeT] 4					
TP-DEFERRED-GRANT-CONTROL req			^Dsh, Dl, ^Dsup ^Dg, ^De ^Lddef [ADGrq] [VDgT] 2							
			^Dsh, Dl, ^Dsup ^Dg, ^De Lddef [VDdefT] [VDgT] 2							
AF-DEFER (end-dialogue) ind			Dsh, Dl, Dsup ^De [TDEi] [VDeT] 2	Dl, Dsup ^De [TDEi] [VDeT] 3	Dl, Dsup ^De [TDEi] [VDeT] 4					

TABLE A.13/X.862 *(sheet 16 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control	S.C. or P.C. w/ control ^Dcr
Event		Dsup		^Dsh		^Dsh			Dl, ^Dsup	Dl, ^Dsup
AF-DEFER (grant-control) ind				Dl, Dsup ^Dg, ^De [TDGi] [VDgT] 3	^Dsh, Dl, Dsup ^Dg, ^De [TDGi] [VDgT] 4					
TP-PREPARE req			Dsh, Dl, Nr ^Ddef [APRrq] [VDpsT] 15		Dsh, Dl, Nr ^Ddef [APRrq] [VDpsT] 15					
			Dsh, Dl, Nr Ddef [DEFREQ] [APRrq] [VDpsT] 15		Dsh, Dl, Nr Ddef [DEFREQ] [APRrq] [VDpsT] 15					
			Dsh, Dl, ^Dsup Ni, Np ^Ddef [APRrq] [VDpsT] 15		Dsh, Dl, ^Dsup Ni, Np ^Ddef [APRrq] [VDpsT] 15					
			Dsh, Dl, ^Dsup Ni, Np Ddef [DEFREQ] [APRrq] [VDpsT] 15		Dsh, Dl, ^Dsup Ni, Np Ddef [DEFREQ] [APRrq] [VDpsT] 15					

TABLE A.13/X.862 *(sheet 17 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control	S.C. or P.C. w/o control	S.C. or P.C. w/ control	S.C. or P.C. w/ control
Event		Dsup		^Dsh		^Dsh	^Dcr or ^Ncr ^Dl	^Dcr or ^Ncr ^Dl	Dl, ^Dsup	^Dcr Dl, ^Dsup
TP-PREPARE (data-permitted = FALSE) req			^Dsh, Dl, Nr ^Ddef [APRrq] [VDpsT] 15							
			^Dsh, Dl, Nr Ddef [DEFREQ] [APRrq] [VDpsT] 15							
			^Dsh, Dl, ^Dsup Ni, Np ^Ddef [APRrq] [VDpsT] 15							
			^Dsh, Dl, ^Dsup Ni, Np Ddef [DEFREQ] [APRrq] [VDpsT] 15							

TABLE A.13/X.862 *(sheet 18 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control	S.C. or P.C. w/o control	S.C. or P.C. w/ control	S.C. or P.C. w/ control
Event		Dsup		^Dsh		^Dsh	^Dcr or ^Ncr ^Dl	^Dcr or ^Ncr ^Dl	Dl, ^Dsup	^Dcr Dl, ^Dsup
TP-PREPARE (data-permitted = TRUE) req			^Dsh, Dl, Nr ^Ddef [APRrq] [VDdpT] [VDpsT] 15							
			^Dsh, Dl, Nr Ddef [DEFREQ] [APRrq] [VDdpT] [VDpsT] 15							
			^Dsh, Dl, ^Dsup Ni, Np ^Ddef [APRrq] [VDdpT] [VDpsT] 15							
			^Dsh, Dl, ^Dsup Ni, Np Ddef [DEFREQ] [APRrq] [VDdpT] [VDpsT] 15							

TABLE A.13/X.862 *(sheet 19 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control	S.C. or P.C. w/ control ^Dcr
Event		Dsup		^Dsh		^Dsh			Dl, ^Dsup	Dl, ^Dsup
TP-COMMIT req			Dl, Nr ^Dcr, ^Ddef [PREPREQ] [COUNTRDY] [VNtT] [VDpsT] 20.1		Dsh, Dl, Nr ^Dcr, ^Ddef [PREPREQ] [COUNTRDY] [VNtT] [VDpsT] 20.1				^Dcr [COUNTRDY] [VNtT] 20.1	
			Dl, Nr ^Dcr, Ddef [DEFREQ] [PREPREQ] [COUNTRDY] [VNtT] [VDpsT] 20.1		Dsh, Dl, Nr ^Dcr, Ddef [DEFREQ] [PREPREQ] [COUNTRDY] [VNtT] [VDpsT] 20.1					
			Dl, ^Dsup Ni, Np ^Dcr, ^Ddef [PREPREQ] [COUNTRDY] [VNtT] [VDpsT] 20.1		Dsh, Dl, ^Dsup Ni, Np ^Dcr, ^Ddef [PREPREQ] [COUNTRDY] [VNtT] [VDpsT] 20.1					
			Dl, ^Dsup Ni, Np ^Dcr, Ddef [DEFREQ] [PREPREQ] [COUNTRDY] [VNtT] [VDpsT] 20.1		Dsh, Dl, ^Dsup Ni, Np ^Dcr, Ddef [DEFREQ] [PREPREQ] [COUNTRDY] [VNtT] [VDpsT] 20.1					
AF-PREPARE ind			Dsh, Dl, Dsup [TPRi] [VNpT] 18		Dsh, Dl, Dsup [TRBi] [INITRB] [OWEDONE] 4					
AF-PREPARE (data-permitted = FALSE) ind				Dl, Dsup [TPRi] [VNpT] 18	^Dsh, Dl, Dsup [TRBi] [INITRB] [OWEDONE] 4					

TABLE A.13/X.862 *(sheet 20 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control	S.C. or P.C. w/ control ^Dcr
Event		Dsup		^Dsh		^Dsh			Dl, ^Dsup	Dl, ^Dsup
AF-PREPARE (data-permitted = TRUE) ind				Dl, Dsup [TPRi] [VNpT] [VDdpT] 18	^Dsh, Dl, Dsup [TRBi] [INITRB] [OWEDONE] 4					
C-READY ind									^Dcr [TRYi] [COUNTRDY] 17	[COUNTRDY] 20.2
TP-ROLLBACK req			Dl, Dsup ^Ncr, ^Nfrb [INITRB] [OWEDONE] [VDaT] 23.3	Dl, Dsup ^Ncr, ^Nfrb [INITRB] [OWEDONE] [VDaT] 23.3	Dl, Dsup ^Nfrb [INITRB] [OWEDONE] 23.3	Dl, Dsup ^Ncr, ^Nfrb [INITRB] [OWEDONE] [VDaT] 23.3				
			Dl, Dsup ^Ncr, Nfrb [VDaT] 23.3	Dl, Dsup ^Ncr, Nfrb [VDaT] 23.3	Dl, Dsup Nfrb 23.3	Dl, Dsup ^Ncr, Nfrb [VDaT] 23.3				
			Dl, ^Dsup ^Nfrb [RBREQ] [INITRB] [OWEDONE] 23.1	Dl, ^Dsup ^Nfrb [RBREQ] [INITRB] [OWEDONE] 23.1	Dl, ^Dsup ^Nfrb [RBREQ] [INITRB] [OWEDONE] 23.1	Dl, ^Dsup ^Nfrb [RBREQ] [INITRB] [OWEDONE] 23.1			^Nfrb [RBREQ] [INITRB] [OWEDONE] 23.1	
			Nfrb, Dl, ^Dsup [RBREQ] 23.1	Nfrb, Dl, ^Dsup [RBREQ] 23.1	Nfrb, Dl, ^Dsup [RBREQ] 23.1	Nfrb, Dl, ^Dsup [RBREQ] 23.1			Nfrb [RBREQ] 23.1	

TABLE A.13/X.862 *(sheet 21 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control	S.C. or P.C. w/o control	S.C. or P.C. w/ control	S.C. or P.C. w/ control
Event		Dsup		^Dsh		^Dsh	^Dcr or ^Ncr ^Dl	^Dcr or ^Ncr ^Dl	Dl, ^Dsup	^Dcr Dl, ^Dsup
C-ROLLBACK ind			Dl, Dsup [TRBi] [INITRB] [OWEDONE] 23.4	Dl, Dsup [TRBi] [INITRB] [OWEDONE] 23.4	Dl, Dsup [TRBi] [INITRB] [OWEDONE] 23.4	Dl, Dsup [TRBi] [INITRB] [OWEDONE] 23.4				
			^Du, Dl, ^Dsup ^Dcr [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2	^Du, Dl, ^Dsup ^Dcr [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2	^Du, Dl, ^Dsup ^Dcr [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2	^Du, Dl, ^Dsup [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2			^Du ^Dcr [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2	^Du [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2
			Du, Dl, ^Dsup ^Dcr [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2	Du, Dl, ^Dsup ^Dcr [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2	Du, Dl, ^Dsup ^Dcr [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2	Du, Dl, ^Dsup [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2			Du ^Dcr [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2	Du [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2
AF-HEURISTIC-REPORT (rollbackRI) ind									^Du, ^Dcr [TRBi] [THRi] [LOGDAM] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2	^Du [TRBi] [THRi] [LOGDAM] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2
									Du, ^Dcr [TRBi] [THRi] [LOGDAM] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2	Du [TRBi] [THRi] [LOGDAM] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2

TABLE A.13/X.862 *(sheet 22 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates Event		Dsup	S.C. or P.C. w/ control	P.C. w/o control ^Dsh	S.C. or P.C. w/o control	P.C. w/ control ^Dsh	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control Dl, ^Dsup	S.C. or P.C. w/ control ^Dcr Dl, ^Dsup
AF-ABORT (provider, rollbackRI) ind			Du, Dl, ^Dsup ^Dbcr [TPABiR] [CRBrs] [SDETrqF] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2	Du, Dl, ^Dsup ^Dbcr [TPABiR] [CRBrs] [SDETrqF] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2	Du, Dl, ^Dsup ^Dbcr [TPABiR] [CRBrs] [SDETrqF] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2	Du, Dl, ^Dsup ^Dbcr [TPABiR] [CRBrs] [SDETrqF] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2			Du ^Dbcr [TPABiR] [CRBrs] [SDETrqF] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2	Du ^Dbcr [TPABiR] [CRBrs] [SDETrqF] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2
AF-ABORT (user, rollbackRI) ind			Dl, Dsup ^Ncr [TUABiR] [ABPTNR] [NOTCHAIN] [INITRB] [OWEDONE] 23.4	Dl, Dsup ^Ncr [TUABiR] [ABPTNR] [NOTCHAIN] [INITRB] [OWEDONE] 23.4	Dl, Dsup [TUABiR] [ABPTNR] [NOTCHAIN] [INITRB] [OWEDONE] 23.4	Dl, Dsup ^Ncr [TUABiR] [ABPTNR] [NOTCHAIN] [INITRB] [OWEDONE] 23.4				
			Dl, Dsup Ncr [TUABi] [CRBrs] [SDETrqF] [DELBR] 1	Dl, Dsup Ncr [TUABi] [CRBrs] [SDETrqF] [DELBR] 1		Dl, Dsup Ncr [TUABi] [CRBrs] [SDETrqF] [DELBR] 1				
			Dl, ^Dsup ^Dcr [TUABiR] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup ^Dcr [TUABiR] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup ^Dcr [TUABiR] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [TUABiR] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2			^Dcr [TUABiR] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	[TUABiR] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2

TABLE A.13/X.862 *(sheet 23 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control	S.C. or P.C. w/o control	S.C. or P.C. w/ control	S.C. or P.C. w/ control
Event		Dsup		^Dsh		^Dsh	^Dcr or ^Ncr ^Dl	^Dcr or ^Ncr ^Dl	Dl, ^Dsup	^Dcr Dl, ^Dsup
AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) ind									^Dcr [TUABiR] [THRi] [LOGDAM] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	[TUABiR] [THRi] [LOGDAM] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2
CAF-RECOVER (ready) ind									[CREsU] [SETTOKX] [CAFDETrqF] [DIALOGUE] [TPABiR] [THRiH] [LOGDAMH] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	[CREsU] [SETTOKX] [CAFDETrqF] [DIALOGUE] [TPABiR] [THRiH] [LOGDAMH] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2

TABLE A.13/X.862 *(sheet 24 of 24)*

Dialogue

State	1	1.1	2	3	4	5	11	12	15	20.1
	Dialogue does not exist	C-BEGIN ind awaited	Data transfer	Data transfer	AF-U-ERROR req issued	AF-U-ERROR ind rcv'd	AF-END-DIALOGUE (conf=TRUE) req issued	AF-END-DIALOGUE (conf=TRUE) ind rcv'd	TP-PREPARE req issued C-READY ind awaited	TP-COMMIT req rcv'd C-READY ind awaited
Predicates			S.C. or P.C. w/ control	P.C. w/o control	S.C. or P.C. w/o control	P.C. w/ control	S.C. or P.C. w/ control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/o control ^Dcr or ^Ncr ^Dl	S.C. or P.C. w/ control	S.C. or P.C. w/ control ^Dcr
Event		Dsup		^Dsh		^Dsh			Dl, ^Dsup	Dl, ^Dsup
Rollback-by-TPPM			Dl, Dsup ^Ncr, ^Nfrb [TRBi] [INITRB] [OWEDONE] 23.3	Dl, Dsup ^Ncr, ^Nfrb [TRBi] [INITRB] [OWEDONE] 23.3	Dl, Dsup ^Nfrb [TRBi] [INITRB] [OWEDONE] 23.3	Dl, Dsup ^Ncr, ^Nfrb [TRBi] [INITRB] [OWEDONE] 23.3				
			Dl, Dsup ^Ncr, Nfrb 23.3	Dl, Dsup ^Ncr, Nfrb 23.3	Dl, Dsup Nfrb 23.3	Dl, Dsup ^Ncr, Nfrb 23.3				
			Dl, ^Dsup ^Nfrb [TRBi] [RBREQ] [INITRB] [OWEDONE] 23.1	Dl, ^Dsup ^Nfrb [TRBi] [RBREQ] [INITRB] [OWEDONE] 23.1	Dl, ^Dsup ^Nfrb [TRBi] [RBREQ] [INITRB] [OWEDONE] 23.1	Dl, ^Dsup ^Nfrb [TRBi] [RBREQ] [INITRB] [OWEDONE] 23.1			^Nfrb [TRBi] [RBREQ] [INITRB] [OWEDONE] 23.1	^Nfrb [TRBi] [RBREQ] [INITRB] [OWEDONE] 23.1
			Dl, ^Dsup Nfrb [RBREQ] 23.1	Dl, ^Dsup Nfrb [RBREQ] 23.1	Dl, ^Dsup Nfrb [RBREQ] 23.1	Dl, ^Dsup Nfrb [RBREQ] 23.1			Nfrb [RBREQ] 23.1	Nfrb [RBREQ] 23.1
Rollback-all			Dsup 23.3	Dsup 23.3	Dsup 23.3	Dsup 23.3				
			^Dsup [RBREQ] 23.1	^Dsup [RBREQ] 23.1	^Dsup [RBREQ] 23.1	^Dsup [RBREQ] 23.1			[RBREQ] 23.1	[RBREQ] 23.1

TABLE A.14/X.862 *(sheet 1 of 13)*

Handshake

State	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates	P.C. or S.C.	P.C. or S.C.	S.C.	S.C. ^Dl	S.C. ^Dl	P.C.	P.C.
Event							
TP-BEGIN-DIALOGUE (accepted) rsp		Dsup Ncr [DELIMIT] 7					Dsup Ncr [DELIMIT] 14
TP-BEGIN-DIALOGUE (rejected) rsp		^Du, ^Dl, Dsup ^Nrn, ^Da [ABDrsRUd] [SDETrqF] 1					^Du, ^Dl, Dsup ^Nrn, ^Da [ABDrsRUd] [SDETrqF] 1
		Du, ^Dl, Dsup ^Nrn, ^Da [ABDrsRUd] [SDETrqBF] 1					Du, ^Dl, Dsup ^Nrn, ^Da [ABDrsRUd] [SDETrqBF] 1
		Dl, Dsup ^Nrn, ^Da [ABDrsRUr] [SDETrqRBC] [DELBR] 1					Dl, Dsup ^Nrn, ^Da [ABDrsRUr] [SDETrqRBC] [DELBR] 1
AF-BEGIN-DIALOGUE (accepted, dataRI) cnf	^Dsup Dcr [TBDcX] [VDcrF] [VDaT] 6					^Dsup Dcr [TBDcX] [VDcrF] [VDaT] 13	
	^Dsup ^Dcr [VDaT] 6					^Dsup ^Dcr [VDaT] 13	
AF-BEGIN-DIALOGUE (rejected(provider), dataRI) cnf	^Dl, ^Dsup [TBDcX] [SDETrqF] 1					^Dl, ^Dsup [TBDcX] [SDETrqF] 1	
	Dl, ^Dsup [TBDcX] [SDETrqRB] [ABDET] [DELBRANCH] 25					Dl, ^Dsup [TBDcX] [SDETrqRB] [ABDET] [DELBRANCH] 25	

TABLE A.14/X.862 *(sheet 2 of 13)*

Handshake

State	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates / Event	P.C. or S.C.	P.C. or S.C.	S.C.	S.C. ^Dl	S.C. ^Dl	P.C.	P.C.
AF-BEGIN-DIALOGUE (rejected(user), dataRI) cnf	^Dl, ^Dsup [TBDcX] [SDETrqF] 1					^Dl, ^Dsup [TBDcX] [SDETrqF] 1	
	Du, Dl, ^Dsup [TBDcX] [SDETrqRB] [ABDET] [DELBRANCH] 25					Du, Dl, ^Dsup [TBDcX] [SDETrqRB] [ABDET] [DELBRANCH] 25	
AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) cnf	Dl, ^Dsup [TBDcX] [CRBrs] [SDETrqF] [ABDET] [DELBRANCH] 25					Dl, ^Dsup [TBDcX] [CRBrs] [SDETrqF] [ABDET] [DELBRANCH] 25	
SAF-ASSOCIATION-LOST ind	^Dl [TBDcRP] 1					^Dl [TBDcRP] 1	
	Dl [TBDcRP] [ABDET] [DELBRANCH] 25					Dl [TBDcRP] [ABDET] [DELBRANCH] 25	
AF-END-DIALOGUE (confirmation = FALSE) ind	Dsh, ^Dl, Dsup [TEDi] [SDETrqF] 1						
	Dsh, ^Dl, ^Dsup ^Dcr [TEDi] [SDETrqF] 1						
	Dsh, Dx [TPABiBTED] [SDETrqRB] [ABDET] [DELBRANCH] 25						

TABLE A.14/X.862 *(sheet 3 of 13)*

Handshake

State	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates	P.C. or S.C.	P.C. or S.C.	S.C.	S.C.	S.C.	P.C.	P.C.
Event				^Dl	^Dl		
AF-END-DIALOGUE (confirmation = TRUE) ind	Dsh, ^Dl, Dsup Denb=0 [TEDi] 9						
	Dsh, ^Dl, Dsup Denb>0 [DECDENB] 6						
	Dsh, ^Dl, ^Dsup ^Dcr Denb=0 [TEDi] 9						
	Dsh, ^Dl, ^Dsup ^Dcr Denb>0 [DECDENB] 6						
	Dsh, Dx Denbb=0 [TPABiBTED] [SDETrqRB] [ABDET] [DELBRANCH] 25						
	Dsh, Dx Denbb>0 [DECDENB] 6						
TP-U-ERROR req	Dsh, Dsup [AUErq] [VDenbINC] 6	Dsup ^Ncr [DELIMIT] [AUErq] 2	[AUErq] 6	[AUErq] 6	[AUErq] 11		Dsup ^Ncr [DELIMIT] [AUErq] 2
	Dsh, ^Dsup [AUErq] [VDenbINC] 6	^Dsup [AUErq] 2					^Dsup [AUErq] 2

TABLE A.14/X.862 *(sheet 4 of 13)*

Handshake

State	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates	P.C. or S.C.	P.C. or S.C.	S.C.	S.C.	S.C.	P.C.	P.C.
Event				^Dl	^Dl		
AF-U-ERROR ind	Dsh, Dsup Denb=0 [TUEi] 2	Dsh ^Da [TUEi] [VDepnbINC] 7					
	Dsh, Dsup Denb>0 [TUEi] 4						
	Dsh, ^Dsup ^Dcr Denb=0 [TUEi] 2	Dsh Da [TUEi] [AUErs] 7	[TUEi] 7	[TUEi] 12	[TUEi] 7		
	Dsh, ^Dsup ^Dcr Denb>0 [TUEi] 4						
	^Dsh, Dsup [TUEi] 3					Dsup [TUEi] 3	
	^Dsh, ^Dsup ^Dcr [TUEi] 3					^Dsup ^Dcr [TUEi] 3	
AF-U-ERROR cnf	Dsh, Denb>0 [DECDENB] 6						

TABLE A.14/X.862 *(sheet 5 of 13)*

Handshake

State	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates	P.C. or S.C.	P.C. or S.C.	S.C.	S.C. ^Dl	S.C. ^Dl	P.C.	P.C.
Event							
TP-U-ABORT req	^Du, ^Dl, Dsup [AABrqUd] [SDETrqF] 1	^Du, ^Dl, Dsup ^Ncr [DELIMIT] [AABrqUd] [SDETrqF] 1	^Du, ^Dl, Dsup [AABrqUd] [SDETrqF] 1	^Du, Dsup [AABrqUd] [SDETrqF] 1	^Du, Dsup [AABrqUd] [SDETrqF] 1	^Du, ^Dl, Dsup [AABrqUd] [SDETrqF] 1	^Du, ^Dl, Dsup ^Ncr [DELIMIT] [AABrqUd] [SDETrqF] 1
	Du, ^Dl, Dsup [AABrqUd] [SDETrqBF] 1	Du, ^Dl, Dsup ^Ncr [DELIMIT] [AABrqUd] [SDETrqBF] 1	Du, ^Dl, Dsup [AABrqUd] [SDETrqBF] 1	Du, Dsup [AABrqUd] [SDETrqBF] 1	Du, Dsup [AABrqUd] [SDETrqBF] 1	Du, ^Dl, Dsup [AABrqUd] [SDETrqBF] 1	Du, ^Dl, Dsup ^Ncr [DELIMIT] [AABrqUd] [SDETrqBF] 1
	^Dl, ^Dsup [AABrqUd] |[SDETrqF] 1	^Dl, ^Dsup [AABrqUd] [SDETrqF] 1	^Dl, ^Dsup [AABrqUd] [SDETrqF] 1	^Dsup [AABrqUd] [SDETrqF] 1	^Dsup [AABrqUd] [SDETrqF] 1	^Dl, ^Dsup [AABrqUd] [SDETrqF] 1	^Dl, ^Dsup [AABrqUd] [SDETrqF] 1
	Dl, Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 6	Dl, Dsup ^Ncr [DELIMIT] [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 7	Dl, Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 8			Dl, Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 13	Dl, Dsup ^Ncr [DELIMIT] [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 14
	Dl, ^Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 6	Dl, ^Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 7	Dl, ^Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 8			Dl, ^Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 13	Dl, ^Dsup [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 14
AF-ABORT (user, dataRI) ind	^Dl, Dsup [TUABi] [SDETrqF] 1	^Dl [TUABi] [SDETrqF] 1	^Dl [TUABi] [SDETrqF] 1	[TUABi] [SDETrqF] 1	[TUABi] [SDETrqF] 1	^Dl, Dsup [TUABi] [SDETrqF] 1	^Dl [TUABi] [SDETrqF] 1
	^Dl, ^Dsup ^Dcr [TUABi] [SDETrqF] 1					^Dl, ^Dsup ^Dcr [TUABi] [SDETrqF] 1	
	Dl, ^Dsup ^Dcr, ^Dbcr [TUABi] [SDETrqRB] [ABDET] [DELBRANCH] 25	Du, Dl, ^Dsup ^Dbcr [TUABi] [SDETrqRB] [ABDET] [DELBRANCH] 25	Du, Dl, ^Dsup ^Dbcr [TUABi] [SDETrqRB] [ABDET] [DELBRANCH] 25			Dl, ^Dsup ^Dcr, ^Dbcr [TUABi] [SDETrqRB] [ABDET] [DELBRANCH] 25	Du, Dl, ^Dsup ^Dbcr [TUABi] [SDETrqRB] [ABDET] [DELBRANCH] 25

TABLE A.14/X.862 *(sheet 6 of 13)*

Handshake

State	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates	P.C. or S.C.	P.C. or S.C.	S.C.	S.C.	S.C.	P.C.	P.C.
Event				^Dl	^Dl		
AF-ABORT (provider, abortRI) ind or A-ABORT ind or A-ABORT req or A-P-ABORT ind or	^Dl [SETDIAGTP] [TPABi] 1	^Dl [SETDIAGTP] [TPABi] 1	^Dl [SETDIAGTP] [TPABi] 1	[SETDIAGTP] [TPABi] 1	[SETDIAGTP] [TPABi] 1	^Dl [SETDIAGTP] [TPABi] 1	^Dl [SETDIAGTP] [TPABi] 1
A-RELEASE (result = affirmative) rsp or A-RELEASE (result = affirmative) cnf		Dl, Dsup Ncr [SETDIAGTP] [TPABi] 1					Dl, Dsup Ncr [SETDIAGTP] [TPABi] 1
	Dl, Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dl, Dsup ^Ncr [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dl, Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8			Dl, Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dl, Dsup ^Ncr [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8
	Dl, ^Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2			Dl, ^Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2

TABLE A.14/X.862 *(sheet 7 of 13)*

Handshake

State	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates	P.C. or S.C.	P.C. or S.C.	S.C.	S.C.	S.C.	P.C.	P.C.
Event				^Dl	^Dl		
Protocol error or Internal error	^Dl [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1	^Dl [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1	^Dl [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1	[SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1	[SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1	^Dl [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1	^Dl [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1
		Dl, Dsup Ncr [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1					Dl, Dsup Ncr [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] 1
	Dl, Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dl, Dsup ^Ncr [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dl, Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8			Dl, Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dl, Dsup ^Ncr [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8
	Dl, ^Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2			Dl, ^Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [SETDIAGTP] [TPABiR] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2
TP-REQUEST-CONTROL req		^Dsh, Dsup ^Ncr [DELIMIT] [ARCrq] 7					
		^Dsh, ^Dsup [ARCrq] 7					
AF-REQUEST-CONTROL ind	^Dsh [TRCi] 6					13	

TABLE A.14/X.862 *(sheet 8 of 13)*

Handshake

State	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates	P.C. or S.C.	P.C. or S.C.	S.C.	S.C.	S.C.	P.C.	P.C.
Event				^Dl	^Dl		
TP-HANDSHAKE req		Dsh, Dsup ^Ncr [DELIMIT] [AHSrq] 8 Dsh, ^Dsup [AHSrq] 8					
AF-HANDSHAKE ind	Dsh, Dsup Denb=0 [THSi] 8 Dsh, Dsup Denb>0 [DECDENB] 6 Dsh, ^Dsup ^Dcr Denb=0 [THSi] 8 Dsh, ^Dsup ^Dcr Denb>0 [DECDENB] 6						
TP-HANDSHAKE rsp		Dsh, Dsup ^Ncr [DELIMIT] [AHSrs] 2 Dsh, ^Dsup [AHSrs] 2 ^Dsh, Dsup ^Ncr [DELIMIT] [AHSrs] 3 ^Dsh, ^Dsup [AHSrs] 3	[AHSrs] 6		[AHSrs] 11		

TABLE A.14/X.862 *(sheet 9 of 13)*

Handshake

State	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates	P.C. or S.C.	P.C. or S.C.	S.C.	S.C.	S.C.	P.C.	P.C.
Event				^Dl	^Dl		
AF-HANDSHAKE cnf	Dsh Denb>0 [THSc] 4		[THSc] 7	[THSc] 12			
	Dsh Denb=0 [THSc] 2						
	^Dsh [THSc] 2						
TP-HANDSHAKE-AND-GRANT-CONTROL rsp							Dsup ^Ncr [DELIMIT] [AHSGCrs] 2
							^Dsup [AHSGCrs] 2
AF-HANDSHAKE-AND-GRANT-CONTROL cnf						[THSGCc] 3	
C-BEGIN ind	Du, Dsh, ^Dl, Dsup Nr [TPABiBTR] [AABrqPrTR] [SDETrqRBC] 1						
	Du, Dsh, ^Dl, Dsup ^Nr [ADDBRSP] [TBTi] 6						
C-BEGIN cnf	Dl, ^Dsup [VDbcrT] [VDxF] 6	Dl, ^Dsup [VDbcrT] [VDxF] 7	Dl, ^Dsup [VDbcrT] [VDxF] 8			Dl, ^Dsup [VDbcrT] [VDxF] 13	
TP-DATA req		Dsh, Dsup ^Ncr [DELIMIT] [UASErq] 7					
		Dsh, ^Dsup [UASErq] 7					

TABLE A.14/X.862 *(sheet 10 of 13)*

Handshake

State	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates	P.C. or S.C.	P.C. or S.C.	S.C.	S.C.	S.C.	P.C.	P.C.
Event				^Dl	^Dl		
U-ASE ind	Dsh, Dsup Denb=0 [TDTi] 6						
	Dsh ^Dsup Denb=0 [TDTi] 6						
	Dsh Denb>0 6						
AF-DEFER (end-dialogue) ind	Dsh, Dl, Dsup ^De [TDEi] [VDeT] 6						
AF-PREPARE ind	Dsh, Dl, Dsup [TRBi] [INITRB] [OWEDONE] 6						
TP-ROLLBACK req	Dl, Dsup ^Nfrb [INITRB] [OWEDONE] 23.3	Dl, Dsup ^Ncr, ^Nfrb [INITRB] [OWEDONE] [VDaT] 23.3	Dl, Dsup ^Nfrb [INITRB] [OWEDONE] 23.3			Dl, Dsup ^Nfrb [INITRB] [OWEDONE] 23.3	Dl, Dsup ^Ncr, ^Nfrb [INITRB] [OWEDONE] [VDaT] 23.3
	Dl, Dsup Nfrb 23.3	Dl, Dsup ^Ncr, Nfrb [VDaT] 23.3	Dl, Dsup Nfrb 23.3			Dl, Dsup Nfrb 23.3	Dl, Dsup ^Ncr, Nfrb [VDaT] 23.3
	Dl, ^Dsup ^Nfrb [RBREQ] [INITRB] [OWEDONE] 23.1	Dl, ^Dsup ^Nfrb [RBREQ] [INITRB] [OWEDONE] 23.1	Dl, ^Dsup ^Nfrb [RBREQ] [INITRB] [OWEDONE] 23.1			Dl, ^Dsup ^Nfrb [RBREQ] [INITRB] [OWEDONE] 23.1	Dl, ^Dsup ^Nfrb [RBREQ] [INITRB] [OWEDONE] 23.1
	Dl, ^Dsup Nfrb [RBREQ] 23.1	Dl, ^Dsup Nfrb [RBREQ] 23.1	Dl, ^Dsup Nfrb [RBREQ] 23.1			Dl, ^Dsup Nfrb [RBREQ] 23.1	Dl, ^Dsup Nfrb [RBREQ] 23.1

TABLE A.14/X.862 *(sheet 11 of 13)*

Handshake

State / Predicates / Event	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates	P.C. or S.C.	P.C. or S.C.	S.C.	S.C. ^Dl	S.C. ^Dl	P.C.	P.C.
C-ROLLBACK ind	Dl, Dsup [TRBi] [INITRB] [OWEDONE] 23.4	Dl, Dsup [TRBi] [INITRB] [OWEDONE] 23.4	Dl, Dsup [TRBi] [INITRB] [OWEDONE] 23.4			Dl, Dsup [TRBi] [INITRB] [OWEDONE] 23.4	Dl, Dsup [TRBi] [INITRB] [OWEDONE] 23.4
	^Du, Dl, ^Dsup ^Dcr [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2	^Du, Dl, ^Dsup [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2	^Du, Dl, ^Dsup [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2			^Du, Dl, ^Dsup ^Dcr [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2	^Du, Dl, ^Dsup [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] 23.2
	Du, Dl, ^Dsup ^Dcr [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2	Du, Dl, ^Dsup [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2	Du, Dl, ^Dsup [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2			Du, Dl, ^Dsup ^Dcr [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2	Du, Dl, ^Dsup [TRBi] [CRBrs] [INITRB] [OWEDONE] [COUNTRB] [CPSAP] 23.2
AF-ABORT (provider, rollbackRI) ind	Du, Dl, ^Dsup ^Dbcr [TPABiR] [CRBrs] [SDETrqF] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2	Du, Dl, ^Dsup ^Dbcr [TPABiR] [CRBrs] [SDETrqF] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2	Du, Dl, ^Dsup ^Dbcr [TPABiR] [CRBrs] [SDETrqF] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2			Du, Dl, ^Dsup ^Dbcr [TPABiR] [CRBrs] [SDETrqF] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2	Du, Dl, ^Dsup ^Dbcr [TPABiR] [CRBrs] [SDETrqF] [ABDET] [INITRB] [OWEDONE] [COUNTRB] 23.2

TABLE A.14/X.862 *(sheet 12 of 13)*

Handshake

State	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates	P.C. or S.C.	P.C. or S.C.	S.C.	S.C. ^Dl	S.C. ^Dl	P.C.	P.C.
Event							
AF-ABORT (user, rollbackRI) ind	Dl, Dsup [TUABiR] [INITRB] [OWEDONE] [ABPTNR] [NOTCHAIN] 23.4	Dl, Dsup ^Ncr [TUABiR] [INITRB] [OWEDONE] [ABPTNR] [NOTCHAIN] 23.4	Dl, Dsup [TUABiR] [INITRB] [OWEDONE] [ABPTNR] [NOTCHAIN] 23.4			Dl, Dsup [TUABiR] [INITRB] [OWEDONE] [ABPTNR] [NOTCHAIN] 23.4	Dl, Dsup ^Ncr [TUABiR] [INITRB] [OWEDONE] [ABPTNR] [NOTCHAIN] 23.4
		Dl, Dsup Ncr [TUABi] [CRBrs] [SDETrqF] [DELBR] 1					Dl, Dsup Ncr [TUABi] [CRBrs] [SDETrqF] [DELBR] 1
	Dl, ^Dsup ^Dcr [TUABiR] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [TUABiR] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [TUABiR] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2			Dl, ^Dsup ^Dcr [TUABiR] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	Dl, ^Dsup [TUABiR] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2
Rollback-by-TPPM	Dl, Dsup ^Nfrb [TRBi] [INITRB] [OWEDONE] 23.3	Dl, Dsup ^Ncr, ^Nfrb [TRBi] [INITRB] [OWEDONE] 23.3	Dl, Dsup ^Nfrb [TRBi] [INITRB] [OWEDONE] 23.3			Dl, Dsup ^Nfrb [TRBi] [INITRB] [OWEDONE] 23.3	Dl, Dsup ^Ncr, ^Nfrb [TRBi] [INITRB] [OWEDONE] 23.3
	Dl, Dsup Nfrb 23.3	Dl, Dsup ^Ncr, Nfrb 23.3	Dl, Dsup Nfrb 23.3			Dl, Dsup Nfrb 23.3	Dl, Dsup ^Ncr, Nfrb 23.3
	Dl, ^Dsup ^Nfrb [TRBi] [INITRB] [OWEDONE] [RBREQ] 23.1	Dl, ^Dsup ^Nfrb [TRBi] [INITRB] [OWEDONE] [RBREQ] 23.1	Dl, ^Dsup ^Nfrb [TRBi] [INITRB] [OWEDONE] [RBREQ] 23.1			Dl, ^Dsup ^Nfrb [TRBi] [INITRB] [OWEDONE] [RBREQ] 23.1	Dl, ^Dsup ^Nfrb [TRBi] [INITRB] [OWEDONE] [RBREQ] 23.1
	Dl, ^Dsup Nfrb [RBREQ] 23.1	Dl, ^Dsup Nfrb [RBREQ] 23.1	Dl, ^Dsup Nfrb [RBREQ] 23.1			Dl, ^Dsup Nfrb [RBREQ] 23.1	Dl, ^Dsup Nfrb [RBREQ] 23.1

TABLE A.14/X.862 *(sheet 13 of 13)*

Handshake

State	6	7	8	9	10	13	14
	AF-HANDSHAKE req issued	AF-HANDSHAKE ind rcv'd	AF-HANDSHAKE ind received on state 6, or req issued on st. 7	AF-END-DIALOGUE ind rcv'd on state 6	AF-HANDSHAKE ind rcv'd on state 11	AF-HANDSHAKE &-GRANT-CTL req issued	AF-HANDSHAKE &-GRANT-CTL ind rcv'd
Predicates	P.C. or S.C.	P.C. or S.C.	S.C.	S.C. ^Dl	S.C. ^Dl	P.C.	P.C.
Event							
Rollback-all	Dsup 23.3	Dsup 23.3	Dsup 23.3			Dsup 23.3	Dsup 23.3
	^Dsup [RBREQ] 23.1	^Dsup [RBREQ] 23.1	^Dsup [RBREQ] 23.1			^Dsup [RBREQ] 23.1	^Dsup [RBREQ] 23.1

TABLE A.15/X.862 *(sheet 1 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
TP-BEGIN-DIALOGUE (accepted) rsp		Ncr [DELIMIT] 18										
TP-BEGIN-DIALOGUE (rejected) rsp		^Nrn, ^Da [ABDrsRUr] [SDETrqRBC] [DELBR] 1										
TP-U-ABORT req	[ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 17	^Ncr [DELIMIT] [ABTPSUI] [NOTCHAIN] [INITRB] [OWEDONE] 18		^Danyb Ni, Nfa [ABTPSUI] 20.3	^Danyb Nfa, Dch [ABTPSUI] [RBNEXTSB] 21.1 ^Danyb Nfa, ^Dch [ABTPSUI] 21.1	^Danyb Nfa [ABTPSUI] 21.2	^Danyb Nfa, Dch [ABTPSUI] [RBNEXTSB] 21.3 ^Danyb Nfa, ^Dch [AABrqUd] [ABDET] [SDETrqF] 21.3	^Danyb Nfa [ABTPSUI] 21.4	^Danyb Nfa, Nch [ABTPSUI] [RBNEXTSB] 21.5 ^Danyb Nfa, ^Nch [ABTPSUI] 21.5	^Danyb Nfa [ABTPSUI] 21.6		

Superseded by a more recent version

TABLE A.15/X.862 *(sheet 2 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
AF-ABORT (provider, abortRI) ind or A-P-ABORT ind or A-ABORT ind or A-ABORT req or A-RELEASE (result = affirmative) rsp or A-RELEASE (result = affirmative) cnf		[SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] 23.8	Dsup, ^Danyb [SETDIAGTP] [TPABi] [ABDET] [NOTCHAIN] [VNfaT] [CAFPLrqSP] 99	^Danyb, ^Dch [SETDIAGTP] [TPABi] [ABDET] [OWEDONE] [CAFPLrqSB] 99				^Danyb, ^Nch [SETDIAGTP] [TPABi] [ABDET] [OWEDONE] 21.5	^Danyb [SETDIAGTP] [TPABi] [ABDET] [OWEDONE] 21.5		
				Dsup, Danyb ^Db [ABDET] [NOTCHAIN] [CAFPLrqSP] 99					Danyb ^Db [ABDET] 21.5	Danyb [ABDET] 21.5		
				Dsup, Dchat [VDchatF] [NOTCHAIN] [CAFPLrqSP] 99					Dchat [VDchatF] 21.5			
	[SETDIAGTP] [TPABiR] [THRiH] [LOGDAMH] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2		^Dsup [SETDIAGTP] [TPABiR] [THRiH] [LOGDAMH] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	^Dsup,^Danyb [SETDIAGTP] [TPABi] [ABDET] [NOTCHAIN] [VNfaT] 20.3	^Danyb, Dch [SETDIAGTP] [TPABi] [ABDET [OWEDONE] [RBNEXTSB] [CAFPLrqSB] 99	[SETDIAGTP] [TPABi] [ABDET] [OWEDONE] [CAFPLrqSB] 99			^Danyb, Nch [SETDIAGTP] [TPABi] [ABDET] [OWEDONE] [RBNEXTSB] 21.5			
				^Dsup, Danyb ^Db [ABDET] [NOTCHAIN] 20.3	Danyb ^Db [ABDET] [CAFPLrqSB] 99							
				^Dsup, Dchat [VDchatF] [NOTCHAIN] 20.3	Dchat [VDchatF] [CAFPLrqSB] 99							

TABLE A.15/X.862 *(sheet 3 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
Protocol error or Internal error		[SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [SETDIAG] [AABrqPa] [INITRB] [OWEDONE] 23.8	Dsup [SETDIAGTP] [TPABiR] [ABDET] [NOTCHAIN] [SETDIAG] [AABrqPa] [INITRB] [OWEDONE] 23.8	Dsup, ^Danyb [SETDIAGTP] [TPABi] [ABDET] [NOTCHAIN] [SETDIAG] [AABrqPa] [VNfaT] [CAFPLrqSP] 99	^Danyb, ^Dch [SETDIAGTP] [TPABi] [ABDET] [SETDIAG] [AABrqPa] [OWEDONE] [CAFPLrqSB] 99		^Danyb,^Dch [SETDIAGTP] [TPABi] [ABDET] [SETDIAG] [AABrqPa] [OWEDONE] 21.3	[SETDIAGTP] [TPABi] [ABDET] [SETDIAG] [AABrqPa] [OWEDONE] 21.3	^Danyb, ^Nch [SETDIAGTP] [TPABi] [ABDET] [SETDIAG] [AABrqPa] [OWEDONE] 21.5	^Danyb [SETDIAGTP] [TPABi] [ABDET] [SETDIAG] [AABrqPa] [OWEDONE] 21.5		
				Dsup, Danyb ^Db [ABDET] [NOTCHAIN] [SETDIAG] [AABrqPa] [CAFPLrqSP] 99					Danyb ^Db [ABDET] [SETDIAG] [AABrqPa] 21.5	Danyb [ABDET] [SETDIAG] [AABrqPa] 21.5		
				Dsup Dchat [NOTCHAIN] [SETDIAG] [AABrqPa] [VDchatF] [CAFPLrqSP] 99					Dchat [SETDIAG] [AABrqPa] [VDchatF] 21.5			
	[SETDIAGTP] [TPABiR] [THRiH] [LOGDAMH] [ABDET] [NOTCHAIN] [SETDIAG] [AABrqPa] [INITRB] [OWEDONE] [COUNTRB] 23.2		^Dsup [SETDIAGTP] [TPABiR] [THRiH] [LOGDAMH] [ABDET] [NOTCHAIN] [SETDIAG] [AABrqPa] [INITRB] [OWEDONE] [COUNTRB] 23.2	^Dsup,^Danyb [SETDIAGTP] [TPABi] [ABDET] [NOTCHAIN] [SETDIAG] [AABrqPa] [VNfaT] 20.3	^Danyb, Dch [SETDIAGTP] [TPABi] [ABDET] [SETDIAG] [AABrqPa] [OWEDONE] [RBNEXTSB] [CAFPLrqSB] 99	[SETDIAGTP] [TPABi] [ABDET] [SETDIAG] [AABrqPa] [OWEDONE] [CAFPLrqSB] 99	^Danyb, Dch [SETDIAGTP] [TPABi] [ABDET] [SETDIAG] [AABrqPa] [OWEDONE] [RBNEXTSB] 21.3		^Danyb, Nch [SETDIAGTP] [TPABi] [ABDET] [SETDIAG] [AABrqPa] [OWEDONE] [RBNEXTSB] 21.5			

Superseded by a more recent version

TABLE A.15/X.862 *(sheet 4 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
Protocol error or Internal error (Concluded)				^Dsup, Danyb ^Db [ABDET] [NOTCHAIN] [SETDIAG] [AABrqPa] 20.3	Danyb ^Db [ABDET] [SETDIAG] [AABrqPa] [CAFPLrqSB] 99		Danyb, ^Dch ^Db [ABDET] [SETDIAG] [AABrqPa] 21.3					
				^Dsup Db, ^Dchat [NOTCHAIN] 20.3			Danyb, Dch ^Db [ABDET] [SETDIAG] [AABrqPa] [RBNEXTSB] 21.3					
				^Dsup Db, Dchat [NOTCHAIN] [SETDIAG] [AABrqPa] [VDchatF] 20.3	Dchat [SETDIAG] [AABrqPa] [VDchatF] [CAFPLrqSB] 99		Db 21.3		Db, ^Dchat 21,5		25	99
TP-DATA req		Dsh ^Ncr [DELIMIT] [UASErq] 18										
		^Dsh ^Ncr, Ddp [DELIMIT] [UASErq] 18										
TP-COMMIT req	[COUNTRDY] [VNtT] 20.2	^Ncr [COUNTRDY] [VNtT] 20.2									[VNcntDEC] [COUNTRDY] [VNtT] 25	

TABLE A.15/X.862 *(sheet 5 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
C-COMMIT ind				Dsup ^Nch [RECCOM] [OWEDONECO] 21.5 --- Dsup De [NOTCHAIN] [RECCOM] [OWEDONECO] 21.5								
C-COMMIT+C-BEGIN ind				Dsup Nch, ^De [RECCOM] [OWEDONECO] 21.5								
AF-ABORT (user, commitRI) ind				Dsup, ^Dtb [NOTCHAIN] [RECCOM] [TUABi] [ABPTNR] [OWEDONECO] 21.5 --- Dsup, Dtb [NOTCHAIN] [RECCOM] [ABPTNR] [OWEDONECO] 21.5								
TP-DONE (heuristic-report) req					Dd, ^Dfdone [LOGDAM] [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 21.1	Dd, ^Dfdone [LOGDAM] [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 21.2	Dd, ^Dfdone [LOGDAM] [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 21.3	Dd, ^Dfdone [LOGDAM] [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 21.4	Dd, ^Dfdone [LOGDAM] [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 21.5	Dd, ^Dfdone [LOGDAM] [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 21.6		Dd, ^Dfdone [LOGDAM] [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 99

TABLE A.15/X.862 *(sheet 6 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
TP-DONE req					Dd [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 21.1	Dd [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 21.2	Dd [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 21.3	Dd [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 21.4	Dd [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 21.5	Dd [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 21.6		Dd [COUNTCOM] [VDfdoneT] [VNfaF] [VDdF] 99
C-COMMIT cnf					^Danyb, ^De [COUNTCOM] [CPSAP] 21.3	^Danyb [CRBrq] [COUNTCOM] [CPSAP] 21.4						
					^Danyb, De [SDETrqF] [ABDET] [COUNTCOM] 21.3							
					^Dbpart, Dtb [AABrqUd] [SDETrqF] [ABDET] [COUNTCOM] 21.3	^Dbpart, Dtb [AABrqUr] [SDETrqRBC] [ABDET] [COUNTCOM] 21.3						
					Dbpart [SDETrqF] [ABDET] [COUNTCOM] 21.3							

TABLE A.15/X.862 *(sheet 7 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
AF-HEURISTIC-REPORT (commitRC) ind					^Danyb, ^De [THRi] [LOGDAM] [COUNTCOM] [CPSAP] 21.3	^Danyb [THRi] [LOGDAM] [CRBrq] [COUNTCOM] [CPSAP] 21.4						
					^Danyb, De [THRi] [LOGDAM] [SDETrqF] [ABDET] [COUNTCOM] 21.3							
					^Dbpart, Dtb [THRi] [LOGDAM] [AABrqUd] [SDETrqF] [ABDET] [COUNTCOM] 21.3	^Dbpart, Dtb [THRi] [LOGDAM] [AABrqUr] [SDETrqRBC] [ABDET] [COUNTCOM] 21.3						
					Dbpart [THRi] [LOGDAM] [SDETrqF] [ABDET] [COUNTCOM] 21.3							

TABLE A.15/X.862 *(sheet 8 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
AF-ABORT (user, commitRC) ind					^Danyb, Du [TUABi] [SDETrqF] [ABDET] [OWEDONE] [COUNTCOM] 21.3							
					Danyb, Du ^Dbpart [SDETrqF] [ABDET] [COUNTCOM] 21.3							
AF-ABORT-AND-HEURISTIC-REPORT (commitRC) ind					^Danyb, Du [TUABi] [THRi] [LOGDAM] [SDETrqF] [ABDET] [OWEDONE] [COUNTCOM] 21.3							
					Danyb, Du ^Dbpart [THRi] [LOGDAM] [SDETrqF] [ABDET] [COUNTCOM] 21.3							
TP-ROLLBACK req	^Nfrb [RBREQ] [INITRB] [OWEDONE] 23.1	^Nfrb ^Ncr [INITRB] [OWEDONE] [VDaT] 23.3									^Nfrb [INITRB] [OWEDONE] [COUNTRB] 23.2	
	Nfrb [RBREQ] 23.1	Nfrb ^Ncr [VDaT] 23.3									Nfrb [COUNTRB] 23.2	

Superseded by a more recent version

TABLE A.15/X.862 *(sheet 9 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
C-ROLLBACK ind		[TRBi] [LOGDAMRB] [INITRB] [OWEDONE] 23.4	Dsup [TRBi] [LOGDAMRB] [INITRB] [OWEDONE] 23.4	Dsup [TRBi] [LOGDAMRB] [INITRB] [OWEDONE] 23.4								
AF-ABORT (user, rollbackRI) ind		[TUABiR] [LOGDAMRB] [ABPTNR] [NOTCHAIN] [INITRB] [OWEDONE] 23.4	Dsup [TUABiR] [LOGDAMRB] [ABPTNR] [NOTCHAIN] [INITRB] [OWEDONE] 23.4	^Danyb, Dsup [TUABiR] [LOGDAMRB] [ABPTNR] [NOTCHAIN] [INITRB] [OWEDONE] 23.4 Danyb, Dsup [TRBi] [LOGDAMRB] [ABPTNR] [NOTCHAIN] [INITRB] [OWEDONE] 23.4								

TABLE A.15/X.862 *(sheet 10 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
CAF-RECOVER (ready) ind	[CRErsU] [SETTOKX] [CAFDETrqF] [DIALOGUE] [SETDIAGTP] [TPABiR] [THRiH] [LOGDAMH] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2		^Dsup [CRErsU] [SETTOKX] [CAFDETrqF] [DIALOGUE] [SETDIAGTP] [TPABiR] [THRiH] [LOGDAMH] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [INITRB] [OWEDONE] [COUNTRB] 23.2	^Dsup,^Danyb ^Ldretry [SETTOKX] [VDchatT] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [VNfaT] 20.3	^Danyb ^Dch [RECVRCOMR] [VDchatT] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [OWEDONE] 21.1							
				^Dsup,^Danyb Ldretry [CRErsRT] [SETTOKX] [CAFDETrqF] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [VNfaT] 20.3	^Danyb Dch [RECVRCOMR] [VDchatT] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [RBNEXTSB] [OWEDONE] 21.1	^Danyb [RECVRCOMR] [VDchatT] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [OWEDONE] 21.1					
				^Dsup, Danyb ^Db ^Ldretry [SETTOKX] [VDchatT] [DIALOGUE] [SETDIAG] [AABrqPa] [ABDET] 20.3	Danyb ^Db [RECVRCOMR] [VDchatT] [DIALOGUE] [SETDIAG] [AABrqPa] [ABDET] 21.1							

TABLE A.15/X.862 *(sheet 11 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
CAF-RECOVER (ready) ind (continued)				^Dsup, Danyb ^Db Ldretry [CRErsRT] [SETTOKX] [CAFDETrqF] [DIALOGUE] [SETDIAG] [AABrqPa] [ABDET] 20.3								
				^Dsup, Danyb Db, ^Dchat ^Ldretry [VDchatT] [SETTOKX] 20.3								
				^Dsup, Danyb Db, ^Dchat Ldretry [CRErsRT] [SETTOKX] [CAFDETrqF] 20.3								
				^Dsup, Danyb Db, Dchat Ldretry ^Ldretryo [CRErsRT] [SETTOKX] [CAFDETrqF] 20.3	Danyb Db, Dchat [CRErsRT] [SETTOKX] [CAFDETrqF] 21.1							
				^Dsup, Danyb Db, Dchat ^Ldretry Ldretryo [SETTOKX] [OLDCHANNEL] [CRErsRT] [CAFDETrqF] 20.3								

TABLE A.15/X.862 *(sheet 12 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
CAF-RECOVER (ready) ind (concluded)				^Dsup, Danyb Db, Dchat Ldretry Ldretryo [CRErsRT] [SETTOKX] [CAFDETrqF] [OLDCHANNEL] [CRErsRT] [CAFDETrqF] [VDchatF] 20.3								
CAF-RECOVER (commit) ind				^Dsup, Danyb Ldretry [CRErsRT] [SETTOKX] [CAFDETrqF] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [RECCOM] [OWEDONE] 21.5					Nch, ^Danyb Ldretry [CRErsRT] [SETTOKX] [CAFDETrqF] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [RBNEXTSB] [OWEDONE] 21.5	^Danyb Ldretry [CRErsRT] [SETTOKX] [CAFDETrqF] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [OWEDONE] 21.5		
				Dsup, ^Danyb ^Ldretry [SETTOKX] [VDchatT] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [RECCOM] [OWEDONE] 21.5					Nch, ^Danyb ^Ldretry [SETTOKX] [VDchatT] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [RBNEXTSB] [OWEDONE] 21.5	^Danyb ^Ldretry [SETTOKX] [VDchatT] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [OWEDONE] 21.5		

TABLE A.15/X.862 *(sheet 13 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
CAF-RECOVER (commit) ind (continued)									^Nch, ^Danyb Ldretry [CRErsRT] [SETTOKX] [CAFDETrqF] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [OWEDONE] 21.5			
									^Nch, ^Danyb ^Ldretry [VDchatT] [SETTOKX] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [OWEDONE] 21.5			
				Danyb, ^Db Dsup, ^Ldretry [VDchatT] [SETTOKX] [DIALOGUE] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [RECCOM] [OWEDONECO] 21.5					Danyb, ^Db ^Ldretry [VDchatT] [SETTOKX] [DIALOGUE] [SETDIAG] [AABrqPa] [ABDET] 21.5			Dsup ^Ldretry [VDchatT] [SETTOKX] [VDrvypF] [RECCOM] [OWEDONECO] 21.5

TABLE A.15/X.862 *(sheet 14 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
CAF-RECOVER (commit) ind (continued)				Danyb, ^Db Dsup, Ldretry [CREsRT] [SETTOKX] [CAFDETrqF] [DIALOGUE] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [RECCOM] [OWEDONECO] 21.5					Danyb, ^Db Ldretry [CREsRT] [SETTOKX] [CAFDETrqF] [DIALOGUE] [SETDIAG] [AABrqPa] [ABDET] 21.5			Dsup ^ Ldretry [CREsRT] [SETTOKX] [CAFDETrqF] [VDrvypF] [RECCOM] [OWEDONECO] 21.5
				Danyb Dsup, Dchat Ldretry [CREsRT] [SETTOKX] [CAFDETrqF] [OLDCHANNEL] [VDchatF] [CAFDETrqCU] [NOTCHAIN] [RECCOM] [OWEDONECO] 21.5					Danyb, Db ^Dchat Ldretry [CREsRT] [SETTOKX] [CAFDETrqF] 21.5			
				Danyb Dsup, Dchat ^Ldretry [SETTOKX] [OLDCHANNEL] [CAFDETrqCU] [NOTCHAIN] [RECCOM] [OWEDONECO] 21.5					Danyb, Db ^Dchat ^Ldretry [VDchatF] [SETTOKX] 21.5			

TABLE A.15/X.862 *(sheet 15 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
CAF-RECOVER (commit) ind (concluded)									Danyb, Db Dchat ^Ldretry Ldretryo [SETTOKX] [OLDCHANNEL] [CRErsRT] [CAFDETrqF] 21.5 Danyb, Db Dchat Ldretry ^Ldretryo [CRErsRT] [SETTOKX] [CAFDETrqF] 21.5 Danyb, Db Dchat Ldretry Ldretryo [CRErsRT] [SETTOKX] [CAFDETrqF] [OLDCHANNEL] [CRErsRT] [CAFDETrqF] [VDchatF] 21.5			
C-RECOVER (commit) ind				Dsup, Dchat Ldretry [CRErsRT] [CAFDETrqF] [VDchatF] [RECCOM] [OWEDONECO] 21.5 Dsup, Dchat ^Ldretry [SETTOKX] [RECCOM] [OWEDONECO] 21.5								

TABLE A.15/X.862 *(sheet 16 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
C-RECOVER (done) cnf					^Atwr [CAFDETrqF] [VDchatF] [COUNTCOM] 21.3							
					Atwr, ^Atokx [CAFDETrqF] [VDchatF] [COUNTCOM] 21.3							
AF-HEURISTIC-REPORT (recoverDoneRC) ind					^Atwr [THRi] [LOGDAM] [CAFDETrqF] [VDchatF] [COUNTCOM] 21.3							
					Atwr,^Atokx [THRi] [LOGDAM] [CAFDETrqF] [VDchatF] [COUNTCOM] 21.3							
C-RECOVER (unknown) cnf				Dsup [TRBi] [LOGDAMRB] [CAFDETrqF] [VDchatF] [INITRB] [OWEDONE] 23.8								
C-RECOVER (retry-later) cnf				Dsup ^Atwr [CAFDETrqF] [VDchatF] [VDrvypT] 99	^Atwr [CAFDETrqF] [VDchatF] [VDrvypT] 99							
				Dsup Atwr, ^Atokx [CAFDETrqF] [VDchatF] [VDrvypT] 99	Atwr, ^Atokx [CAFDETrqF] [VDchatF] [VDrvypT] 99							

TABLE A.15/X.862 *(sheet 17 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates / Event	Dl ^Dsup	Dl Dsup	Dl	Dl	Dl ^Dsup	Dl ^Dsup, Dch	Dl ^Dsup	Dl ^Dsup, Dch	Dl Dsup	Dl Dsup, Nch	Dl ^Dsup	Dl ^Dchat
AF-TOKEN-GIVE (two-way-recovery) ind				Atwr, Atokx ^Dsup, Dchat [VAtokxF] 20.3	Atwr, Atokx Dchat [VAtokxF] [ATOKGrqTWR] 21.1				Atwr, Atokx Dchat [VAtokxF] 21.5			
AF-TOKEN-PLEASE ind				Dchat 20.3	Dchat 21.1				Dchat 21.5			
CAF-GIVE ind					[CAFDETrqNU] 21.1		[CAFDETrqNU] 21.3		[CAFDETrqNU] 21.5			Dsup [VDchatT] [RECVRRDY] 20.3 ^Dsup [VDchatT] [RECVRCOMI] 21.1
CAF-FAIL ind					21.1		21.3		21.5			Dsup [CAFPLrqSP] 99 ^Dsup [CAFPLrqSB] 99
Heuristic-decision	Ni 17	[LOGHD] 18	Dsup [LOGHD] 20.2 ^Dsup, Ni 20.2	Dsup [LOGHD] 20.3 ^Dsup, Ni 20.3							25	^Dsup [LOGHD] 99
Heuristic-damage-comp	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 17	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 18	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 20.2	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 20.3	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 21.1	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 21.2	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 21.3	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 21.4	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 21.5	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 21.6	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 25	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 99
Delay-recovery				^Dsup, Dchat [CREsrRT] [CAFDETrqF] [VDchatF] 20.3					Dchat [CREsrRT] [CAFDETrqF] [VDchatF] 21.5			

Superseded by a more recent version

TABLE A.15/X.862 *(sheet 18 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
Retry-recovery												Drvyp, Dsup [CAFPLrqSP] [VDrvypF] 99
												Drvyp, ^Dsup [CAFPLrqSB] [VDrvypF] 99
Rollback-by-TPPM		^Nfrb ^Ncr [TRBi] [INITRB] [OWEDONE] 23.3	^Nfrb, Dsup ^Ncr [TRBi] [INITRB] [OWEDONE] 23.3									
	^Nfrb [TRBi] [RBREQ] [INITRB] [OWEDONE] 23.1		^Nfrb, ^Dsup [TRBi] [RBREQ] [INITRB] [OWEDONE] 23.1								^Nfrb [TRBi] [INITRB] [OWEDONE] [COUNTRB] 23.2	
		Nfrb ^Ncr 23.3	Nfrb, Dsup ^Ncr 23.3									
	Nfrb [RBREQ] 23.1		Nfrb, ^Dsup [RBREQ] 23.1								Nfrb [COUNTRB] 23.2	
Restart-TPPM				Dsup [TPABi] [CAFPLrqSP] 99	[TPABi] [CAFPLrqSB] 99							
				^Dsup 20.3					21.5			

Superseded by a more recent version

TABLE A.15/X.862 *(sheet 19 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates / Event	Dl ^Dsup	Dl Dsup	Dl	Dl	Dl ^Dsup	Dl ^Dsup, Dch	Dl ^Dsup	Dl ^Dsup, Dch	Dl Dsup	Dl Dsup, Nch	Dl ^Dsup	Dl ^Dchat
Rollback-all	[RBREQ] 23.1	23.3	^Dsup [RBREQ] 23.1	^Dsup, ^Db [RBREQ] 23.1							[COUNTRB] 23.2	
				^Dsup, Db ^Dchat [LOGDAMH] [COUNTRB] 23.2								
				^Dsup, Dchat [LOGDAMH] [CREsU] [CAFDETrqF] [VDchatF] [COUNTRB] 23.2								
			Dsup 23.3	Dsup 23.3								
Enter-ready			Dsup, Ptok [DELIMIT] [PTOKGrq] [CRYrq] 20.3									
			Dsup, ^Ptok [DELIMIT] [CRYrq] 20.3									
			^Dsup 20.3									
Set-done-true			[VDdT] 20.2	[VDdT] 20.3	[VDdT] 21.1	[VDdT] 21.2	[VDdT] 21.3	[VDdT] 21.4	[VDdT] 21.5	[VDdT] 21.6	[VDdT] 25	[VDdT] 99

Superseded by a more recent version

TABLE A.15/X.862 *(sheet 20 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
Continue-commit			^De Ptok [COMREQ] 21.1	^Dsup, ^Db ^De Ptok [COMREQ] 21.1							[COUNTCOM] 21.3	
			De Ptok [NOTCHAIN] [COMREQ] 21.1	^Dsup, ^Db De Ptok [NOTCHAIN] [COMREQ] 21.1								
				^Dsup, Dchat [RECVRCOMR] 21.1								
				^Dsup, ^Dchat Db [CAFPLrqSP] 99					21.5			
Rollback-next-trans					^Db, Dch 21.2		^Danyb, Dch [CRBrq] 21.4		^Db, Nch 21.6			99
							Dtb, Dch [AABrqUr] [SDETrqRBC] 21.3					
					Db, Dch 21.1		Db, Dch 21.3		Db, Nch 21.5			
					^Dch 21.1		^Dch 21.3		^Nch 21.5			

Superseded by a more recent version

TABLE A.15/X.862 *(sheet 21 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
Complete-commit							Danyb ^Nrpend [CMPCOMSB] [DELBR] 1	[CMPCOMSB] 23.1	Danyb,^Db ^Nrpend [COMRSP] [DELBR] [NEXTAAID] [SDETrqF] 1			
							Danyb Nrpend [CMPCOMSB] [COUNTRB] 23.2		Danyb,^Db Nrpend [COMRSP] [NEXTAAID] [SDETrqF] [ABDET] 23.8	[COMRSP] [CMPCOMSP] [NEXTAAID] 23.3		
									Danyb, Db ^Dchat ^Nrpend [DELBR] [NEXTAAID] 1			
									Danyb, Db ^Dchat Nrpend [NEXTAAID] 23.8			
									Danyb, Db Dchat ^Nrpend [RECVRDONE] [DELBR] [NEXTAAID] [CAFDETrqF] [VDchatF] 1			

Superseded by a more recent version

TABLE A.15/X.862 *(sheet 22 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
Complete-commit (continued)									Danyb, Db Dchat Nrpend [RECVRDONE] [NEXTAAID] [CAFDETrqF] [VDchatF] 23.8			
							^Danyb, De ^Nrpend [CMPCOMSB] [DELBR] 1		^Danyb, De ^Nrpend [COMRSP] [DELBR] [NEXTAAID] [SDETrqF] 1			
							^Danyb, De Nrpend [CMPCOMSB] [COUNTRB] 23.2		^Danyb, De Nrpend [COMRSP] [NEXTAAID] [SDETrqF] 23.8			
							^Danyb, ^De Dch, Dsh [CMPCOMSB] [RESETD] 2		^Danyb, ^De Nch, Dsh [COMRSP] [CMPCOMSP] [NEXTAAID] [RESETD] 2			
							^Danyb, ^De Dch, ^Dsh, Dg [CMPCOMSB] [RESETD] 3		^Danyb, ^De Nch, ^Dsh, Dg [COMRSP] [CMPCOMSP] [NEXTAAID] [RESETD] 2			

Superseded by a more recent version

TABLE A.15/X.862 *(sheet 23 of 23)*

Commitment

State	17	18	20.2	20.3	21.1	21.2	21.3	21.4	21.5	21.6	25	99
Node state		ACTIVE		READY	DECIDED (COMMIT)							
	C-READY ind received TP-COMMIT req awaited	C-PREPARE ind received	Last ready awaited	commit indication awaited	commit confirm awaited	commit confirm awaited need to rbck	commit confirm received	commit confirm received rbck initiat'd	Last commit confirm awaited	Last commit confirm awaited need to rbck	zombie still born transaction branch	channel estblshmnt awaited
Predicates	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl	Dl
Event	^Dsup	Dsup			^Dsup	^Dsup, Dch	^Dsup	^Dsup, Dch	Dsup	Dsup, Nch	^Dsup	^Dchat
Complete-commit (concluded)							^Danyb, ^De Dch, ^Dsh, ^Dg [CMPCOMSB] [RESETD] 2		^Danyb, ^De Nch, ^Dsh, ^Dg [COMRSP] [CMPCOMSP] [NEXTAAID] [RESETD] 3			
							^Danyb, ^De ^Dch, Dsh [CMPCOMSB] [DELBR] [RESETD] 2		^Danyb, ^De ^Nch, Dsh [COMRSP] [CMPCOMSP] [DELBR] [NEXTAAID] [RESETD] 2			
							^Danyb, ^De ^Dch, ^Dsh, Dg [CMPCOMSB] [DELBR] [RESETD] 3		^Danyb, ^De ^Nch, ^Dsh, Dg [COMRSP] [CMPCOMSP] [DELBR] [NEXTAAID] [RESETD] 2			
							^Danyb, ^De ^Dch, ^Dsh, ^Dg [CMPCOMSB] [DELBR] [RESETD] 2		^Danyb, ^De ^Nch, ^Dsh, Dg [COMRSP] [CMPCOMSP] [DELBR] [NEXTAAID] [RESETD] 3			

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 1 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates Event	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
TP-BEGIN-DIALOGUE (accepted) rsp				Nlf Ncr [VNcrF] [VDahT] 23.4				
TP-BEGIN-DIALOGUE (rejected) rsp				^Nrn, ^Da [ABDrsRUrbc] [DELBR] [SDETrqF] 1				
AF-BEGIN-DIALOGUE (accepted, dataRI) cnf	^Danyb Dcr [TBDcX] [VDcrF] [VDaT] 23.1							
	Danyb Dcr [VDcrF [VDaT] 23.1							
	^Dcr [VDaT] 23.1							

TABLE A.16/X.862 (*sheet 2 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
Event								
AF-BEGIN-DIALOGUE (accepted, rollbackRC) cnf	^Du, ^Dtb Dcr [TBDcX] [VDcrF] [VDaT] [COUNTRB] 23.2							
	^Du, ^Dtb ^Dcr [VDaT] [COUNTRB] 23.2							
	Du, ^Dtb Dcr [TBDcX] [VDcrF] [VDaT] [CPSAP] [COUNTRB] 23.2							
	Du, ^Dtb ^Dcr [VDaT] [CPSAP] [COUNTRB] 23.2							
	Dtb [AABrqUd] [SDETrqF] [ABDET] [COUNTRB] 23.2							

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 3 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl	Dl	Dl	Dl, ^Db	Dl	Dl, ^Danyb	Dl, Dsup	Dl
Event	^Dsup	^Dsup	Dsup	Dsup	Dsup	Dsup, Nch	Nfa, Dd	Dsup, ^Nch
AF-BEGIN-DIALOGUE (rejected(provider), dataRI) cnf	^Danyb [TBDcX] [SDETrqRBC] [ABDET] [NOTCHAIN] [OWEDONE] [COUNTRB] 23.2							
	Danyb [SDETrqRBC] [ABDET] [NOTCHAIN] [COUNTRB] 23.2							
AF-BEGIN-DIALOGUE (rejected(user), dataRI) cnf	^Danyb, Du [TBDcX] [SDETrqRBC] [ABDET] [OWEDONE] [COUNTRB] 23.2							
	Danyb, Du [SDETrqRBC] [ABDET] [COUNTRB] 23.2							

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 4 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
Event								
AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) cnf	^Danyb [TBDcX] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [OWEDONE] [COUNTRB] 23.2							
	Danyb [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [COUNTRB] 23.2							
AF-BEGIN-DIALOGUE (rejected(user), rollbackRC) cnf	^Danyb [TBDcX] [SDETrqF] [ABDET] [NOTCHAIN] [OWEDONE] [COUNTRB] 23.2							
	Danyb [SDETrqF] [ABDET] [NOTCHAIN] [COUNTRB] 23.2							

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 5 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl	Dl	Dl	Dl, ^Db	Dl	Dl, ^Danyb	Dl, Dsup	Dl
Event	^Dsup	^Dsup	Dsup	Dsup	Dsup	Dsup, Nch	Nfa, Dd	Dsup, ^Nch
SAF-ASSOCIATION-LOST ind	^Danyb [TBDcRP] [ABDET] [NOTCHAIN] [OWEDONE] [COUNTRB] 23.2							
	Danyb [ABDET] [NOTCHAIN] [COUNTRB] 23.2							
AF-END-DIALOGUE (confirmation = FALSE) ind	Dx, ^Danyb [TPABiBTED] [SDETrqRBC] [ABDET] [OWEDONE] [COUNTRB] 23.2							
	Dx, Danyb [SDETrqRBC] [ABDET] [COUNTRB] 23.2							

TABLE A.16/X.862 (*sheet 6 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates Event	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
AF-END-DIALOGUE (confirmation = TRUE) ind	Dx, ^Danyb Denbb=0 [TPABiBTED] [SDETrqRBC] [ABDET] [OWEDONE] [COUNTRB] 23.2							
	Dx, Danyb Denbb=0 [SDETrqRBC] [ABDET] [COUNTRB] 23.2							
	Dx, Danyb Denbb>0 [DECDENB] 23.1							
AF-U-ERROR ind	23.1		23.3		23.5			
AF-U-ERROR cnf	Dsh Denb>0 [DECDENB] 23.1		Dsh Denb>0 [DECDENB] 23.3		Dsh Denb>0 [DECDENB] 23.5			
TP-U-ABORT req	Nfa, ^Danyb [ABTPSUI] [NOTCHAIN] 23.1	Nfa, ^Danyb [ABDET] [NOTCHAIN] [AABrqUd] [OPSAP] [SDETrqF] 23.2	Nfa, ^Danyb [ABTPSUI] [NOTCHAIN] 23.3	^Ncr, Nfa, ^Danyb [ABTPSUI] [NOTCHAIN] 23.4	Nfa, ^Danyb [ABTPSUI] [NOTCHAIN] 23.5	Nfa [NOTCHAIN] [AABrqUd] [SDETrqBF] [ABDET] 23.7	^Danyb, ^Nch [AABrqUd] [OPSAP] [SDETrqF] [ABDET] 23.7	
							^Danyb, Nch [AABrqUr] [OPSAP] [SDETrqRBC] [ABDET] [NOTCHAIN] 23.7	

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 7 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
Event								
AF-ABORT (user, dataRI) ind	Dx, ^Danyb [TUABi] [SDETrqRBC] [ABDET] [OWEDONE] [COUNTRB] 23.2	Dch [TUABi] [SDETrqF] [ABDET] [OWEDONE] [NOTCHAIN] 23.2				[TUABi] [SDETrqF] [ABDET] [OWEDONE] [NOTCHAIN] 23.7		
	Dx, Danyb [SDETrqRBC] [ABDET] [COUNTRB] 23.2							

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 8 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
Event								
AF-ABORT (provider, abortRI) ind or A-P-ABORT ind or A-ABORT ind or A-ABORT req or A-RELEASE (result = affirmative) rsp or A-RELEASE (result = affirmative) cnf	^Danyb, ^Dps [SETDIAGTP] [TPABi] [ABDET] [OWEDONE] [COUNTRB] [NOTCHAIN] 23.2	^Danyb [SETDIAGTP] [TPABi] [ABDET] [OWEDONE] [NOTCHAIN] 23.2	^Danyb [SETDIAGTP] [TPABi] [ABDET] [OWEDONE] [NOTCHAIN] 23.8	^Danyb, ^Ncr [SETDIAGTP] [TPABi] [ABDET] [OWEDONE] [NOTCHAIN] 23.8	^Danyb [SETDIAGTP] [TPABi] [ABDET] [OWEDONE] [NOTCHAIN] 23.7	[SETDIAGTP] [TPABi] [ABDET] [OWEDONE] [NOTCHAIN] 23.7		
	Danyb, ^Dps [ABDET] [NOTCHAIN] [COUNTRB] 23.2			^Danyb Ncr [SETDIAGTP] [TPABi] [ABDET] 1	Danyb, ^Dd [ABDET] [NOTCHAIN] [NXTTRAN] 23.5			
			Danyb [ABDET] [NOTCHAIN] 23.8	Danyb [ABDET] [NOTCHAIN] 23.8	Danyb, Dd [ABDET] [NOTCHAIN] 23.7			
	^Danyb, Dps [SETDIAGTP] [TPABi] [THRi] [LOGDAMH] [ABDET] [OWEDONE] [COUNTRB] [NOTCHAIN] 23.2							
	Danyb, Dps [THRi] [LOGDAMH] [ABDET] [NOTCHAIN] [COUNTRB] 23.2							

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 9 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
Event								
Protocol error or Internal error	^Danyb, ^Dps [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [OWEDONE] [COUNTRB] 23.2	^Danyb [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [OWEDONE] 23.2	^Danyb [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [OWEDONE] 23.8	^Danyb, ^Ncr [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [OWEDONE] 23.8	^Danyb [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [OWEDONE] 23.7	[SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [OWEDONE] 23.7	^Danyb [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] 23.7	
	Danyb, ^Dps [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [COUNTRB] 23.2			^Danyb, Ncr [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] 1	Danyb, ^Db, ^Dd [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [NXTTRAN] 23.5			
		Db 23.2	Danyb, ^Db [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] 23.8	Danyb [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] 23.8	Danyb, ^Db, Dd [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] 23.7		Db 23.7	Db 23.8
	^Danyb, Dps [SETDIAGTP] [TPABi] [THRi] [LOGDAMH] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [OWEDONE] [COUNTRB] 23.2							
	Danyb, Dps [THRi] [LOGDAMH] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [COUNTRB] 23.2							

TABLE A.16/X.862 (*sheet 10 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl	Dl	Dl	Dl, ^Db	Dl	Dl, ^Danyb	Dl, Dsup	Dl
Event	^Dsup	^Dsup	Dsup	Dsup	Dsup	Dsup, Nch	Nfa, Dd	Dsup, ^Nch
AF-GRANT-CONTROL ind or AF-REQUEST-CONTROL ind	^Dsh 23.1		^Dsh 23.3		^Dsh 23.5			
AF-HANDSHAKE ind or AF-HANDSHAKE cnf	Dh 23.1		Dh 23.3		Dh 23.5			
AF-HANDSHAKE-AND-GRANT-CONTROL ind or AF-HANDSHAKE-AND-GRANT-CONTROL cnf	Dh, ^Dsh 23.1		Dh, ^Dsh 23.3		Dh, ^Dsh 23.5			
C-BEGIN ind						^Dd [NXTTRAN] [CBEAFTRB] 23.6 Dd [CPSAP] [CBEAFTRB] 23.7		
C-BEGIN cnf	[VDbcrT] [VDxF] 23.1							
U-ASE ind	23.1		23.3		23.5			
AF-DEFER (end-dialogue) ind			^De 23.3		^De 23.5			
AF-DEFER (grant-control) ind			^De, ^Dg 23.3		^De, ^Dg 23.5			
AF-PREPARE ind or AF-PREPARE (data-permitted = FALSE) ind or AF-PREPARE (data-permitted = TRUE) ind			23.3		23.5			

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 11 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl	Dl	Dl	Dl, ^Db	Dl	Dl, ^Danyb	Dl, Dsup	Dl
Event	^Dsup	^Dsup	Dsup	Dsup	Dsup	Dsup, Nch	Nfa, Dd	Dsup, ^Nch
TP-DONE (heuristic-report) req	Dd, ^Dfdone ^Nr, Np [VDdF] [VNfaF] [VDfdoneT] [LOGHD] [COUNTRB] 23.1	Dd, ^Dfdone ^Nr, Np [VDdF] [VNfaF] [VDfdoneT] [LOGHD] [COUNTRB] 23.2	Dd, ^Dfdone Np [VDdF] [VNfaF] [VDfdoneT] [LOGHD] [COUNTRB] 23.3	Dd, ^Dfdone ^Ncr, Np [VDdF] [VNfaF] [VDfdoneT] [LOGHD] [COUNTRB] 23.4				Dd, ^Dfdone Np [VDdF] [VNfaF] [VDfdoneT] [LOGHD] [COUNTRB] 23.8
	Dd, ^Dfdone Nr [VDdF] [VNfaF] [VDfdoneT] [LOGHD] [COUNTRB] 23.1	Dd, ^Dfdone Nr [VDdF] [VNfaF] [VDfdoneT] [LOGHD] [COUNTRB] 23.2						
TP-DONE req	Dd [VDdF] [VNfaF] [VDfdoneT] [COUNTRB] 23.1	^Drbrep, Dd [VDdF] [VNfaF] [VDfdoneT] [COUNTRB] 23.2 Drbrep, Dd [VDdF] [VNfaF] 23.2	Dd [VDdF] [VNfaF] [VDfdoneT] [VDaT] [VNrnT] [COUNTRB] 23.3	Dd ^Ncr [VDdF] [VNfaF] [VDfdoneT] [VDaT] [VNrnT] [COUNTRB] 23.4	Ni, Dd [VDdF] [VNfaF] 23.5	Dd [VDdF] [VNfaF] 23.6	Dd [VDdF] [VNfaF] [NXTTRAN] 23.7	Dd, Danyb [VDdF] [VNfaF] [VDfdoneT] [COUNTRB] 23.8

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 12 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates Event	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
C-ROLLBACK ind	^Du, ^Danyb [CRBrs] [COUNTRB] 23.2				^Danyb, Nch [RBRSPNOAB] 23.6			
					^Danyb, ^Nch, ^Dd [RBRSPNOAB] [NXTTRAN] 23.5			
	Du, ^Danyb [CRBrs] [COUNTRB] [CPSAP] 23.2				^Danyb, ^Nch, Dd [RBRSPNOAB] [CPSAP] 23.7			
	Danyb [AABrqUrbc] [SDETrqF] [ABDET] [COUNTRB] 23.2				Danyb, ^Dd [RBRSPAB] [ABDET] [SDETrqF] [NXTTRAN] 23.5			
			23.4		Danyb, Dd [RBRSPAB] [SDETrqF] [ABDET] 23.7			

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 13 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
Event								
AF-HEURISTIC-REPORT (rollbackRI) ind	^Du, ^Danyb [THRi] [LOGDAM] [CRBrs] [COUNTRB] 23.2							
	Du, ^Danyb [THRi] [LOGDAM] [CRBrs] [CPSAP] [COUNTRB] 23.2							
	Danyb [THRi] [LOGDAM] [AABrqUrbc] [SDETrqF] [ABDET] [COUNTRB] 23.2							

TABLE A.16/X.862 (*sheet 14 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
Event								
AF-ABORT (provider, diagnostic = begin-transaction-reject, rollbackRI) ind	^Danyb [TPABi] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [OWEDONE] [COUNTRB] 23.2							
	Danyb [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [COUNTRB] 23.2							

TABLE A.16/X.862 (*sheet 15 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl	Dl	Dl	Dl, ^Db	Dl	Dl, ^Danyb	Dl, Dsup	Dl
Event	^Dsup	^Dsup	Dsup	Dsup	Dsup	Dsup, Nch	Nfa, Dd	Dsup, ^Nch
AF-ABORT (user, rollbackRI) ind	^Danyb [TUABi] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [OWEDONE] [COUNTRB] 23.2		^Danyb [TUABi] [ABPTNR] [NOTCHAIN] [OWEDONE] 23.4		^Danyb [TUABi] [RBRSPNOAB] [SDETrqF] [ABDET] [NOTCHAIN] [OWEDONE] 23.7			
	Danyb [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [COUNTRB] 23.2		Danyb [ABPTNR] [NOTCHAIN] 23.4		Danyb, Dd [RBRSPNOAB] [SDETrqF] [ABDET] [NOTCHAIN] 23.7			
					Danyb, ^Dd [RBRSPNOAB] [SDETrqF] [ABDET] [NOTCHAIN] [NXTTRAN] 23.5			

TABLE A.16/X.862 (*sheet 16 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
Event								
AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) ind	^Danyb [THRi] [TUABi] [LOGDAM] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [OWEDONE] [COUNTRB] 23.2							
	Danyb [THRi] [LOGDAM] [CRBrs] [SDETrqF] [ABDET] [NOTCHAIN] [COUNTRB] 23.2							

TABLE A.16/X.862 (*sheet 17 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl	Dl	Dl	Dl, ^Db	Dl	Dl, ^Danyb	Dl, Dsup	Dl
Event	^Dsup	^Dsup	Dsup	Dsup	Dsup	Dsup, Nch	Nfa, Dd	Dsup, ^Nch
C-ROLLBACK cnf	^Du, ^Danyb [COUNTRB] 23.2				^Du, ^Danyb 23.6			
					Du, ^Danyb, ^Dd [NXTTRAN] 23.5			
	Du, ^Danyb [COUNTRB] [CPSAP] 23.2				Du, ^Danyb, Dd [CPSAP] 23.7			
	Dtb [AABrqUd] [SDETrqF] [ABDET] [COUNTRB] 23.2				Dtb, ^Dd [AABrqUd] [SDETrqBF] [ABDET] [NXTTRAN] 23.5			
					Dtb, Dd [AABrqUd] [SDETrqBF] [ABDET] 23.7			
	Dbpart [SDETrqF] [ABDET] [COUNTRB] 23.2				Dbpart, ^Dd [SDETrqF] [ABDET] [NXTTRAN] 23.5			
					Dbpart, Dd [SDETrqF] [ABDET] 23.7			

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 18 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
Event								
AF-HEURISTIC-REPORT (rollbackRC) ind	^Danyb, Dch [THRi] [LOGDAM] [COUNTRB] 23.2							
	^Danyb, ^Dch [THRi] [LOGDAM] [COUNTRB] [CPSAP] 23.2							
	Dtb [THRi] [LOGDAM] [AABrqUd] [SDETrqF] [ABDET] [COUNTRB] 23.2							
	Dbpart [THRi] [LOGDAM] [SDETrqF] [ABDET] [COUNTRB] 23.2							

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 19 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl	Dl	Dl	Dl, ^Db	Dl	Dl, ^Danyb	Dl, Dsup	Dl
Event	^Dsup	^Dsup	Dsup	Dsup	Dsup	Dsup, Nch	Nfa, Dd	Dsup, ^Nch
AF-ABORT (provider, diagnostic = begin-transaction-reject, rollbackRC) ind	Du, ^Dbcr ^Danyb [TPABi] [SDETrqF] [ABDET] [OWEDONE] [COUNTRB] 23.2							
	Du, ^Dbcr Danyb [SDETrqF] [ABDET] [COUNTRB] 23.2							
AF-ABORT (user, rollbackRC) ind	^Danyb [TUABi] [SDETrqF] [ABDET] [NOTCHAIN] [OWEDONE] [COUNTRB] 23.2				^Danyb [TUABi] [SDETrqF] [ABDET] [NOTCHAIN] [OWEDONE] 23.7			
	Danyb [SDETrqF] [ABDET] [NOTCHAIN] [COUNTRB] 23.2				Danyb, Dd [SDETrqF] [ABDET] [NOTCHAIN] 23.7			
					Danyb, ^Dd [NOTCHAIN] [SDETrqF] [ABDET] [NXTTRAN] 23.5			

TABLE A.16/X.862 (*sheet 20 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
Event								
AF-ABORT-AND-HEURISTIC-REPORT (rollbackRC) ind	^Danyb [THRi] [TUABi] [LOGDAM] [SDETrqF] [ABDET] [NOTCHAIN] [OWEDONE] [COUNTRB] 23.2							
	Danyb [THRi] [LOGDAM] [SDETrqF] [ABDET] [NOTCHAIN] [COUNTRB] 23.2							

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 21 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
Event								
CAF-RECOVER (ready) ind	^Danyb [CRErsU] [SETTOKX] [CAFDETrqF] [DIALOGUE] [SETDIAGTP] [TPABi] [THRi] [LOGDAMH] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [OWEDONE] [COUNTRB] 23.2	^Danyb [CRErsU] [SETTOKX] [CAFDETrqF] [DIALOGUE] [SETDIAGTP] [TPABi] [SETDIAG] [AABrqPa] [ABDET] [NOTCHAIN] [OWEDONE] 23.2						
	Danyb [CRErsU] [SETTOKX] [CAFDETrqF] [DIALOGUE] [THRi] [LOGDAMH] [SETDIAG] [AABrqPa] [ABDET] [COUNTRB] 23.2	Db [CRErsU] [SETTOKX] [CAFDETrqF] 23.2						
Heuristic-decision-comp	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 23.1	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 23.2	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 23.3	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 23.4	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 23.5	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 23.6	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 23.7	memsp (SldD, Naaid, Nbrid) [LOGREMOVE] 23.8
Rollback-all	23.1	23.2	23.3	23.4				23.8
Set-done-true	[VDdT] 23.1	[VDdT] 23.2	[VDdT] 23.3	[VDdT] 23.4	[VDdT] 23.5	[VDdT] 23.6	[VDdT] 23.7	[VDdT] 23.8

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 22 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl	Dl	Dl	Dl, ^Db	Dl	Dl, ^Danyb	Dl, Dsup	Dl
Event	^Dsup	^Dsup	Dsup	Dsup	Dsup	Dsup, Nch	Nfa, Dd	Dsup, ^Nch
Report-rollback				^Danyb, Dah ^Nch [ABDrsArbc] [VDahF] [VDaT] [VDrbrepT] [NXTTRAN] 23.4				
				^Danyb, Dah Nch [ABDrsArbc] [VDahF] [VDaT] [VDrbrepT] 23.6				
				^Danyb, ^Dah ^Nch [RBRSPNOAB] [VDaT] [VDrbrepT] [NXTTRAN] 23.4				
				^Danyb, ^Dah Nch [RBRSPNOAB] [VDaT] [VDrbrepT] 23.6				
				Dtb [RBRSPAB] [SDETrqF] [ABDET] [VDaT] [VDrbrepT] [NXTTRAN] 23.4				
			[RBREQ]	Dbpart [RBRSPNOAB]				
			[VDaT]	[SDETrqF] [ABDET] [VDaT]				
		[VDrbrepT] 23.2	[VDrbrepT] 23.5	[VDrbrepT] [NXTTRAN] 23.4				[NXTTRAN] 23.8

Superseded by a more recent version

TABLE A.16/X.862 (*sheet 23 of 23*)

Rollback

State	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8
	Rollback req issued Rollback confirm awaited	Rollback ind/cnf received Rollback compl. awaited	Rollback not recvd from sup Report to sup awaited	Rollback ind recvd from sup Report to sup awaited	Rollback req issued Rollback confirm from sup awaited	Report to sup done C-BEGIN awaited	Report to sup done TP-DONE req awaited	Rollback not complete
Predicates	Dl ^Dsup	Dl ^Dsup	Dl Dsup	Dl, ^Db Dsup	Dl Dsup	Dl, ^Danyb Dsup, Nch	Dl, Dsup Nfa, Dd	Dl Dsup, ^Nch
Event								
Complete-rollback		Danyb [DELBR] 1		Danyb [DELBR] 1	Danyb [DELBR] 1		Danyb [DELBR] 1	Danyb [DELBR] 1
		^Danyb, Dc, ^Du [RESETD] [CMPRBSB] [CBErq] 2					^Danyb, Dc, Nch [OPSAP] [RESETD] 2	
		^Danyb, ^Dc, ^Du [RESETD] [CMPRBSB] [CBErq] 3					^Danyb, ^Dc, Nch [OPSAP] [RESETD] 3	
		^Danyb, Dc, Du [OPSAP] [RESETD] [DELBR] 2		^Danyb, Dc [OPSAP] [RESETD] [DELBR] 2	^Danyb, Dc [OPSAP] [RESETD] [DELBR] 2	Dc [OPSAP] [RESETD] 2	^Danyb, Dc, ^Nch [OPSAP] [RESETD] [DELBR] 2	
		^Danyb, ^Dc, Du [OPSAP] [RESETD] [DELBR] 3		^Danyb, ^Dc [OPSAP] [RESETD] [DELBR] 3	^Danyb, ^Dc [OPSAP] [RESETD] [DELBR] 3	^Dc [OPSAP] [RESETD] 3	^Danyb, ^Dc, ^Nch [OPSAP] [RESETD] [DELBR] 3	

Superseded by a more recent version

TABLE A.17/X.862 (*sheet 1 of 7*)

Channel

State / Predicates / Event	1 Channel does not exist	2 Free channel, available	3 Free channel, not available	4 Channel owned by TPPM	5 Token awaited CAF-PLEASE req outstanding	6 AF-BEGIN-DIALOGUE cnf awaited	7 Clean-up
					Atwr		
AF-BEGIN-DIALOGUE (Recovery fu selected, one-way-recovery) ind	^Ldrej [ABDrsAd] [VAtwrF] 3						
	Ldrej [SETDIAGBD] [ABDrsRPd] [SDETrqF] 1						
AF-BEGIN-DIALOGUE (Recovery fu selected, two-way-recovery) ind	^Ldrej [ABDrsAd] [VAtwrT] 3						
	Ldrej [SETDIAGBD] [ABDrsRPd] [SDETrqF] 1						
AF-BEGIN-DIALOGUE (accepted, dataRI) cnf						memsp (SnD, Caaid, Cbrid) [VAtppmT] [VCinitT] [CAFGIVi] 4	
						^memsp (SnD, Caaid, Cbrid) [VCinitT] 2	
AF-BEGIN-DIALOGUE (rejected(provider), dataRI) cnf						memsp (SnD, Caaid, Cbrid) [CAFFAILi] [SDETrqF] 1	
						^memsp (SnD, Caaid, Cbrid) [SDETrqF] 1	
SAF-ASSOCIATION-LOST ind						memsp (SnD, Caaid, Cbrid) [CAFFAILi] 1	
			1		1	^memsp (SnD, Caaid, Cbrid) 1	

Superseded by a more recent version

TABLE A.17/X.862 (*sheet 2 of 7*)

Channel

State	1	2	3	4	5	6	7
	Channel does not exist	Free channel, available	Free channel, not available	Channel owned by TPPM	Token awaited CAF-PLEASE req outstanding	AF-BEGIN-DIALOGUE cnf awaited	Clean-up
Predicates / Event					Atwr		
AF-END-DIALOGUE ind			1		1		
AF-ABORT (provider, abortRI) ind or A-ABORT ind or A-P-ABORT ind or A-RELEASE (result = affirmative) rsp or A-RELEASE (result = affirmative) cnf		1	1		memsp (SnD, Caaid, Cbrid) [CAFFAILi] 1 ^memsp (SnD, Caaid, Cbrid) 1	memsp (SnD, Caaid, Cbrid) [CAFFAILi] 1 ^memsp (SnD, Caaid, Cbrid) 1	1
Protocol error or Internal error		[SETDIAG] [AABrqPa] 1	[SETDIAG] [AABrqPa] 1		memsp (SnD, Caaid, Cbrid) [SETDIAG] [AABrqPa] [CAFFAILi] 1 ^memsp (SnD, Caaid, Cbrid) [SETDIAG] [AABrqPa] 1	memsp (SnD, Caaid, Cbrid) [SETDIAG] [AABrqPa] [CAFFAILi] 1 ^memsp (SnD, Caaid, Cbrid) [SETDIAG] [AABrqPa] 1	[SETDIAG] [AABrqPa] 1
C-RECOVER (ready) ind			^Atokx ^memsb (SnD, AAI, BI) [SETTOKX] [CRErsU] 3 ^Atokx memsb (SnD, AAI, BI) [SETTOKX] [VAtppmT] [CAFREiR] 4		^Atokx ^memsb (SnD, AAI, BI) memsp (SnD, Caaid, Cbrid) [CAFFAILi] [SETTOKX] [CRErsU] 3 ^Atokx ^memsb (SnD, AAI, BI) ^memsp (SnD, Caaid, Cbrid) [SETTOKX] [CRErsU] 3 ^Atokx memsb (Snd, AAI, BI) memsp (SnD, Caaid, Cbrid) [CAFFAILi] [VAtppmT] [SETTOKX] [CAFREiR] 4 ^Atokx memsb (SnD, AAI, BI) ^memsp (SnD, Caaid, Cbrid) [SETTOKX] [VAtppmT] [CAFREiR] 4		

TABLE A.17/X.862 (*sheet 3 of 7*)

Channel

State	1	2	3	4	5	6	7
	Channel does not exist	Free channel, available	Free channel, not available	Channel owned by TPPM	Token awaited CAF-PLEASE req outstanding	AF-BEGIN-DIALOGUE cnf awaited	Clean-up
Predicates / Event					Atwr		
AF-RECOVER (ready) ind					^Atokx Ldretry memsp (SnD, Caaid, Cbrid) [CAFFAILi] [SETTOKX] [CRErsRTC] 3		
			^Atokx Ldretry [SETTOKX] [CRErsRTC] 3		^Atokx Ldretry ^memsp (SnD, Caaid, Cbrid) [SETTOKX] [CRErsRTC] 3		
					^Ldretry, ^Atokx ^memsb (SnD, AAI, BI) memsp (SnD, Caaid, Cbrid) [CAFFAILi] [SETTOKX] [CRErsU] 3		
			^Ldretry, ^Atokx ^memsb (SnD, AAI, BI) [SETTOKX] [CRErsU] 3		^Ldretry, ^Atokx ^memsb (SnD, AAI, BI) ^memsp (SnD, Caaid, Cbrid) [SETTOKX] [CRErsU] 3		
					^Ldretry, ^Atokx memsb (SnD, AAI, BI) memsp (SnD, Caaid, Cbrid) [CAFFAILi] [VAtppmT] [SETTOKX] [CAFREiR] 4		
			^Ldretry, ^Atokx memsb (SnD, AAI, BI) [SETTOKX] [VAtppmT] [CAFREiR] 4		^Ldretry, ^Atokx memsb (SnD, AAI, BI) ^memsp (SnD, Caaid, Cbrid) [SETTOKX] [VAtppmT] [CAFREiR] 4		

TABLE A.17/X.862 (*sheet 4 of 7*)

Channel

State	1	2	3	4	5	6	7
	Channel does not exist	Free channel, available	Free channel, not available	Channel owned by TPPM	Token awaited CAF-PLEASE req outstanding	AF-BEGIN-DIALOGUE cnf awaited	Clean-up
Predicates					Atwr		
Event							
C-RECOVER (commit) ind					^Atokx ^memsp (SldD, AAI, BI) ^memsp (SnD, AAI, BI) memsp (SnD, Caaid, Cbrid) [CAFFAILi] [SETTOKX] [CRErsDC] 3		Atwr [SETTOKX] [CRErsRTC] 3
			^Atokx ^memsp (SldD, AAI, BI) ^memsp (SnD, AAI, BI) [SETTOKX] [CRErsDC] 3		^Atokx ^memsp (SldD, AAI, BI) ^memsp (SnD, AAI, BI) ^memsp (SnD, Caaid, Cbrid) [SETTOKX] [CRErsDC] 3		^Atwr [CRErsRTC] 2
					^Atokx memsp (SldD, AAI, BI) ^memsp (SnD, AAI, BI) memsp (SnD, Caaid, Cbrid) [SETTOKX] [CAFFAILi] [AHRrqHrdC] 3		
			^Atokx memsp (SldD, AAI, BI) ^memsp (SnD, AAI, BI) [SETTOKX] [AHRrqHrdC] 3		^Atokx memsp (SldD, AAI, BI) ^memsp (SnD, AAI, BI) ^memsp (SnD, Caaid, Cbrid) [SETTOKX] [AHRrqHrdC] 3		
					^Atokx memsp (SnD, AAI, BI) memsp (SnD, Caaid, Cbrid) [CAFFAILi] [SETTOKX] [VAtppmT] [CAFREiC] 4		
			^Atokx memsp (SnD, AAI, BI) [SETTOKX] [VAtppmT] [CAFREiC] 4		^Atokx memsp (SnD, AAI, BI) ^memsp (SnD, Caaid, Cbrid) [SETTOKX] [VAtppmT] [CAFREiC] 4		

TABLE A.17/X.862 (*sheet 5 of 7*)

Channel

State / Predicates / Event	1 Channel does not exist	2 Free channel, available	3 Free channel, not available	4 Channel owned by TPPM	5 Token awaited CAF-PLEASE req outstanding	6 AF-BEGIN-DIALOGUE cnf awaited	7 Clean-up
					Atwr		
AF-RECOVER (commit) ind			^Atokx Ldretry [SETTOKX] [CRErsRTC] 3		^Atokx Ldretry memsp (SnD, Caaid, Cbrid) [CAFFAILi] [SETTOKX] [CRErsRTC] 3		
					^Atokx Ldretry ^memsp (SnD, Caaid, Cbrid) [SETTOKX] [CRErsRTC] 3		
			^Atokx ^Ldretry ^memsp (SldD, AAI, BI) ^memsp (SnD, AAI, BI) [SETTOKX] [CRErsDC] 3		^Atokx ^Ldretry ^memsp (SldD, AAI, BI) ^memsp (SnD, AAI, BI) memsp (SnD, Caaid, Cbrid) [CAFFAILi] [SETTOKX] [CRErsDC] 3		
					^Atokx ^Ldretry ^memsp (SldD, AAI, BI) ^memsp (SnD, AAI, BI) ^memsp (SnD, Caaid, Cbrid) [SETTOKX] [CRErsDC] 3		
			^Atokx ^Ldretry memsp (SldD, AAI, BI) ^memsp (SnD, AAI, BI) [SETTOKX] [AHRrqHrdC] 3		^Atokx ^Ldretry memsp (SldD, AAI, BI) ^memsp (SnD, AAI, BI) memsp (SnD, Caaid, Cbrid) [CAFFAILi] [SETTOKX] [AHRrqHrdC] 3		
					^Atokx ^Ldretry memsp (SldD, AAI, BI) ^memsp (SnD, AAI, BI) ^memsp (SnD, Caaid, Cbrid) [SETTOKX] [AHRrqHrdC] 3		
					^Atokx ^Ldretry memsp (SnD, AAI, BI) memsp (SnD, Caaid, Cbrid) [CAFFAILi] [SETTOKX] [VAtppmT] [CAFREiC] 4		

TABLE A.17/X.862 (*sheet 6 of 7*)

Channel

State / Predicates / Event	1 Channel does not exist	2 Free channel, available	3 Free channel, not available	4 Channel owned by TPPM	5 Token awaited CAF-PLEASE req outstanding	6 AF-BEGIN-DIALOGUE cnf awaited	7 Clean-up
					Atwr		
AF-RECOVER (commit) ind			^Atokx ^Ldretry memsp (SnD, AAI, BI) [SETTOKX] [VAtppmT] [CAFREiC] 4		^Atokx ^Ldretry memsp (SnD, AAI, BI) ^memsp (SnD, Caaid, Cbrid) [SETTOKX] [VAtppmT] [CAFREiC] 4		
C-RECOVER (retry-later) cnf or C-RECOVER (unknown) cnf							Atwr 3 ^Atwr 2
AF-TOKEN-GIVE (two-way-recovery) ind			Atwr, Atokx [VAtokxF] 2 Atwr, ^Atokx 2		memsp (SnD, Caaid, Cbrid) [VAtppmT] [CAFGIVi] 4 ^memsp (SnD, Caaid, Cbrid) 2	Aq [FLUSHALL] 6 ^Aq [PASSTHRU] 6	
AF-TOKEN-PLEASE ind		Atwr, Ptok [ATOKGrqTWR] 3					
CAF-PLEASE req	^Ldtwr [VAtwrF] [SETAAID] [ABDrqRO] 6 Ldtwr [VAtwrT] [SETAAID] [ABDrqRT] 6	[VAtppmT] [SETAAID] [CAFGIVi] 4	Atwr, ^Atokx [SETAAID] [ATOKPrq] 5				

Superseded by a more recent version

TABLE A.17/X.862 (*sheet 7 of 7*)

Channel

State	1	2	3	4	5	6	7
	Channel does not exist	Free channel, available	Free channel, not available	Channel owned by TPPM	Token awaited CAF-PLEASE req outstanding	AF-BEGIN-DIALOGUE cnf awaited	Clean-up
Predicates / Event					Atwr		
CAF-DETACH (type = free) req				Atwr, Ptok [VAtppmF] 2			
				Atwr, ^Ptok [VAtppmF] 3			
				^Atwr, Cinit [VAtppmF] 2			
				^Atwr, ^Cinit [VAtppmF] 3			
CAF-DETACH (type = not-used) req				Atwr [VAtppmF] 2			
				^Atwr, Cinit [VAtppmF] 2			
				^Atwr, ^Cinit [VAtppmF] 3			
CAF-DETACH (type = clean-up) req				[VAtppmF] 7			
Terminate-channel		Ptok [AEDrqF] [SDETrqF] 1					

TABLE A.18/X.862 (*sheet 1 of 18*)

SACF

State / Predicates / Event	1 FREE	1.1 AF-BID ind pending (winner) Aw	1.2 AF-BID ind accepted (winner) Aw	2 STRAY	3 BIDDING ^Aw, Aq	4 BID CONFIRM RECEIVED ^Aw	6 BUSY ^Adt	7 CLEANUP ROLLBACK INDICATION EXPECTED	8 CLEANUP BEGIN INDICATION EXPECTED	9 CLEANUP ROLLBACK CONFIRM EXPECTED
SAF-DETACH-ASSOCIATION (free) req				^Aq [RETTOKEN] 1	[VAdtT] 3	^Aq [RETTOKEN] 1	[RETTOKEN] 1			
SAF-DETACH-ASSOCIATION (begin-fear) req				Aq [VAfT] [VAdtT] 2 ^Aq [VAfT] [RETTOKEN] 1			[VAfT] [RETTOKEN] 1			
SAF-DETACH-ASSOCIATION (rollback-indication-expected) req							Aq [DISCARDQ] [RETTOKEN] [RESETS] 1 ^Aq [VAdtT] 7			
SAF-DETACH-ASSOCIATION (rollback-confirm-expected) req							Aq [DISCARDQ] [RETTOKEN] [RESETS] 1 ^Aq [VAdtT] 9			
SAF-DETACH-ASSOCIATION (begin-indication-expected) req							[VAdtT] 8			

Superseded by a more recent version

TABLE A.18/X.862 (*sheet 2 of 18*)

SACF

State / Predicates / Event	1 FREE	1.1 AF-BID ind pending (winner)	1.2 AF-BID ind accepted (winner)	2 STRAY	3 BIDDING	4 BID CONFIRM RECEIVED	6 BUSY	7 CLEANUP ROLLBACK INDICATION EXPECTED	8 CLEANUP BEGIN INDICATION EXPECTED	9 CLEANUP ROLLBACK CONFIRM EXPECTED
		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-BEGIN-DIALOGUE req	^Aw Abm [BIDREQ] [VAdcNEW] [SETCORR] [VAqT] [VAdtF] [QUEUE] 3									
	^Aw Af [BIDREQ] [VAdcNEW] [SETCORR] [VAqT] [VAdtF] [QUEUE] 3									
	^Aw Ldbid [BIDREQ] [VAdcNEW] [SETCORR] [VAqT] [VAdtF] [QUEUE] 3									
	^Aw ^Abm, ^Af ^Ldbid [VAdcNEW] [SETCORR] [SETLPI] [PASSTHRU] [VAdtF] 2									
	Aw Af [VAdcNEW] [SETCORR] [VAlpiCORR] [VAnfdT] [VAqT] [VAdtF] [QUEUE] 2									
	Aw ^Af [VAdcNEW] [SETCORR] [VAlpiCORR] [VAnfdT] [VAdtF] [PASSTHRU] 2									

Superseded by a more recent version

TABLE A.18/X.862 (*sheet 3 of 18*)

SACF

State / Predicates / Event	1 FREE	1.1 AF-BID ind pending (winner)	1.2 AF-BID ind accepted (winner)	2 STRAY	3 BIDDING	4 BID CONFIRM RECEIVED	6 BUSY	7 CLEANUP ROLLBACK INDICATION EXPECTED	8 CLEANUP BEGIN INDICATION EXPECTED	9 CLEANUP ROLLBACK CONFIRM EXPECTED
		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-BEGIN-DIALOGUE ind	Aw ^Abm, ^Ldres Ptok Anfd, LPI=Alpi CFU [VAdcCORR] [SETCORR] [ATOKGrqKP] [VAdtF] [ATTACHMACF] [PASSTHRU] 6		[VAdcCORR] [ATTACHMACF] [PASSTHRU] 6							
	Aw ^Abm, ^Ldres ^Ptok Anfd, LPI=Alpi CFU [VAdcCORR] [VAtokrT] [ATTACHMACF] [PASSTHRU] [VAdtF] 6									

TABLE A.18/X.862 (*sheet 4 of 18*)

SACF

State	1	1.1	1.2	2	3	4	6	7	8	9
	FREE	AF-BID ind pending (winner)	AF-BID ind accepted (winner)	STRAY	BIDDING	BID CONFIRM RECEIVED	BUSY	CLEANUP ROLLBACK INDICATION EXPECTED	CLEANUP BEGIN INDICATION EXPECTED	CLEANUP ROLLBACK CONFIRM EXPECTED
Predicates / Event		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-BEGIN-DIALOGUE ind	Aw ^Abm, ^Ldres Anfd, LPI=Alpi ^CFU [VAdcCORR] [ATTACHMACF] [PASSTHRU] [VAdtF] 6									
	Aw ^Abm, Ldres Anfd, LPI=Alpi [VAdtF] [ABDrsRPdAR] 1									
	Aw ^Abm Anfd, LPI^=Alpi [VAdtF] 1			Aw ^Abm 2						
	Aw ^Abm, ^Ldres Ptok ^Anfd CFU [VAdcCORR] [SETCORR] [ATOKGrqKP] [VAdtF] [ATTACHMACF] [PASSTHRU] 6									
	Aw ^Abm, ^Ldres ^Ptok ^Anfd CFU [VAdcCORR] [VAtokrT] [ATTACHMACF] [PASSTHRU] [VAdtF] 6									
	Aw ^Abm, ^Ldres ^Anfd ^CFU [VAdcCORR] [ATTACHMACF] [PASSTHRU] [VAdtF] 6									

TABLE A.18/X.862 (*sheet 5 of 18*)

SACF

State	1	1.1	1.2	2	3	4	6	7	8	9
	FREE	AF-BID ind pending (winner)	AF-BID ind accepted (winner)	STRAY	BIDDING	BID CONFIRM RECEIVED	BUSY	CLEANUP ROLLBACK INDICATION EXPECTED	CLEANUP BEGIN INDICATION EXPECTED	CLEANUP ROLLBACK CONFIRM EXPECTED
Predicates / Event		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-BEGIN-DIALOGUE ind	Aw ^Abm ^Anfd Ldres [ABDrsRPdAR] [VAdtF] 1									
	^Aw [VAnfdT] [VAlpiCORR] [VAdcCORR] [ATTACHMACF] [PASSTHRU] [VAdtF] 6			^Aw, ^Adt [VAnfdT] [DISCARDQ] [SALi] [RESETS] [VAlpiCORR] [VAdcCORR] [ATTACHMACF] [PASSTHRU] 6	^Adt [VAnfdT] [DISCARDQ] [SALi] [RESETS] [VAlpiCORR] [VAdcCORR] [ATTACHMACF] [PASSTHRU] 6					
				^Aw, Adt [VAnfdT] [DISCARDQ] [RESETS] [VAlpiCORR] [VAdcCORR] [ATTACHMACF] [PASSTHRU] 6	Adt [VAnfdT] [DISCARDQ] [RESETS] [VAlpiCORR] [VAdcCORR] [ATTACHMACF] [PASSTHRU] 6					
AF-BEGIN-DIALOGUE (accepted) rsp or AF-BEGIN-DIALOGUE (rejected(provider)) rsp or AF-BEGIN-DIALOGUE (rejected(user), dataRI) rsp or AF-BEGIN-DIALOGUE (rejected(user), rollbackRC) rsp							[SETCORR] [PASSTHRU] 6			
AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) rsp							[VAdruT] [SETCORR] [COPY] [PASSTHRU] 6			

Superseded by a more recent version

TABLE A.18/X.862 (*sheet 6 of 18*)

SACF

State / Predicates / Event	1 FREE	1.1 AF-BID ind pending (winner) Aw	1.2 AF-BID ind accepted (winner) Aw	2 STRAY	3 BIDDING ^Aw, Aq	4 BID CONFIRM RECEIVED ^Aw	6 BUSY ^Adt	7 CLEANUP ROLLBACK INDICATION EXPECTED	8 CLEANUP BEGIN INDICATION EXPECTED	9 CLEANUP ROLLBACK CONFIRM EXPECTED
AF-BEGIN-DIALOGUE (diagnostic = association-reserved, dataRI) cnf	1			DC^=Adc 2 ^Aw DC=Adc [PASSTHRU] 6	3					
AF-BEGIN-DIALOGUE (diagnostic ^= association-reserved, dataRI) cnf	1			DC^=Adc 2 DC=Adc [PASSTHRU] 6	3	DC=Adc [PASSTHRU] 6				
AF-BEGIN-DIALOGUE (diagnostic ^= association-reserved, rollbackRI) cnf or AF-BEGIN-DIALOGUE (diagnostic ^= association-reserved, rollbackRC) cnf				DC=Adc [PASSTHRU] 6		DC=Adc [PASSTHRU] 6				

Superseded by a more recent version

TABLE A.18/X.862 (*sheet 7 of 18*)

SACF

State	1	1.1	1.2	2	3	4	6	7	8	9
	FREE	AF-BID ind pending (winner)	AF-BID ind accepted (winner)	STRAY	BIDDING	BID CONFIRM RECEIVED	BUSY	CLEANUP ROLLBACK INDICATION EXPECTED	CLEANUP BEGIN INDICATION EXPECTED	CLEANUP ROLLBACK CONFIRM EXPECTED
Predicates / Event		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-BID (token-requested = FALSE) ind	Aw Anfd, LPI=Alpi Ldres [ABIDrsR] [VAdtF] 1									
	Aw Anfd, LPI=Alpi ^Ldres [ABIDrsA] [VAdtF] 1.2									
	Aw Anfd, LPI^=Alpi [VAdtF] 1			Aw 2				Aw 7		Aw 9
	Aw ^Anfd Ldres [ABIDrsR] [VAdtF] 1									
	Aw ^Anfd ^Ldres [ABIDrsA] [VAdtF] 1.2									

Superseded by a more recent version

TABLE A.18/X.862 (*sheet 8 of 18*)

SACF

State	1	1.1	1.2	2	3	4	6	7	8	9
	FREE	AF-BID ind pending (winner)	AF-BID ind accepted (winner)	STRAY	BIDDING	BID CONFIRM RECEIVED	BUSY	CLEANUP ROLLBACK INDICATION EXPECTED	CLEANUP BEGIN INDICATION EXPECTED	CLEANUP ROLLBACK CONFIRM EXPECTED
Predicates Event		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-BID (token-requested = TRUE) ind	Aw Anfd, LPI=Alpi Ldres [ABIDrsR] [VAdtF] 1									
	Aw Anfd, LPI=Alpi ^Ldres, Ptok [ABIDrsA] [ATOKGrqRG] [VAdtF] 1.2									
	Aw Anfd, LPI=Alpi ^Ldres, ^Ptok ^Lddel [ABIDrsA] [VAtokrT] [VAdtF] 1.2									

TABLE A.18/X.862 (*sheet 9 of 18*)

SACF

State	1	1.1	1.2	2	3	4	6	7	8	9
	FREE	AF-BID ind pending (winner)	AF-BID ind accepted (winner)	STRAY	BIDDING	BID CONFIRM RECEIVED	BUSY	CLEANUP ROLLBACK INDICATION EXPECTED	CLEANUP BEGIN INDICATION EXPECTED	CLEANUP ROLLBACK CONFIRM EXPECTED
Predicates / Event		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-BID (token-requested = TRUE) ind	Aw Anfd, LPI=Alpi ^Ldres, ^Ptok Lddel [VAtokrT] [VAdtF] 1.1									
	Aw Anfd, LPI^=Alpi [VAdtF] 1			Aw 2				Aw 7		Aw 9
	Aw ^Anfd Ldres [ABIDrsR] [VAdtF] 1									
	Aw ^Anfd ^Ldres, Ptok [ABIDrsA] [ATOKGrqRG] [VAdtF] 1.2									
	Aw ^Anfd ^Ldres, ^Ptok ^Lddel [ABIDrsA] [VAtokrT] [VAdtF] 1.2									
	Aw ^Anfd ^Ldres, ^Ptok Lddel [VAtokrT] [VAdtF] 1.1									

Superseded by a more recent version

TABLE A.18/X.862 (*sheet 10 of 18*)

SACF

State / Predicates / Event	1 FREE	1.1 AF-BID ind pending (winner) Aw	1.2 AF-BID ind accepted (winner) Aw	2 STRAY	3 BIDDING ^Aw, Aq	4 BID CONFIRM RECEIVED ^Aw	6 BUSY ^Adt	7 CLEANUP ROLLBACK INDICATION EXPECTED	8 CLEANUP BEGIN INDICATION EXPECTED	9 CLEANUP ROLLBACK CONFIRM EXPECTED
AF-BID (accepted) cnf					Acbegq [FLUSHPAR] [VAfF] 4 ^Acbegq, ^Adt [FLUSHALL] [VAfF] [VAqF] 4 ^Acbegq, Adt [FLUSHALL] [VAfF] [VAqF] [VAdtF] 1					
AF-BID (rejected) cnf					Adt [DISCARDQ] [VAfF] [RESETS] 1 ^Adt [DISCARDQ] [VAfF] [RESETS] [SALi] 1					
AF-END-DIALOGUE req				^Aq [PASSTHRU] 2 Aq [QUEUE] 2	[QUEUE] 3	^Aq [PASSTHRU] 4 Aq [QUEUE] 4	[PASSTHRU] 6			

TABLE A.18/X.862 (*sheet 11 of 18*)

SACF

State	1	1.1	1.2	2	3	4	6	7	8	9
	FREE	AF-BID ind pending (winner)	AF-BID ind accepted (winner)	STRAY	BIDDING	BID CONFIRM RECEIVED	BUSY	CLEANUP ROLLBACK INDICATION EXPECTED	CLEANUP BEGIN INDICATION EXPECTED	CLEANUP ROLLBACK CONFIRM EXPECTED
Predicates Event		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-U-ERROR req or AF-ABORT (dataRI) req or AF-ABORT (diagnostic ^= begin-transaction-reject, rollbackRI) req or AF-GRANT-CONTROL req or AF-REQUEST-CONTROL req or AF-HANDSHAKE req or AF-HANDSHAKE-AND-GRANT-CONTROL req or AF-DEFER req or AF-PREPARE req or U-ASE req or C-ROLLBACK req				^Aq [PASSTHRU] 2 Aq [QUEUE] 2	[QUEUE] 3	^Aq [PASSTHRU] 4 Aq [QUEUE] 4	^Aq [PASSTHRU] 6 Aq [QUEUE] 6			
AF-ABORT (diagnostic = begin-transaction-reject, rollbackRI) req				^Aq [PASSTHRU] 2 Aq [QUEUE] 2	[QUEUE] 3	^Aq [PASSTHRU] 4 Aq [QUEUE] 4	^Aq [VAbtrT] [COPY] [PASSTHRU] 6			
AF-ABORT (rollbackRC) req						[PASSTHRU] 4	[PASSTHRU] 6			
AF-ABORT (abortRI) req				[PASSTHRU] *	[PASSTHRU] *	[PASSTHRU] *	[PASSTHRU] *			

Superseded by a more recent version

TABLE A.18/X.862 (*sheet 12 of 18*)

SACF

State	1	1.1	1.2	2	3	4	6	7	8	9
	FREE	AF-BID ind pending (winner)	AF-BID ind accepted (winner)	STRAY	BIDDING	BID CONFIRM RECEIVED	BUSY	CLEANUP ROLLBACK INDICATION EXPECTED	CLEANUP BEGIN INDICATION EXPECTED	CLEANUP ROLLBACK CONFIRM EXPECTED
Predicates / Event		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-END-DIALOGUE ind or AF-END-DIALOGUE cnf or AF-U-ERROR cnf or AF-GRANT-CONTROL ind or AF-REQUEST-CONTROL ind or AF-HANDSHAKE ind or AF-HANDSHAKE cnf or AF-HANDSHAKE-AND-GRANT-CONTROL ind or AF-HANDSHAKE-AND-GRANT-CONTROL cnf or U-ASE ind	1			2	3		[PASSTHRU] 6			
AF-U-ERROR ind	1			2	3		[PASSTHRU] 6	7		9
AF-END-DIALOGUE rsp or AF-U-ERROR rsp or AF-HANDSHAKE rsp or AF-HANDSHAKE-AND-GRANT-CONTROL rsp or C-BEGIN rsp or C-READY req or C-COMMIT req or C-COMMIT+C-BEGIN req or C-COMMIT rsp or AF-ABORT (user, commitRI) req or AF-ABORT (user, commitRC) req or AF-HEURISTIC-REPORT req or AF-ABORT-AND-HEURISTIC-REPORT req or C-ROLLBACK rsp or P-TOKEN-GIVE (sync-minor) req							[PASSTHRU] 6			
C-RECOVER rsp							[PASSTHRU] [VArvyrsF] 6			

TABLE A.18/X.862 (*sheet 13 of 18*)

SACF

State	1	1.1	1.2	2	3	4	6	7	8	9
	FREE	AF-BID ind pending (winner)	AF-BID ind accepted (winner)	STRAY	BIDDING	BID CONFIRM RECEIVED	BUSY	CLEANUP ROLLBACK INDICATION EXPECTED	CLEANUP BEGIN INDICATION EXPECTED	CLEANUP ROLLBACK CONFIRM EXPECTED
Predicates / Event		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-ABORT (provider, abortRI) ind				^Adt [DISCARDQ] [PASSTHRU] *	^Adt [DISCARDQ] [PASSTHRU] *	^Adt [DISCARDQ] [PASSTHRU] *	[DISCARDQ] [PASSTHRU]			
	*	*	*	Adt [DISCARDQ] *	Adt [DISCARDQ] *	Adt [DISCARDQ] *	*	*	*	*
AF-ABORT (user, dataRI) ind	1			2	3		[PASSTHRU] 6	7	1	9
A-ABORT ind or A-P-ABORT ind or A-RELEASE (result = affirmative) cnf				^Adt [PASSTHRU] *	^Adt [PASSTHRU] *	^Adt [PASSTHRU] *	[PASSTHRU]			
	*	*	*	Adt *	Adt *	Adt *	*	*	*	*
A-ABORT req or A-RELEASE (result = affirmative) rsp	[PASSTHRU] *	[PASSTHRU] *	[PASSTHRU] *	[DISCARDQ] [PASSTHRU] *	[DISCARDQ] [PASSTHRU] *	[DISCARDQ] [PASSTHRU] *	[DISCARDQ] [PASSTHRU] *	[PASSTHRU] *	[PASSTHRU] *	[PASSTHRU] *
Protocol error	[SETDIAG] [AABrqPa] *	[SETDIAG] [AABrqPa] *	[SETDIAG] [AABrqPa] *	2	Adt [SETDIAG] [AABrqPa] *	4	6	[SETDIAG] [AABrqPa] *	[SETDIAG] [AABrqPa] *	[SETDIAG] [AABrqPa] *
					^Adt 3					

Superseded by a more recent version

TABLE A.18/X.862 (*sheet 14 of 18*)

SACF

State	1	1.1	1.2	2	3	4	6	7	8	9
	FREE	AF-BID ind pending (winner)	AF-BID ind accepted (winner)	STRAY	BIDDING	BID CONFIRM RECEIVED	BUSY	CLEANUP ROLLBACK INDICATION EXPECTED	CLEANUP BEGIN INDICATION EXPECTED	CLEANUP ROLLBACK CONFIRM EXPECTED
Predicates / Event		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-DEFER ind or C-BEGIN cnf or C-READY ind or C-COMMIT ind or C-COMMIT+C-BEGIN ind or AF-ABORT (user, commitRI) ind or AF-ABORT (user, commitRC) ind or C-COMMIT cnf or AF-HEURISTIC-REPORT (commitRC) ind or AF-ABORT-AND-HEURISTIC-REPORT (commitRC) ind or AF-HEURISTIC-REPORT (recoverDoneRC) ind or C-RECOVER (commit) ind or C-RECOVER cnf or AF-RECOVER (commit) ind							[PASSTHRU] 6			
C-RECOVER (ready) ind or AF-RECOVER (ready) ind							[PASSTHRU] [VArvyrsT] 6			
AF-PREPARE ind							[PASSTHRU] 6			9
C-BEGIN req				Ptok [PASSTHRU] 2 ^Ptok [VAcbegqT] [VAqT] [QUEUE] 2	[VAcbegqT] [QUEUE] 3	Ptok [PASSTHRU] 4 ^Ptok [VAcbegqT] [VAqT] [QUEUE] 4	Ptok [PASSTHRU] 6			

TABLE A.18/X.862 (*sheet 15 of 18*)

SACF

State / Predicates / Event	1 FREE	1.1 AF-BID ind pending (winner) Aw	1.2 AF-BID ind accepted (winner) Aw	2 STRAY	3 BIDDING ^Aw, Aq	4 BID CONFIRM RECEIVED ^Aw	6 BUSY ^Adt	7 CLEANUP ROLLBACK INDICATION EXPECTED	8 CLEANUP BEGIN INDICATION EXPECTED	9 CLEANUP ROLLBACK CONFIRM EXPECTED
C-BEGIN ind	Af [VAfF] [CRBrq] 9			Af, ^Adt [SALi] [DISCARDQ] [RESETS] [VAfF] [CRBrq] 9	Af, ^Adt [SALi] [DISCARDQ] [RESETS] [VAfF] [CRBrq] 9					
				Af, Adt [DISCARDQ] [RESETS] [VAfF] [CRBrq] 9	Af, Adt [DISCARDQ] [RESETS] [VAfF] [CRBrq] 9		[PASSTHRU] 6		[CRBrq] 9	
C-ROLLBACK ind				[PASSTHRU] 6		[PASSTHRU] 6	[PASSTHRU] 6	[CRBrs] [RETTOKEN] 1		Abtr [REPREQ] [RETTOKEN] [VAbtrF] 1
										Adru [REPREQ] [RETTOKEN] [VAdruF] 1
										^Abtr, ^Adru [CRBrs) [RETTOKEN] 1
AF-HEURISTIC-REPORT (rollbackRI) ind or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) ind				[PASSTHRU] 6		[PASSTHRU] 6	[PASSTHRU] 6			
AF-ABORT (rollbackRI) ind				[PASSTHRU] 6		[PASSTHRU] 6	[PASSTHRU] 6			[CRBrs] [RETTOKEN] 1

TABLE A.18/X.862 (*sheet 16 of 18*)

SACF

State / Predicates / Event	1 FREE	1.1 AF-BID ind pending (winner) Aw	1.2 AF-BID ind accepted (winner) Aw	2 STRAY	3 BIDDING ^Aw, Aq	4 BID CONFIRM RECEIVED ^Aw	6 BUSY ^Adt	7 CLEANUP ROLLBACK INDICATION EXPECTED	8 CLEANUP BEGIN INDICATION EXPECTED	9 CLEANUP ROLLBACK CONFIRM EXPECTED
C-ROLLBACK cnf or AF-HEURISTIC-REPORT (rollbackRC) ind or AF-ABORT (rollbackRC) ind or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRC) IND				[PASSTHRU] 6		[PASSTHRU] 6	[PASSTHRU] 6			[RETTOKEN] [VAbtrF] [VAdruF] 1
C-RECOVER (ready) req or AF-RECOVER req							Ptok [PASSTHRU] 6			
							^Ptok [VAqT] [QUEUE] 6			
C-RECOVER (commit) req							Arvyrs [PASSTHRU] [VArvyrsF] 6			
							^Arvyrs Ptok [PASSTHRU] 6			
							^Arvyrs ^Ptok [QUEUE] 6			
AF-TOKEN-GIVE (regular) ind	Aw [VAfF] 1	[ABIDrsA] [ATOKGrqRG] [VAtokrF] 1.2	Atokr [ATOKGrqRG] [VAtokrF] 1.2	Aw, ^Adt Aq [FLUSHALL] [VAcbegqF] [VAqF] [VAfF] 2		Aq [FLUSHALL] [VAcbegqF] [VAqF] [VAfF] 4	Aw Atokr [SETCORR] [ATOKGrqKP] [VAtokrF] 6			Aw [VAfF] 9
			^Atokr [VAfF] 1.2	Aw, Adt Aq [FLUSHALL] [VAcbegqF] [VAqF] [VAfF] 1		^Aq				
	^Aw [ATOKGrqRG] 1			Aw ^Aq [VAfF] 2						
				^Aw [ATOKGrqRG] 2	[ATOKGrqRG] 3	4				^Aw 9

TABLE A.18/X.862 (*sheet 17 of 18*)

SACF

State / Predicates / Event	1 FREE	1.1 AF-BID ind pending (winner)	1.2 AF-BID ind accepted (winner)	2 STRAY	3 BIDDING	4 BID CONFIRM RECEIVED	6 BUSY	7 CLEANUP ROLLBACK INDICATION EXPECTED	8 CLEANUP BEGIN INDICATION EXPECTED	9 CLEANUP ROLLBACK CONFIRM EXPECTED
		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-TOKEN-GIVE (keep) ind	^Aw [ATOKGrqRG] 1			^Aw DC^=Adc [ATOKGrqRG] 2	DC^=Adc [ATOKGrqRG] 3					
				^Aw DC=Adc [FLUSHALL] [PASSTOKEN] [VAfF] [VAqF] [VAcbegqF] 2			^Aw DC=Adc [FLUSHALL] [PASSTOKEN] [VAfF] [VAqF] [VAcbegqF] 6			
AF-TOKEN-GIVE (two-way-recovery) req							Ptok [PASSTHRU] 6			
							^Ptok [VAqT] [QUEUE] 6			
AF-TOKEN-GIVE (two-way-recovery) ind							[PASSTHRU] 6			
P-TOKEN-GIVE (sync-minor) ind	Aw [VAfF] 1			Aw, ^Adt Aq [FLUSHALL] [VAcbegqF] [VAqF] [VAfF] 2						Aw [VAfF] 9
				Aw, Adt Aq [FLUSHALL] [VAcbegqF] [VAqF] [VAfF] 1						
				Aw ^Aq [VAfF] 2						
	^Aw [ATOKGrqRG] 1			^Aw [ATOKGrqRG] 2	[ATOKGrqRG] 3		[PASSTOKEN] 6			^Aw 9

Superseded by a more recent version

TABLE A.18/X.862 (*sheet 18 of 18*)

SACF

State	1	1.1	1.2	2	3	4	6	7	8	9
	FREE	AF-BID ind pending (winner)	AF-BID ind accepted (winner)	STRAY	BIDDING	BID CONFIRM RECEIVED	BUSY	CLEANUP ROLLBACK INDICATION EXPECTED	CLEANUP BEGIN INDICATION EXPECTED	CLEANUP ROLLBACK CONFIRM EXPECTED
Predicates / Event		Aw	Aw		^Aw, Aq	^Aw	^Adt			
AF-TOKEN-PLEASE req							[PASSTHRU] 6			
AF-TOKEN-PLEASE ind	1			2	3		[PASSTHRU] 6			
Reject-bid		[ABIDrsR] 1								

Annex B

Requirements for writing U-ASEs and application contexts

(This annex forms an integral part of this Recommendation)

U-ASEs that are to be used within the OSI TP environment (i.e. included in an OSI TP application-context) shall observe the following guidelines while operating within the bounds of a dialogue:

a) They shall document in the application context definition, any direct use of ASEs or Presentation including the embedding of U-ASE APDUs in ASE APDUs or Presentation PDUs;

b) They shall document in the application context definition any direct use of ACSE that conflicts with the TP use of ACSE;

NOTE 1 – It is recommended that the U-ASE does not make direct use of ACSE; however, the U-ASE could conceivably use the A-ABORT request or A-RELEASE request. The affirmative confirmation of the A-RELEASE request has the same effect on the TPPM as if an A-ABORT request has been received; depending on when the A-ABORT service is invoked or the A-RELEASE confirm is received, the existing transaction (if any) will be rolled back or recovered as appropriate (see 8.5.9).

c) They shall not use those non-sharable Presentation Services which are used by the TP-ASE, CCR, or ACSE;

NOTE 2 – It is permissible for the U-ASE to use the Session minor synchronize service and resynchronization service, as long as resynchronization is not done to a point before the beginning of the transaction. The use of the resynchronization service by the U-ASE should not disrupt the TP services. The U-ASE may make use of the Session major or minor synchronize service when not part of a provider-supported transaction. In this case, a U-ASE is responsible for the movement of the tokens in order that an appropriate U-ASE can have the tokens at dialogue establishment time.

d) They shall not use the CCR service directly;

e) They shall ensure that they work properly within the restrictions of this protocol, without loss of semantics.

NOTE 3 – For example, a U-ASE may not initiate commitment prior to receiving all expected U-ASE information.

In particular, when CCR is part of the application-context, the protocols of the U-ASEs that utilize the synchronize-minor token shall be such that the synchronize-minor token is owned by the issuer of the TP-BEGIN-TRANSACTION request;

f) The TP Service and Protocol make use of a dummy service, TP-DATA, to indicate where one or more U-ASE services may be included in the allowed sequence of TP services. For each such occurrence of TP-DATA, the U-ASE specification shall indicate the specific U-ASE service(s), and their sequencing rules that may be substituted. Thus the U-ASE specification shall expand (and complete if it is the only U-ASE) the TPSP rules specified in this protocol specification.

Annex C

Scenarios

(This annex does not form an integral part of this Recommendation)

C.1 Introduction

This annex contains scenarios which may assist in the understanding of OSI TP. Examples have been chosen to illustrate the most common functions and combinations of sequences of primitives. These are however just a few of the many possible sequences; these examples do not by themselves place any constraints on the use of OSI TP.

The representation of OSI TP protocol flows and their relationship to OSI TP Service are shown in Figure C.1.

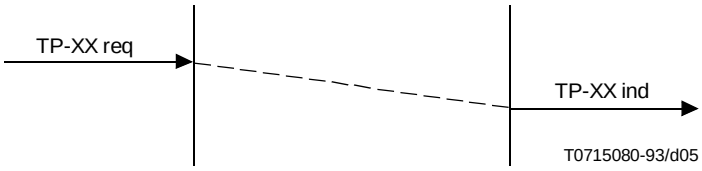


FIGURE C.1/X.862

Representation of OSI TP Protocol flows

In the figures in this annex, a solid vertical line implies that there is an active dialogue and interaction can occur at any time. A dotted vertical line implies that there are still OSI TP Service interactions to complete the transaction, although the dialogue is terminated. In addition, note that some scenarios do not show complete sequences.

The following list gives the figure number and the title of scenarios supplied in this annex:

C.1.1 Scenarios with a single dialogue (successful cases)

C.2 Application supported transactions with handshakes in Polarized Control

C.3 Application supported transactions with handshakes in Shared Control

C.4 Provider-supported chained transactions

C.5 Provider-supported unchained transactions

C.6 TP-PREPARE with Data-Permitted="false" in Polarized Control

C.7 TP-PREPARE with Data-Permitted="true" in Polarized Control

C.8 TP-PREPARE in Shared Control

C.9 Handshake service, immediate response

C.10 Handshake service, delayed response

C.11 Deferred end dialogue, normal case

C.1.2 Scenarios with a single dialogue (unsuccessful cases)

1) Negative Response to TP-HANDSHAKE

C.12 Negative response to a TP-HANDSHAKE in Polarized Control

C.13 Collision between a TP-HANDSHAKE and a TP-U-ERROR in Polarized Control

C.14 Negative response to a TP-HANDSHAKE in Shared Control

C.15 Collision between a TP-HANDSHAKE and a TP-U-ERROR in Shared Control

2) TP-ROLLBACK scenarios

C.16 TP-ROLLBACK with Chained Transactions

C.17 TP-ROLLBACK with Unchained Transactions

3) Rejection of a TP-BEGIN-TRANSACTION

C.18 Rejection of a TP-BEGIN-TRANSACTION

4) TP-U-ERROR collision with TP-DATA

C.19 TP-U-ERROR collision with TP-DATA in Polarized Control

C.20 TP-U-ERROR collision with TP-DATA in Shared Control

5) TP-ROLLBACK with TP-U-ABORT

C.21 TP-U-ABORT response to rollback

6) TP-DEFERRED-END-DIALOGUE with TP-ROLLBACK

C.22 Deferred end dialogue cancelled by rollback in active phase

C.23 Deferred end dialogue cancelled by rollback in termination phase

7) Dialogue establishment scenarios

C.24 Rejection of the dialogue establishment, coordination level “none”

C.25 Rejection of the dialogue establishment, coordination level “commitment”

C.26 Rejection of the dialogue establishment, coordination level “commitment” (TP-COMMIT request issued)

C.27 Aborting the dialogue establishment by the requestor

C.28 Dialogue establishment followed by rollback from the requestor, dialogue rejected by recipient

C.29 Dialogue establishment followed by rollback from the requestor, dialogue accepted by recipient

C.30 Failure after a dialogue Establishment

C.31 Rejection of a dialogue establishment request causing rollback

C.32 Rejection of a dialogue establishment request after TP-PREPARE

C.33 Aborting the dialogue establishment by requestor before acceptance

C.34 Aborting the dialogue establishment by requestor after acceptance

C.35 Aborting the dialogue establishment by recipient after acceptance

C.36 Rollback on a rejected dialogue

C.37 Rollback on an accepted dialogue

C.38 Failure during dialogue establishment before acceptance

C.39 Failure during dialogue establishment after acceptance

C.40 Dialogue establishment followed by rollback and subsequent communication failure

C.41 Confirmed dialogue establishment followed by rollback and subsequent user abort, recipient accepts the dialogue

C.42 Confirmed dialogue establishment followed by rollback and subsequent user abort, recipient rejects the dialogue

C.1.3 Scenarios with a single dialogue (failure case)

C.43 TP-P-ABORT during active phase

C.44 TP-P-ABORT during the first phase of commitment

C.45 TP-P-ABORT during the second phase of commitment after decision has reached subordinate

C.46 TP-P-ABORT during the second phase of commitment after the end of the transaction for the subordinate

C.47 TP-P-ABORT during the second phase of commitment before decision has reached subordinate

C.1.4 Collision scenarios on a single dialogue

C.48 Collision of TP-U-ERROR and TP-COMMIT

C.49 Collision of TP-U-ERRORs in Polarized Control

C.50 Collision of TP-U-ERRORs issued without having control

C.51 Suppression effect of TP-U-ERROR in Shared Control

C.52 Collision of TP-U-ERRORs in Shared Control

C.53 TP-U-ERROR during an outstanding handshake request

C.54 TP-U-ERROR during an outstanding handshake indication

C.55 Collision of TP-U-ERROR with TP-END-DIALOGUE

C.56 Collision of TP-U-ERRORs with TP-HANDSHAKE indication in Shared Control

C.57 Queuing TP-U-ERROR-RC before TP-BEGIN-DIALOGUE-RC is sent in Shared Control

C.58 Two TP-U-ERROR requests after a TP-HANDSHAKE collision in Shared Control

C.59 Collision of a TP-END-DIALOGUE (Confirmation="true") and a TP-END-DIALOGUE (Confirmation="false")

C.60 Collision of a TP-END-DIALOGUE (Confirmation="true") and a TP-END-DIALOGUE (Confirmation="true")

C.61 Collision of a TP-END-DIALOGUE (Confirmation="true") and a TP-U-ERROR in Polarized Control

C.62 Collision of a TP-END-DIALOGUE (Confirmation="true") and a TP-U-ERROR in Shared Control

C.63 Collision of a TP-END-DIALOGUE (Confirmation="true") and a TP-REQUEST-CONTROL

C.64 Collision of a TP-END-DIALOGUE (Confirmation="true") and a TP-BEGIN-TRANSACTION

C.65 Collision of a TP-END-DIALOGUE (Confirmation="true") and a TP-HANDSHAKE

C.66 Collision of a TP-COMMIT request and a TP-BEGIN-DIALOGUE confirm [rejected (provider)]

C.67 Collision of a TP-COMMIT request and a TP-BEGIN-DIALOGUE confirm [rejected (user)]

C.68 Collision of TP-COMMIT and TP-DATA

C.1.5 Tree with multiple dialogues (successful cases)

C.69 Commitment in a multi-dialogue tree (Chained Transactions)

C.70 Commitment in a multi-dialogue tree with usage of TP-PREPARE (Unchained Transactions)

C.1.6 Tree with multiple dialogues (unsuccessful cases)

C.71 Rollback from root node in Chained Transactions

C.72 Rollback from an intermediate node in Unchained Transactions

C.73 Rollback from an intermediate node in Chained Transactions

C.74 Two failures during first phase of commitment

C.75 Rollback-related actions (three dialogues aborted)

C.76 Failure in active phase; two isolated trees

C.77 Failure in active phase; superior tree aborted

C.78 Failure after TP-COMMIT indication issued to superior; rollback of next transaction in superior tree

C.79 Failure after TP-COMMIT indication issued to superior; isolated node refuses to be root; rollback of next transaction

C.80 Failure after all TPSUIs have received TP-COMMIT indication; rollback of next transaction in both trees

C.81 Failure after all TPSUIs have received TP-COMMIT indication; isolated node refuses to be root; rollback of next transaction in both trees

C.82 Failure after TP-COMMIT indication issued to superior; superior aborts all its dialogues; rollback of next transaction in superior trees

C.83 Failure after TP-COMMIT-COMPLETE indication issued to subordinate; rollback of next transaction in both trees

C.1.7 Heuristic decisions and reporting

C.84 Dialogue aborted during commitment; subordinate takes (wrong) decision to rollback

C.85 Dialogue aborted during commitment; subordinate takes (correct) decision to commit

C.86 Dialogue aborted during commitment; subordinate takes (wrong) decision to rollback but is able to compensate

C.87 Dialogue aborted during commitment: subordinate takes contradicting heuristic decisions producing an internal heuristic mix

C.88 Dialogue aborted during commitment: subordinate takes (wrong) decision to commit

C.89 Dialogue aborted during commitment; subordinate takes (correct) decision to rollback but a heuristic-damage is reported

C.90 Dialogue aborted before subordinate is aware of transaction termination; no heuristic decision taken but a heuristic-damage is reported

C.91 Heuristic decision and reporting in a multi-dialogue tree; all nodes above the failure receive the heuristic report

C.92 Heuristic decision and reporting in a multi-dialogue tree; root node is able to compensate and does not report heuristic mix to its TPSUI

C.93 Heuristic decision and reporting in a multi-dialogue tree; Heuristic report during rollback procedure

C.1.8 Scenarios for SACF

C.94 BID used in the commit

C.95 BID not used in the commit

C.1.9 Scenarios for CPM

C.96 Channel establishment requested by contention-winner

C.97 Channel establishment requested by contention-loser (simple case)

C.98 Channel establishment requested by contention-loser (complex case)

C.99 Two way recovery (simple case)

C.100 Recovery collision due to requests by both a superior and a subordinate

C.2 Scenarios with a single dialogue (successful cases)

The following scenarios demonstrate the service primitives in one dialogue between two TPSUIs.

C.2.1 Application supported transactions

Two scenarios are shown. Figure C.2 illustrates Polarized Control and Figure C.3 illustrates Shared Control. Apart from that the scenarios are equivalent. In each, a dialogue is begun and date is passed between the two TPSUIs. At the midpoint, the Handshake service is used to synchronize the two partners. After further transfer of data, the partners synchronize again and end the dialogue (by using the confirmed TP-END-DIALOGUE service).

C.2.2 Provider-supported chained transactions

The scenario in Figure C.4 shows a dialogue being established between two TPSUIs to support a chained sequence of transactions. After the second transaction is completed, the dialogue is ended. The TP-DEFERRED-END-DIALOGUE service is used to request termination of the dialogue after the successful conclusion of the second transaction.

NOTE – As drawn, the scenario is accurate for Shared Control; for Polarized Control, each TP-DATA request would need to be followed by a TP-GRANT-CONTROL request to pass control of the dialogue.

C.2.3 Provider-supported unchained transactions

The scenario in Figure C.5 shows a dialogue being established between two TPSUIs to support unchained transactions. Two transactions are performed. After the second transaction is completed, the dialogue is ended. The first transaction is begun simultaneously with the dialogue (parameter “Begin-Transaction” of TP-BEGIN-DIALOGUE set to “true”). After the first transaction has finished, data can be exchange between the two TPSUIs outside the scope of a transaction although this is not shown. After the second transaction has ended, the dialogue is terminated by the superior TPSUI.

NOTE – As drawn, the scenario is accurate for Shared Control; for Polarized Control, each TP-DATA request would need to be followed by a TP-GRANT-CONTROL request to pass control of the dialogue.

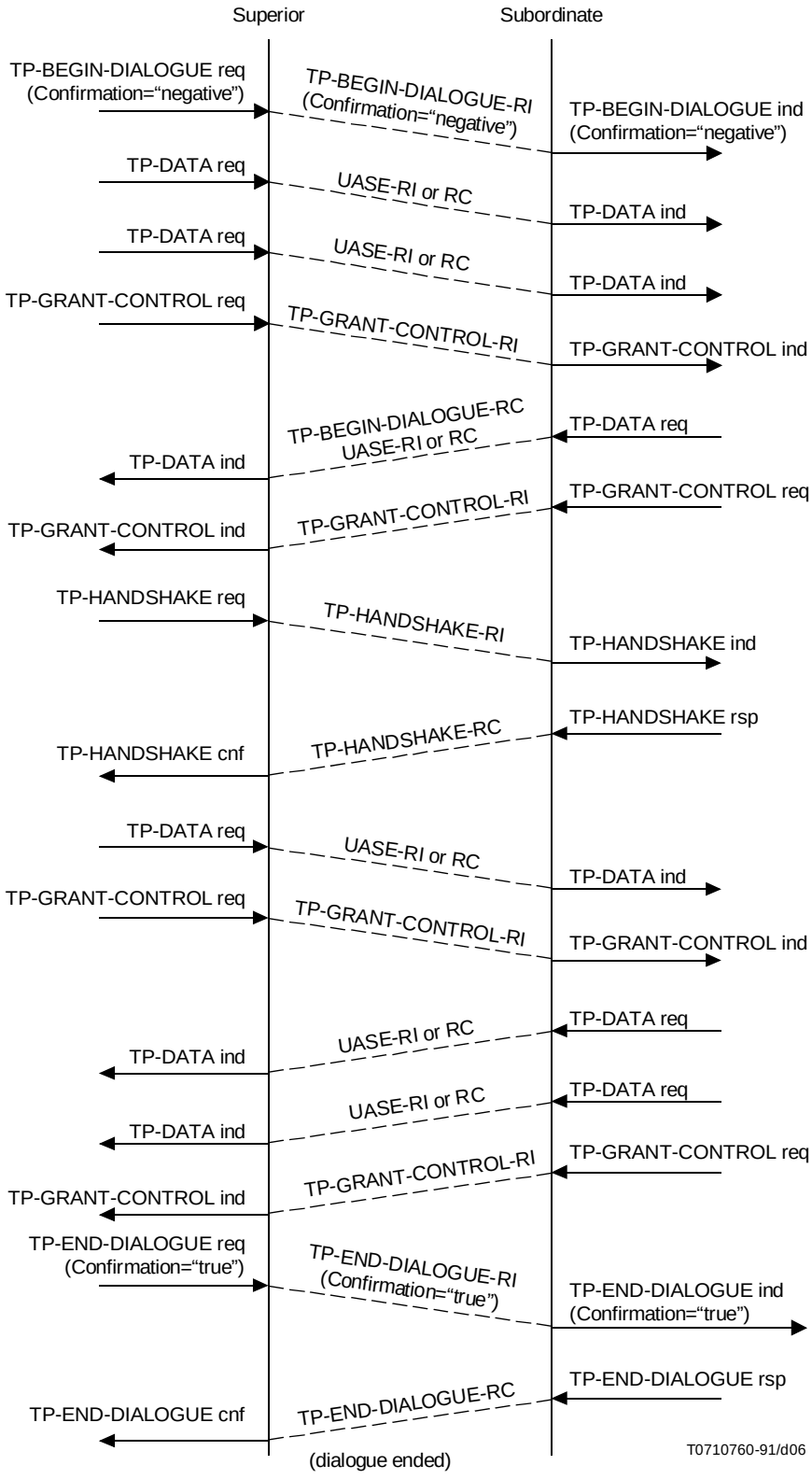


FIGURE C.2/X.862

Application supported transactions with handshakes in Polarized Control

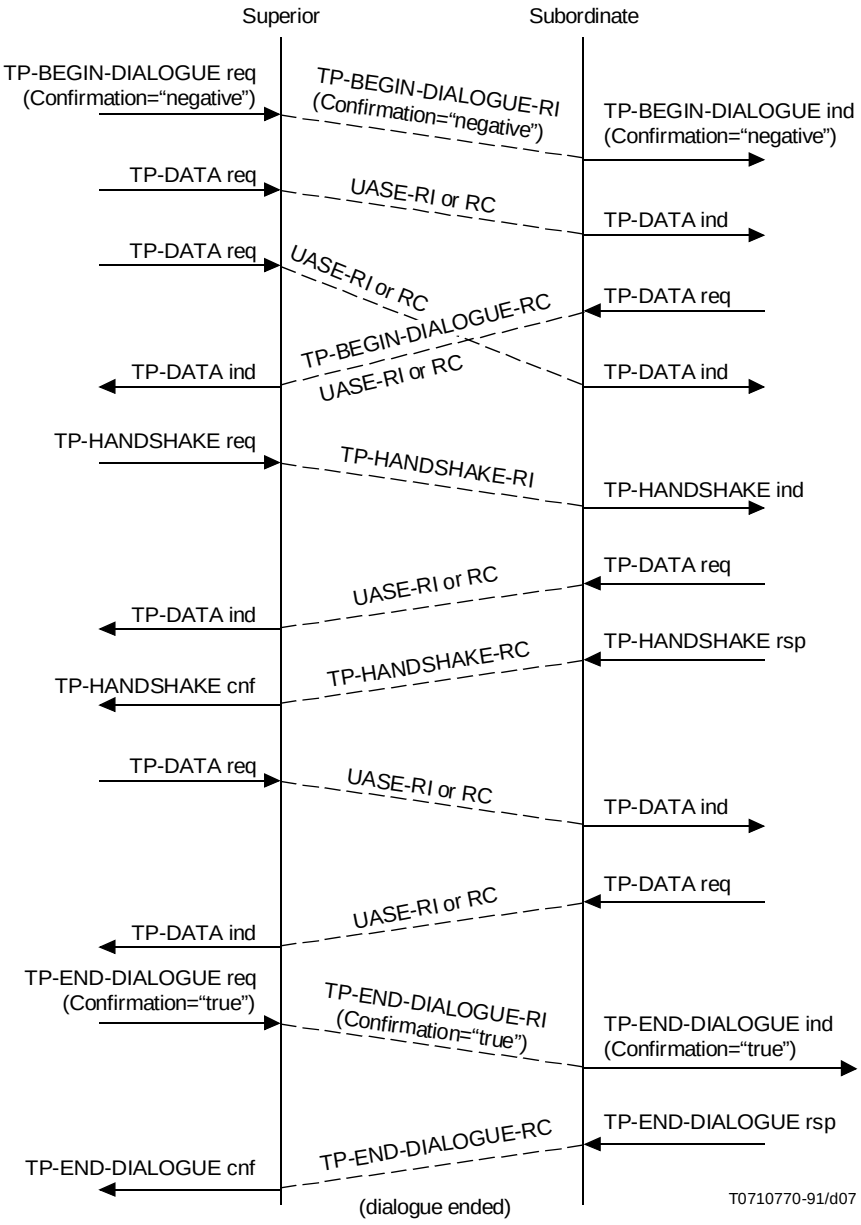


FIGURE C.3/X.862

Application supported transactions with handshakes in Shared Control

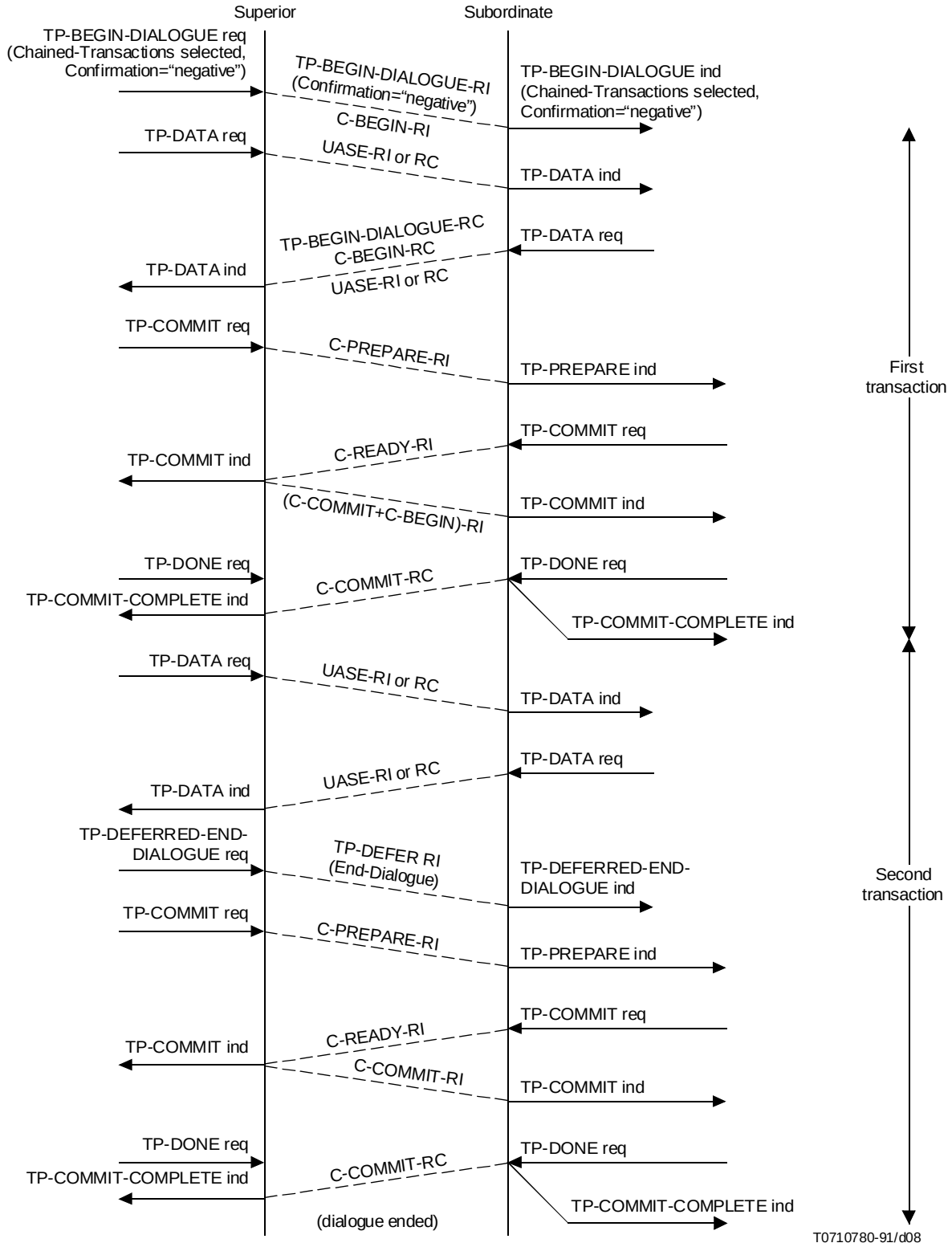


FIGURE C.4/X.862

Provider-supported chained transactions

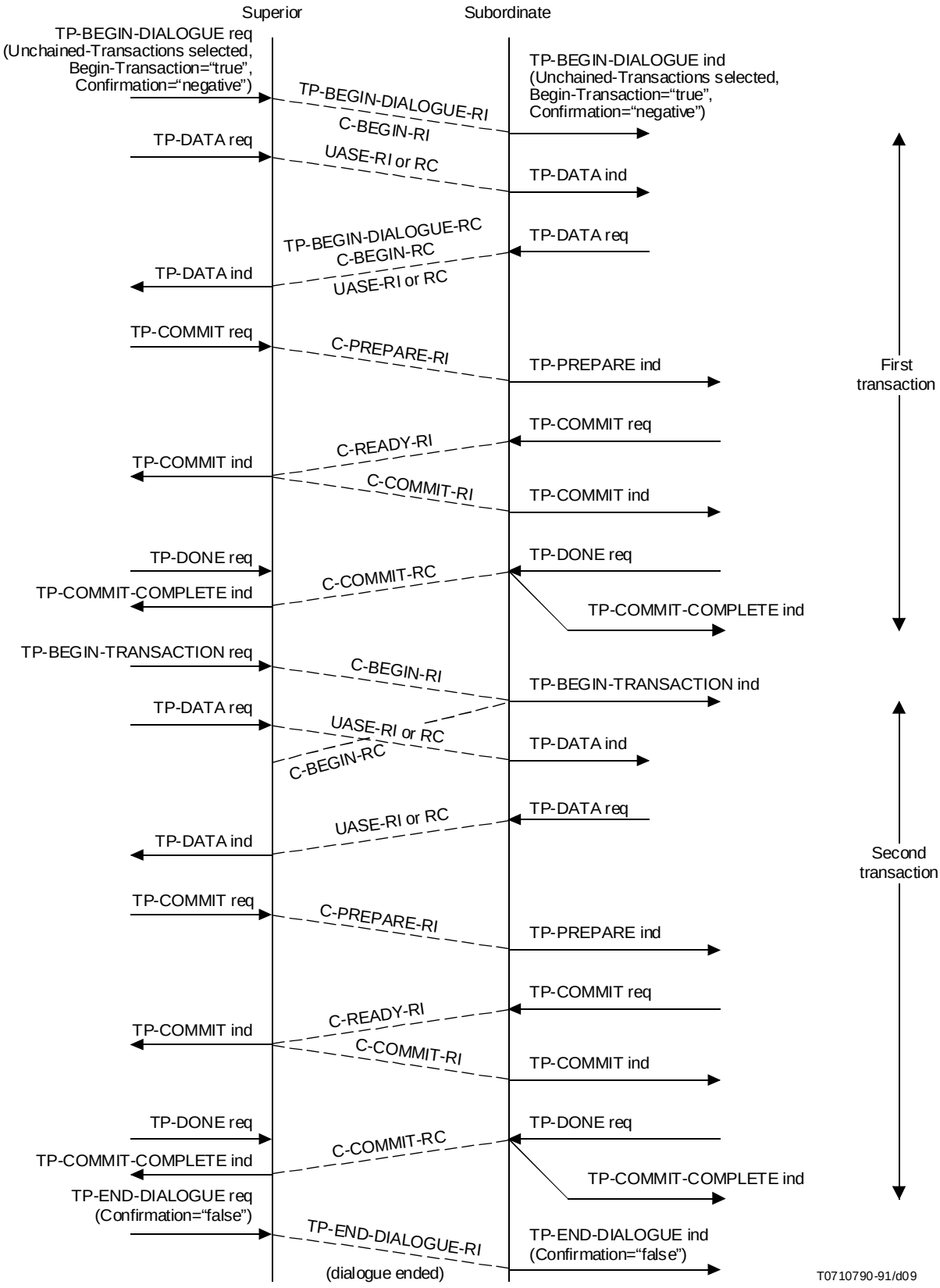


FIGURE C.5/X.862

Provider-supported unchained transactions

C.2.4 TP-PREPARE scenarios

Three scenarios are documented for TP-PREPARE:

- TP-PREPARE with Data-permitted="false" in Polarized Control;
- TP-PREPARE with Data-permitted="true" in Polarized Control;
- TP-PREPARE in Shared Control.

C.2.4.1 TP-PREPARE with Data-Permitted="false" in Polarized Control

The scenario in Figure C.6 describes a sequence of primitives in the case when data is exchanged between two TPSUIs and a TP-PREPARE request is issued with Data-Permitted="false" in Polarized Control.

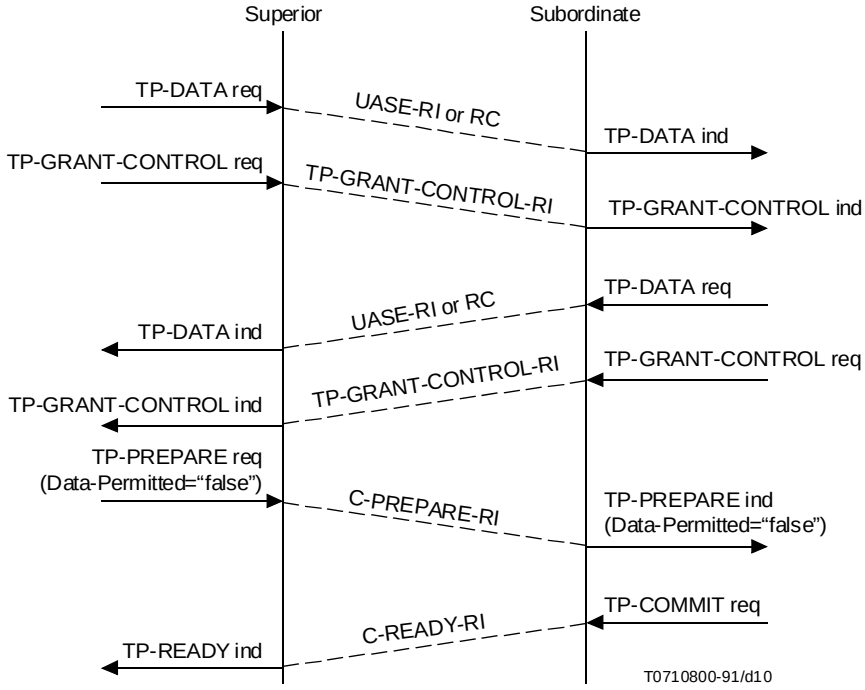


FIGURE C.6/X.862

TP-PREPARE with Data-Permitted="false" in Polarized Control

C.2.4.2 TP-PREPARE with Data-Permitted="true" in Polarized Control

The scenario in Figure C.7 describes a similar sequence of primitives in the case when data is sent to the remote TPSUI and then a TP-PREPARE request is issued with Data-Permitted="true" to allow the remote TPSUI to send data before issuing the TP-COMMIT request.

C.2.4.3 TP-PREPARE in Shared Control

The scenario in Figure C.8 describes a sequence of primitives in the case when data is exchanged between two TPSUIs and a TP-PREPARE request is issued in Shared Control.

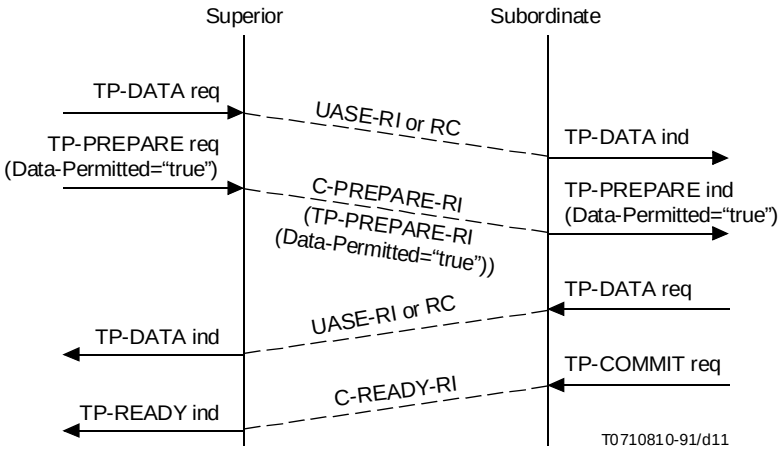


FIGURE C.7/X.862

TP-PREPARE with Data-Permitted="true" in Polarized Control

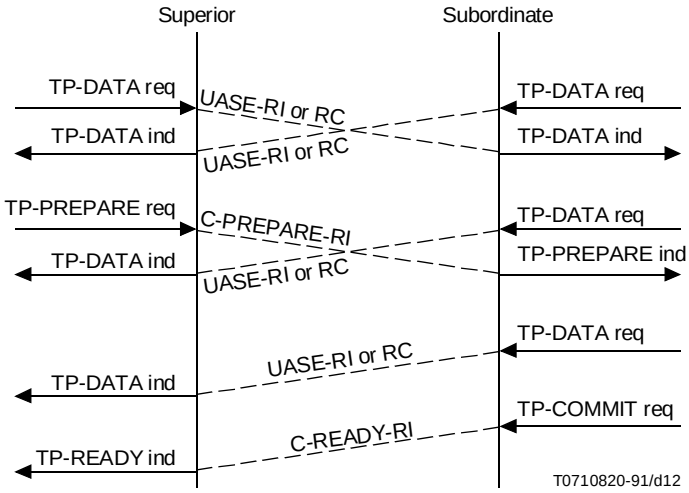


FIGURE C.8/X.862

TP-PREPARE in Shared Control

C.2.5 Handshake services: illustration of Confirmation-Urgency parameter

Scenarios in Figures C.9 and C.10 demonstrate the effect of the Confirmation-Urgency parameter of the TP-HANDSHAKE request and TP-HANDSHAKE-AND-GRANT-CONTROL request services. The Confirmation-Urgency parameter is passed to the TPPM at side B but it is not made visible to the TPSUI.

– Figure C.9: when

1) a TP-HANDSHAKE is used in Polarized Control;

2) TP-HANDSHAKE-AND-GRANT-CONTROL with Confirmation-Urgency set to "urgent"; or

3) TP-HANDSHAKE is used in Shared Control and Confirmation-Urgency set to "urgent". The confirmation shall be issued immediately.

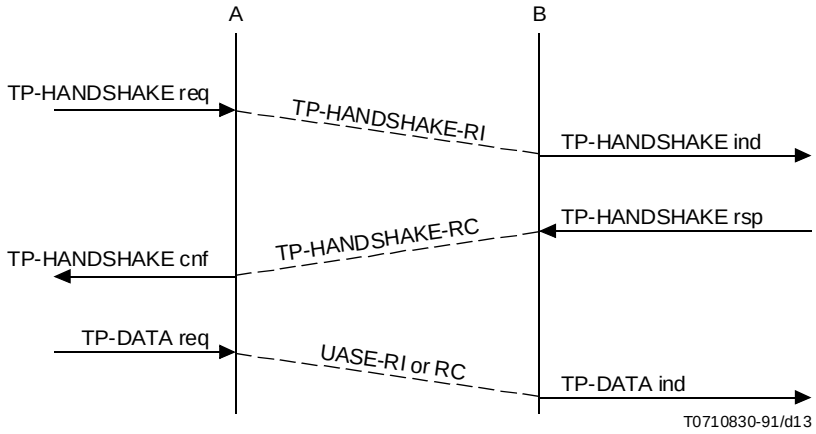


FIGURE C.9/X.862

TP-HANDSHAKE, immediate response

– Figure C.10: when TP-HANDSHAKE is used in Shared Control or when TP-HANDSHAKE-AND-GRANT-CONTROL is used, it is a local TPPM decision whether to concatenate the handshake response with other services. This could result in a substantial delay as shown by case (B). The Confirmation-Urgency parameter allows the TPSUI to specify that the handshake confirm should be issued without delay as illustrated in case (A).

NOTE – Figure C.10 applies equally to TP-HANDSHAKE-AND-GRANT-CONTROL in Polarized Control.

C.2.6 Deferred End Dialogue service

The scenario in Figure C.11 describes a sequence of primitives in the normal case of a TP-DEFERRED-END-DIALOGUE.

C.3 Scenarios with a single dialogue (unsuccessful cases)

C.3.1 Negative response to a TP-HANDSHAKE

C.3.1.1 Negative response to a TP-HANDSHAKE in Polarized Control

The scenario in Figure C.12 describes a sequence of primitives in the case when a TP-DATA request is followed by a TP-HANDSHAKE request and the TP-HANDSHAKE is negatively responded to in Polarized Control.

A collision between a TP-HANDSHAKE request and a TP-U-ERROR request is treated as an early negative response to TP-HANDSHAKE as shown in the scenario of Figure C.13.

C.3.1.2 Negative response to a TP-HANDSHAKE in Shared Control

The scenario in Figure C.14 describes a sequence of primitives in the case when a TP-DATA exchange between two TPSUIs is followed by a TP-HANDSHAKE request that is negatively responded to in Shared Control. The simple negative response to TP-HANDSHAKE in Shared Control is shown below.

A collision between a TP-HANDSHAKE request and a TP-U-ERROR request is treated as an early negative response to TP-HANDSHAKE in Shared Control as shown in the scenario in Figure C.15. The TP-HANDSHAKE indication is suppressed because B would not know if the corresponding request had been issued before the TP-U-ERROR indication (and the TP-U-ERROR request would have been an anticipated negative response to the handshake) or after the TP-U-ERROR (and the TP-HANDSHAKE is not related to TP-U-ERROR).

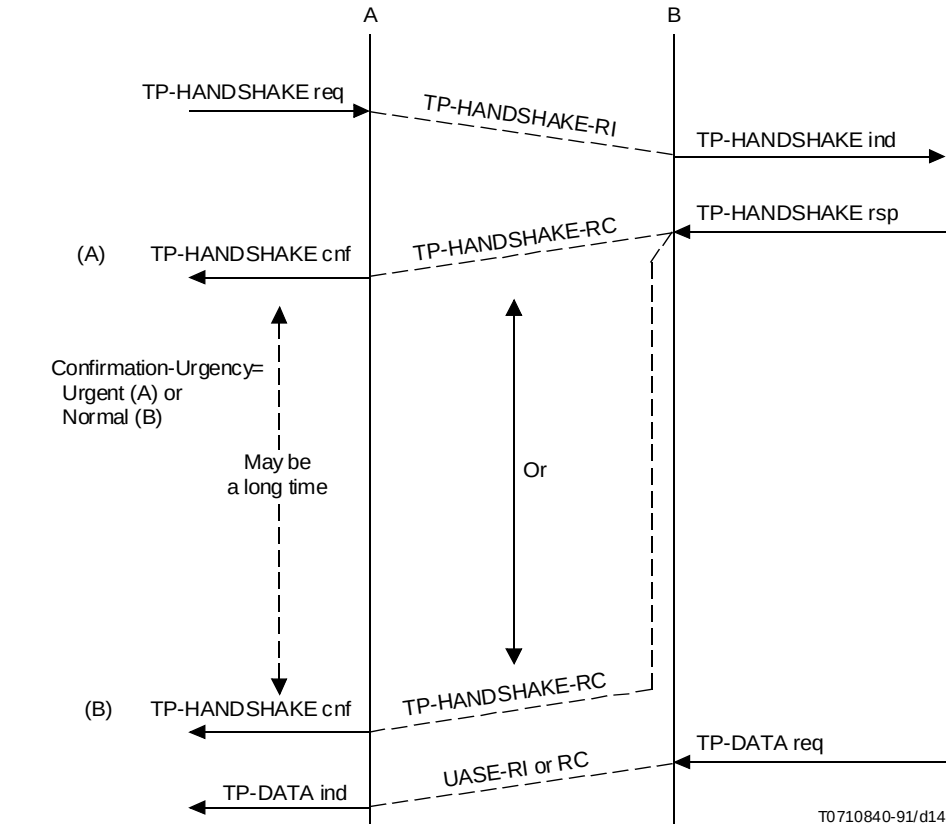


FIGURE C.10/X.862

TP-HANDSHAKE, delayed response

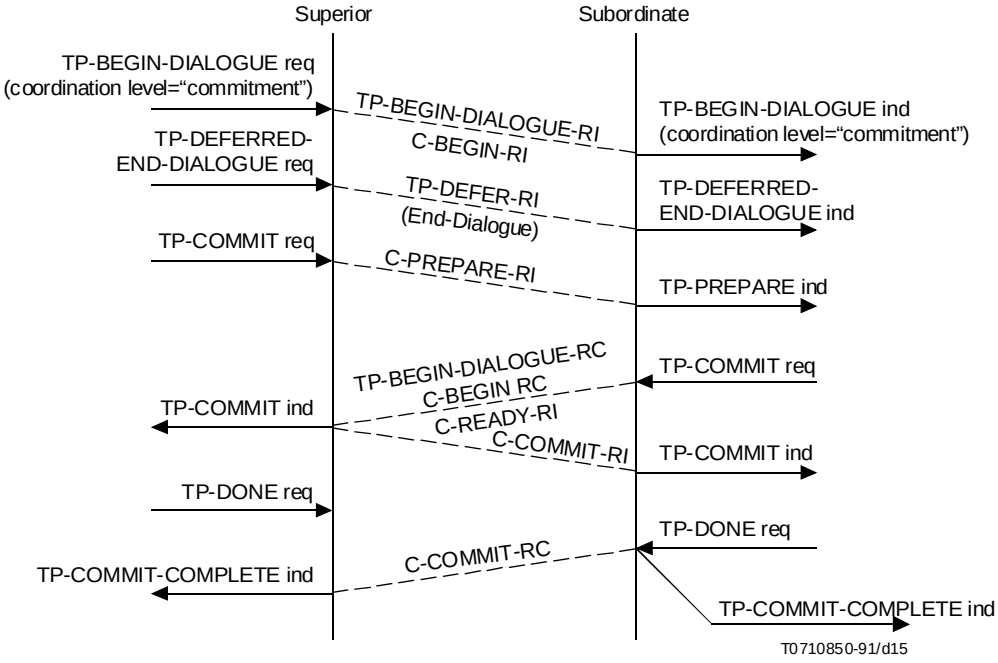


FIGURE C.11/X.862

TP-DEFERRED-END-DIALOGUE, normal case

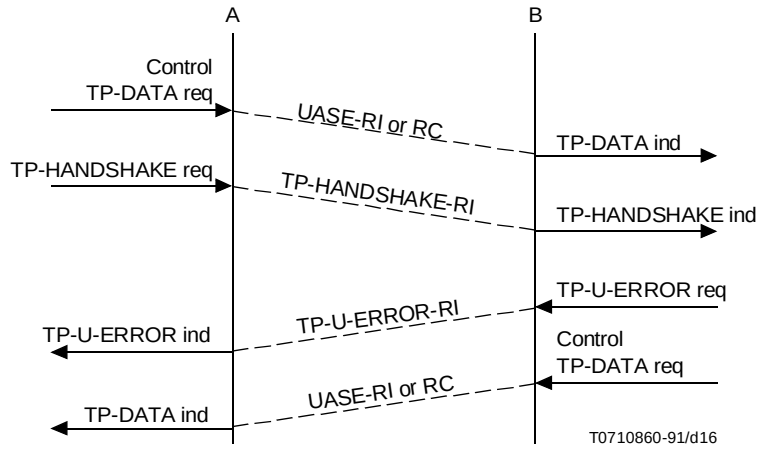


FIGURE C.12/X.862

Negative response to a handshake request in Polarized Control

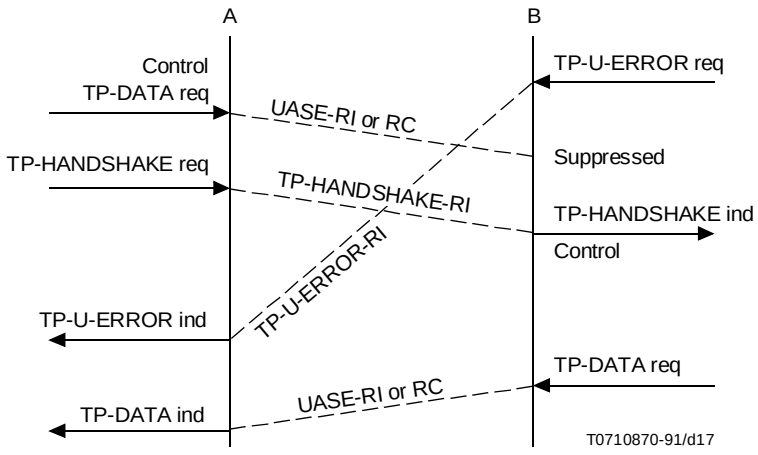


FIGURE C.13/X.862

Anticipated negative response to a TP-HANDSHAKE in Polarized Control

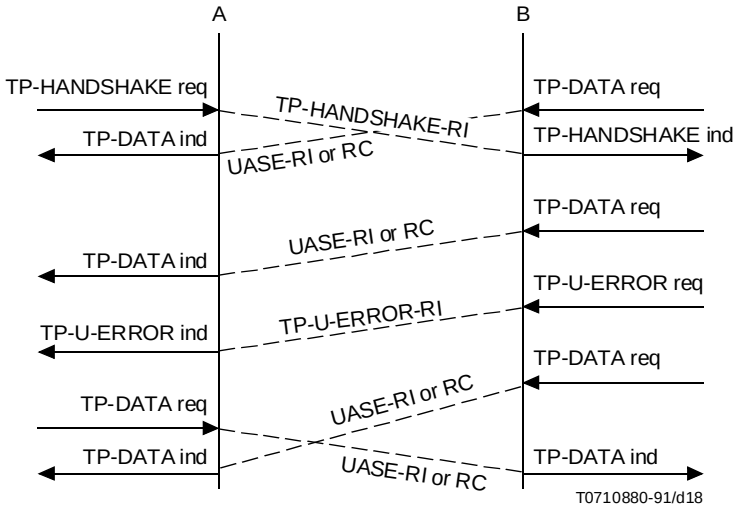
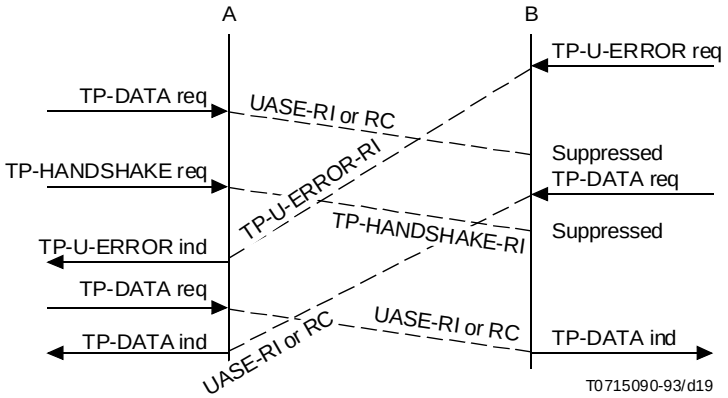


FIGURE C.14/X.862

Negative response to a TP-HANDSHAKE in Shared Control



NOTE – In this scenario, TP-HANDSHAKE may be replaced by TP-END-DIALOGUE with the Confirmation parameter set to "true".

FIGURE C.15/X.862

Anticipated negative response to a TP-HANDSHAKE request in shared Control

C.3.2 TP-ROLLBACK scenarios

C.3.2.1 TP-ROLLBACK with Chained Transactions

The scenario in Figure C.16 describes a sequence of primitives in the case when a transaction is rolled back by one of the TPSUIs issuing a TP-ROLLBACK request during the active phase. The TPSUIs each immediately begin a new transaction.

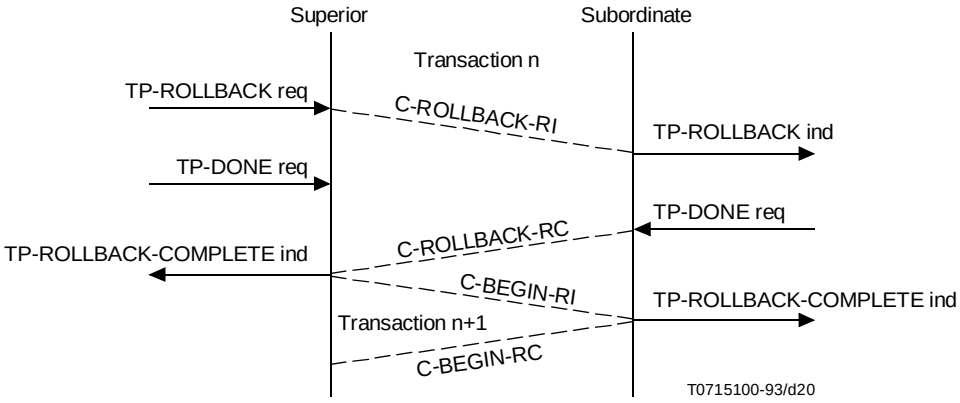


FIGURE C.16/X.862

TP-ROLLBACK with the Chained Transactions functional unit

C.3.2.2 TP-ROLLBACK with Unchained Transactions

The scenario for TP-ROLLBACK with unchained transactions, shown in Figure C.17, is identical to the scenario for chained transactions except that a new transaction is not begun until a TP-BEGIN-TRANSACTION request has been issued.

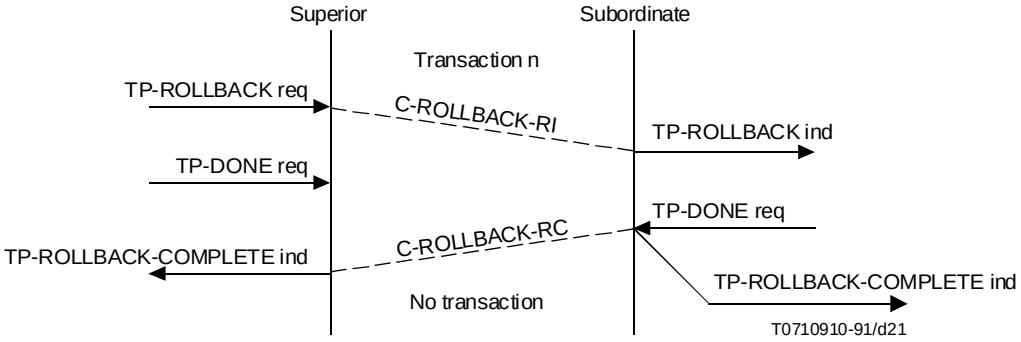


FIGURE C.17/X.862

TP-ROLLBACK with the Unchained Transactions functional unit

C.3.3 Rejection of a TP-BEGIN-TRANSACTION request

The scenario in Figure C.18 describes a situation in which an attempt to include a subordinate TPSUI in the current transaction failed because the subordinate is already participating in another provider-supported transaction. TP-BEGIN-TRANSACTION is rejected, the dialogue between A and B is aborted; the transactions are not rolled back.

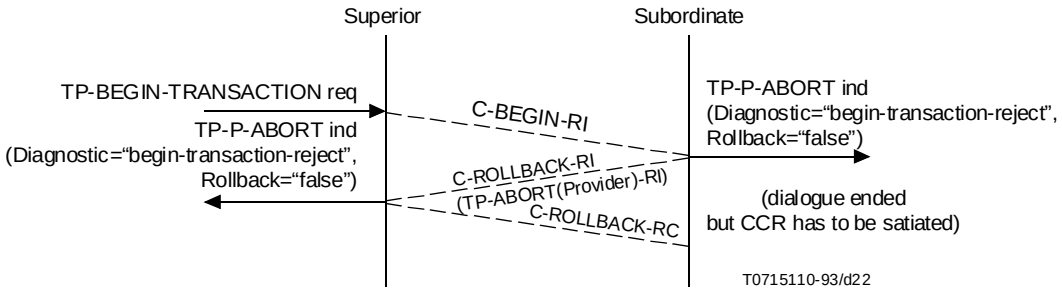


FIGURE C.18/X.862

Rejection of a T-BEGIN-TRANSACTION request

C.3.4 TP-U-ERROR collision with TP-DATA

C.3.4.1 TP-U-ERROR collision with TP-DATA in Polarized Control

The scenario in Figure C.19 describes a sequence of primitives in the case of a collision between a TP-DATA request and a TP-U-ERROR request in Polarized Control. TPSUI B is not allowed to issue a TP-DATA request until the TP-GRANT-CONTROL indication is received.

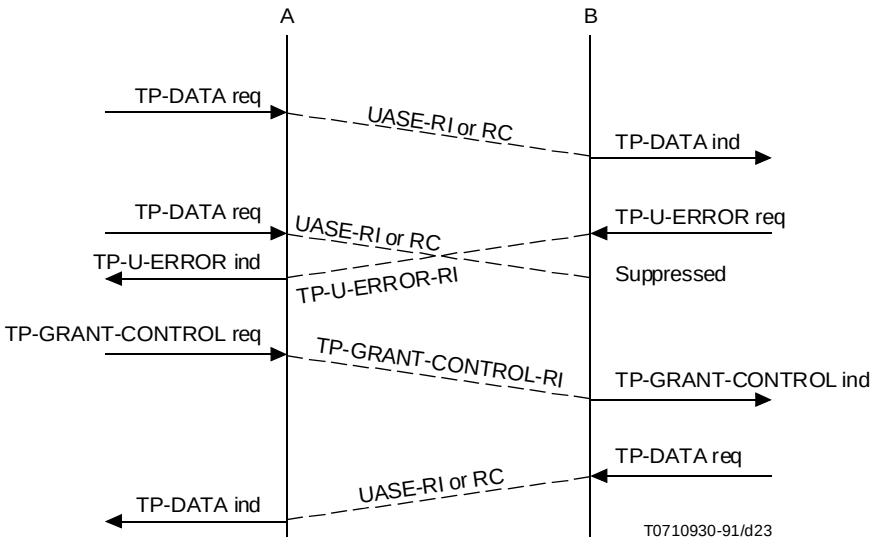


FIGURE C.19/X.862

TP-U-ERROR collision with TP-DATA in Polarized Control

C.3.4.2 TP-U-ERROR Collision with TP-DATA in Shared Control

The scenario in Figure C.20 describes a sequence of primitives in the case when a TP-DATA exchange between two TPSUIs is followed by a collision between a TP-DATA request and a TP-U-ERROR request in Shared Control.

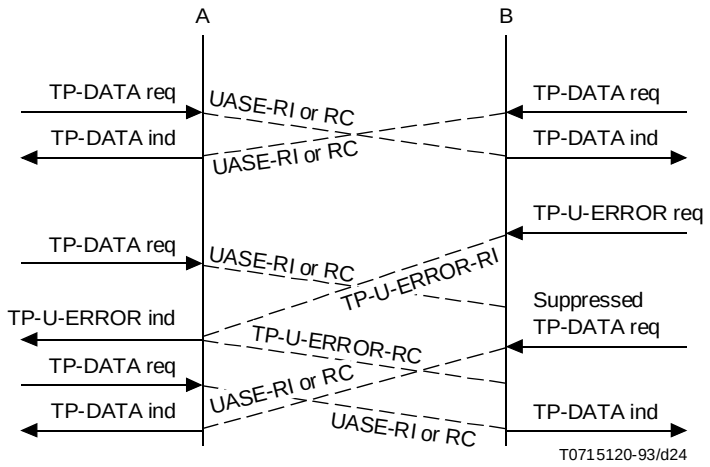


FIGURE C.20/X.862

TP-U-ERROR collision with TP-DATA in Shared Control

C.3.5 TP-ROLLBACK with TP-U-ABORT

The scenario in Figure C.21 describes a sequence of primitives in the case when a TP-ROLLBACK indication is followed by a TP-U-ABORT request to abort the dialogue.

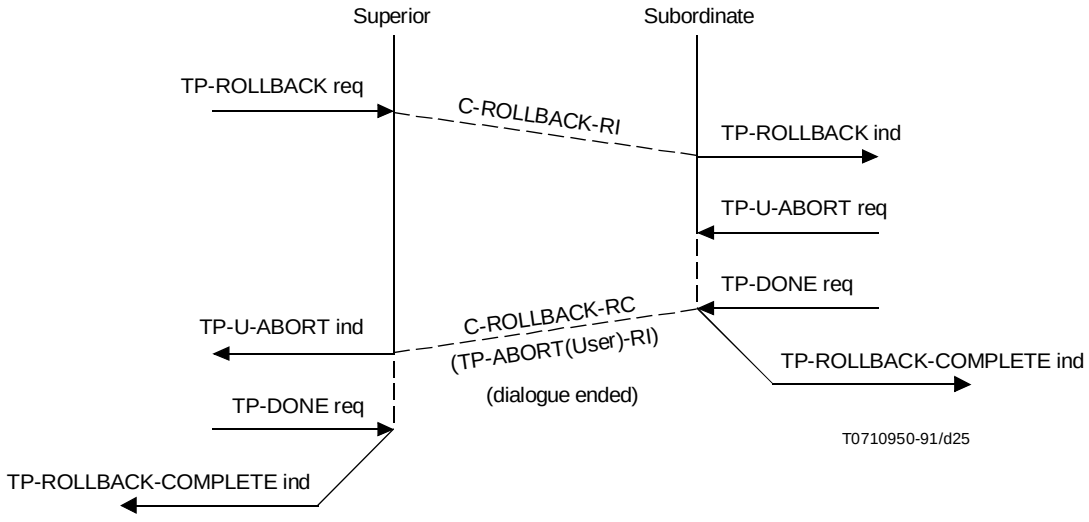


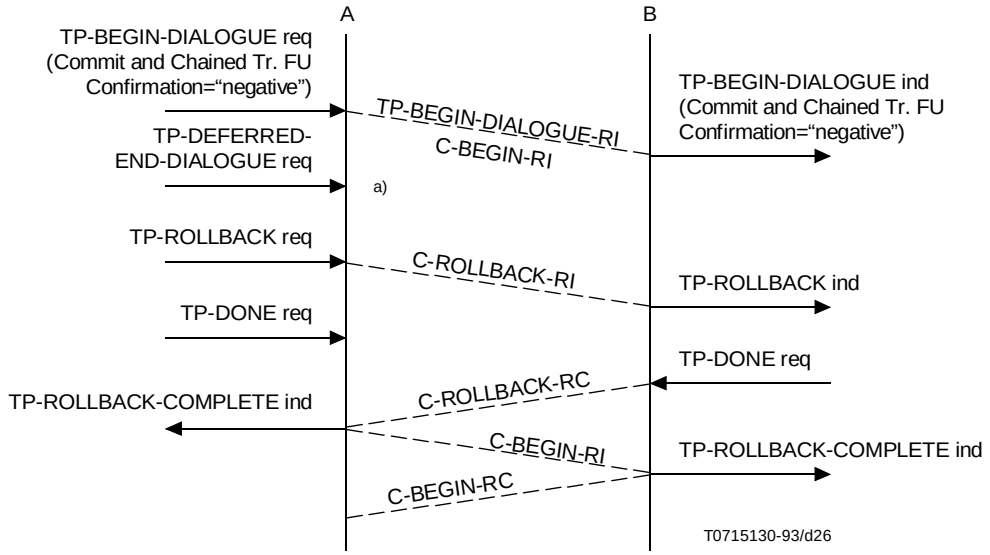
FIGURE C.21/X.862

TP-U-ABORT in response to a TP-ROLLBACK indication

C.3.6 TP-DEFERRED-END-DIALOGUE with TP-ROLLBACK

C.3.6.1 TP-ROLLBACK request issued during the active phase

The scénario in Figure C.22 describes a sequence of primitives in the case when a TP-DEFERRED-END-DIALOGUE request is cancelled by a TP-ROLLBACK request during the active phase of a provider-supported transaction. The dialogue is not terminated.



[a] The TP-DEFERRED-END-DIALOGUE-RI, not sent immediately, has been discarded by the rollback procedure.

NOTE – TP-BEGIN-DIALOGUE-RC and C-BEGIN-RC are not required in this case. C-ROLLBACK-RC serves as the confirmation instead.

FIGURE C.22/X.862

TP-DEFERRED-END-DIALOGUE cancelled by a rollback

C.3.6.2 TP-ROLLBACK request issued after a TP-PREPARE indication

The scenario of Figure C.23 describes a sequence of primitives in the case when a TP-DEFERRED-END-DIALOGUE request is cancelled by a TP-ROLLBACK request during the termination phase of a provider-supported transaction. The dialogue is not terminated.

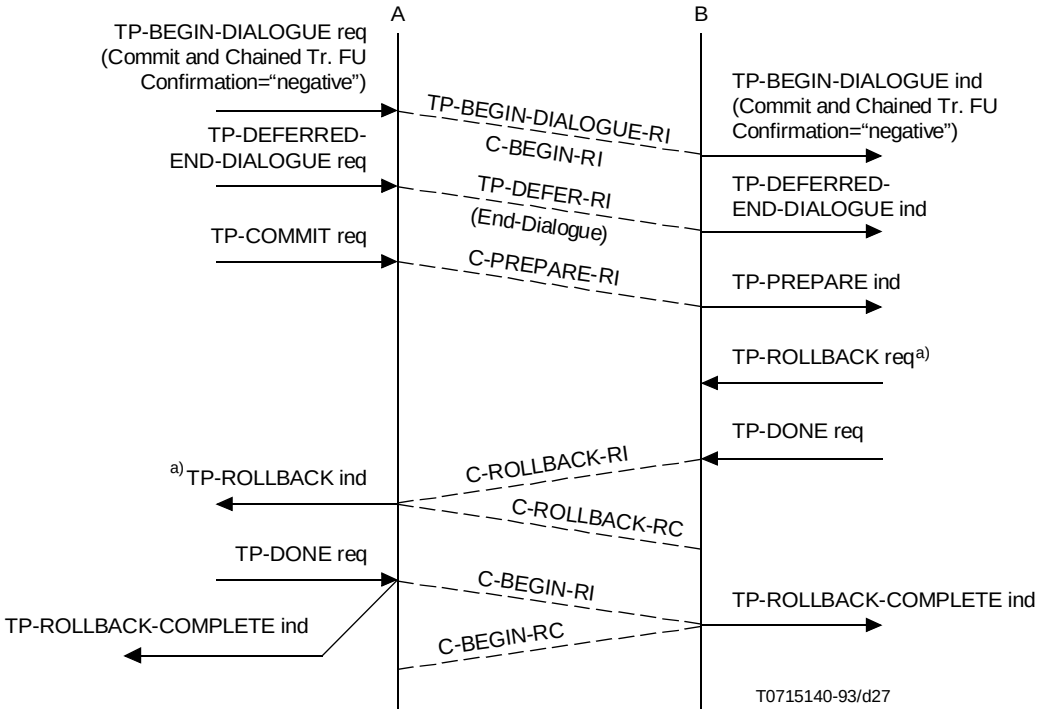
C.3.7 Dialogue Establishment Scenarios

C.3.7.1 Rejection of the dialogue establishment request

The scenarios of Figures C.24, C.25 and C.26 describe a sequence of primitives in the case when dialogue establishment is requested with a TP-BEGIN-DIALOGUE request, with either Confirmation="negative" or Confirmation="always", but is rejected by the recipient.

C.3.7.2 TP-BEGIN-DIALOGUE (Confirmation="negative") scenarios

The following scenarios apply to provider-supported transaction and describe various dialogue establishment sequences using the TP-BEGIN-DIALOGUE (Confirmation="negative") service related to aborting, rejecting, and failure cases.



a) Any other rollback-initiating service primitive would also cancel the effects of the TP-DEFERRED-END-DIALOGUE service.

NOTE – TP-BEGIN-DIALOGUE-RC and C-BEGIN-RC are not required in this case. C-ROLLBACK-RI serves as the confirmation instead.

FIGURE C.23/X.862

Effects of a TP-DEFERRED-END-DIALOGUE cancelled by a rollback, after TP-COMMIT request

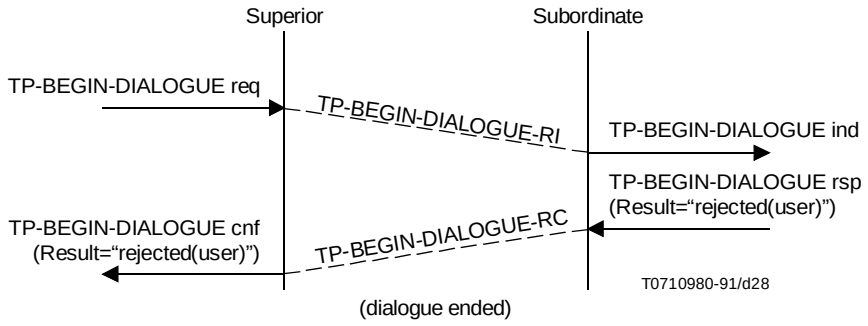


FIGURE C.24/X.862

Rejection of a TP-BEGIN-DIALOGUE, coordination level "none"

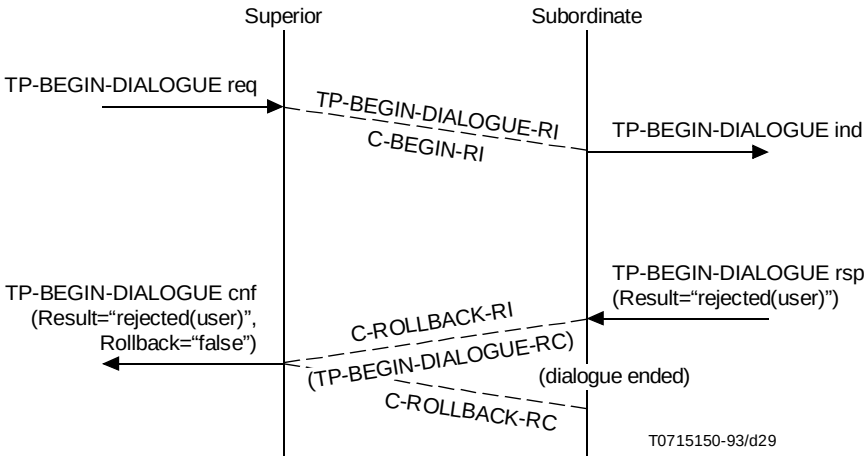


FIGURE C.25/X.862

Rejection of a TP-BEGIN-DIALOGUE, coordination level "commitment"

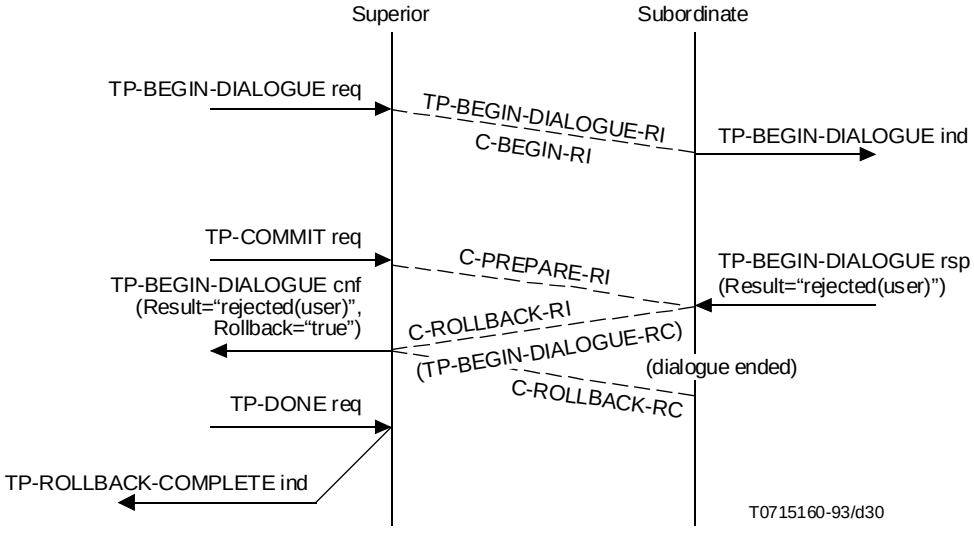


FIGURE C.26/X.862

Rejection of a TP-BEGIN-DIALOGUE, coordination level "commitment"
(TP-COMMIT request issued)

C.3.7.2.1 Aborting the dialogue establishment by the requestor

The scenario in Figure C.27 describes a sequence of primitives in the case when dialogue establishment is requested with a TP-BEGIN-DIALOGUE (Confirmation="negative") request and is then aborted by the requestor with a TP-U-ABORT request.

When a TP-U-ABORT indication is received following a TP-BEGIN-DIALOGUE (Confirmation="negative") indication, the TP-U-ABORT indication will carry the Rollback parameter set to "true" and the recipient TPSUI must issue a TP-DONE request to complete the rollback action.

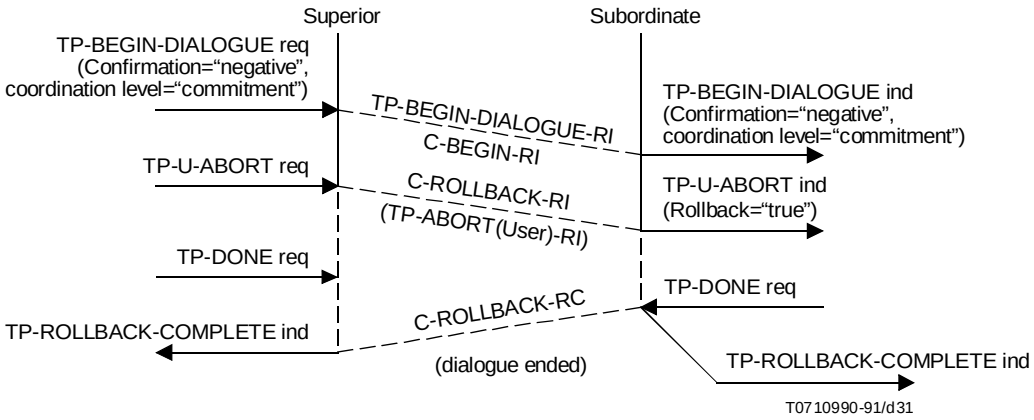


FIGURE C.27/X.862

Abort of a dialogue establishment by the requestor (Confirmation="negative")

C.3.7.2.2 Dialogue establishment followed by rollback from the requestor

The following scenarios describe two sequences of primitives for the cases when dialogue establishment is attempted with a TP-BEGIN-DIALOGUE (Confirmation="negative") request and then rolled back by the requestor with a TP-ROLLBACK request.

As shown in Figure C.28, when a TP-ROLLBACK indication is received following the receipt of a TP-BEGIN-DIALOGUE (Confirmation="negative") indication and prior to issuing any other services on the specific dialogue, a negative response may be issued with a TP-BEGIN-DIALOGUE (Result="rejected (user)") response.

Otherwise, the recipient must issue a TP-DONE request to complete the rollback action, as shown in Figure C.29.

C.3.7.2.3 Failure after Dialogue Establishment

The scenario of Figure C.30 describes a sequence of primities in the case when dialogue establishment is attempted with a TP-BEGIN-DIALOGUE (Confirmation="negative") request, followed by a failure.

In case of a dialogue failure, a TP-P-ABORT indication with the Rollback parameter set to "true" will be issued to both TPSUIs. When the TP-P-ABORT indication is issued to the superior TPSUI before the TP-BEGIN-DIALOGUE confirm has been received, the TP-P-ABORT indication will have the Rollback parameter set to "true" because it is not known whether the subordinate accepted or rejected the dialogue initialization request.

C.3.7.2.4 Dialogue establishment rejected after TP-COMMIT request

Figure C.31 shows how dialogue establishment rejection received after a TP-COMMIT request, signals that the transaction is being rolled back.

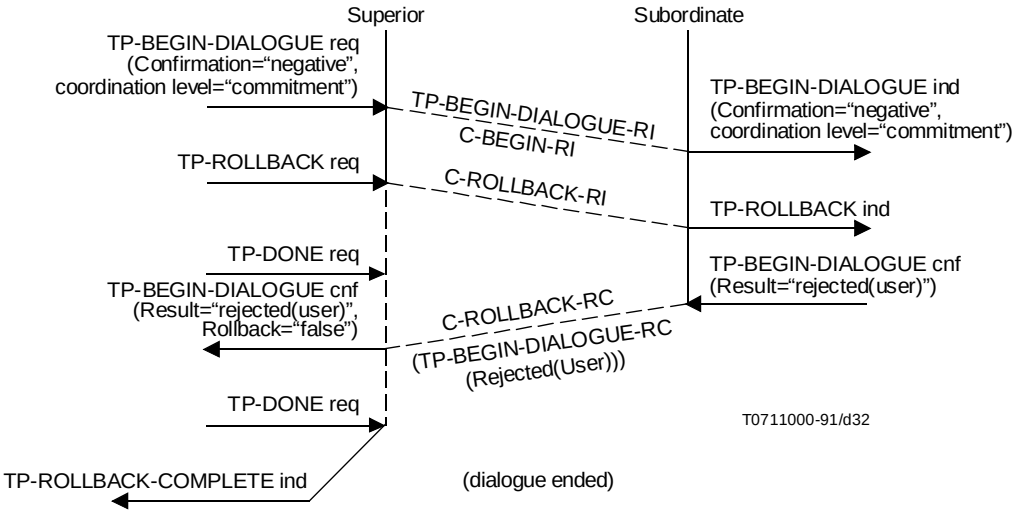


FIGURE C.28/X.862

Dialogue establishment followed by rollback from the requestor, recipient rejects the dialogue

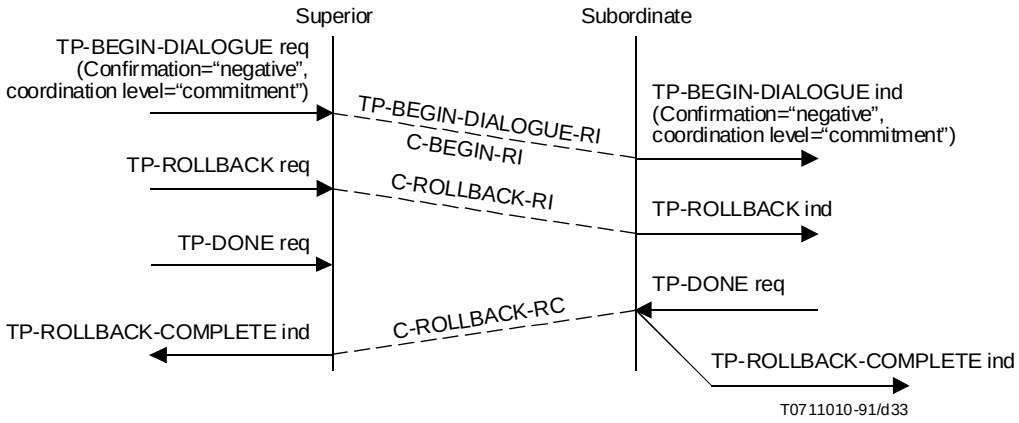


FIGURE C.29/X.862

Dialogue establishment followed by rollback from the requestor, recipient accepts the dialogue

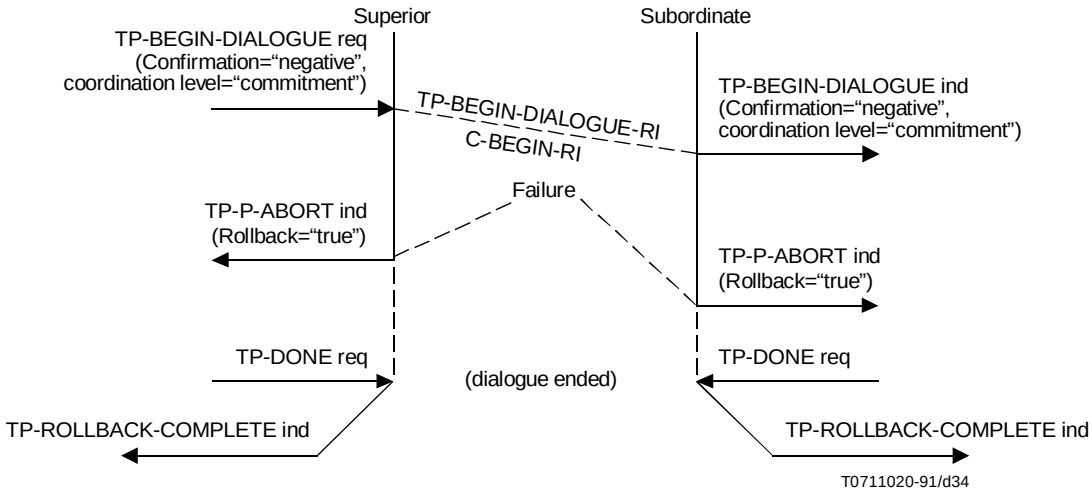


FIGURE C.30/X.862

Dialogue establishment (Confirmation="negative") followed by dialogue failure; recipient does not reject the dialogue

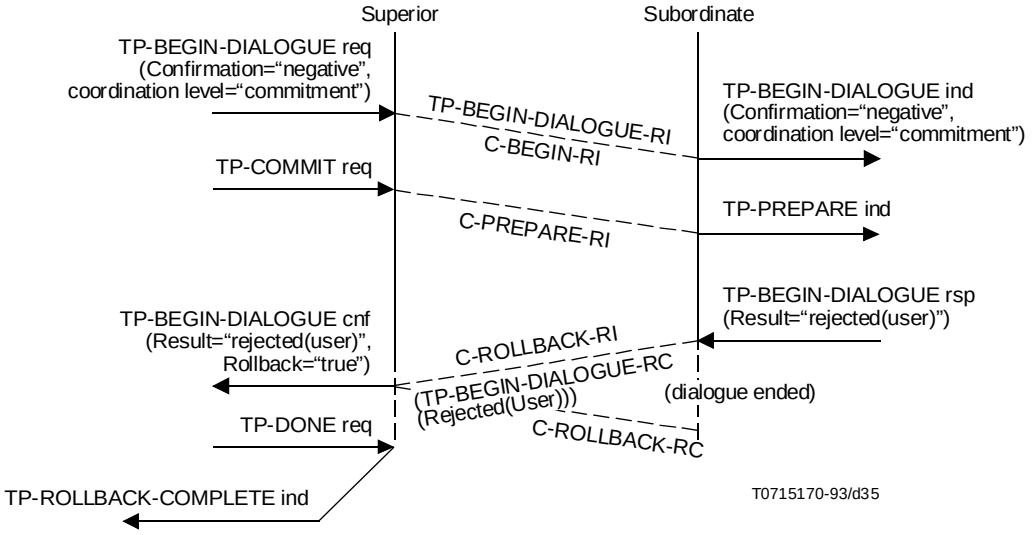


FIGURE C.31/X.862

Rejection of a Dialogue establishment request causing rollback

C.3.7.2.5 Dialogue establishment rejected after TP-COMMIT request

Figure C.32 shows how dialogue establishment rejection received after a TP-PREPARE request does not cause rollback of the transaction.

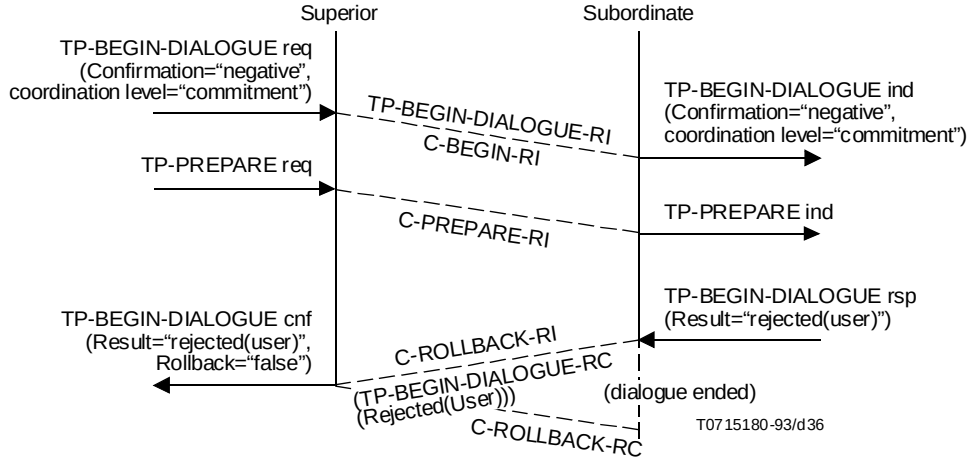


FIGURE C.32/X.862

Rejection of a Dialogue establishment request after TP-PREPARE

C.3.7.3 TP-BEGIN-DIALOGUE (Confirmation="always") scenarios

The following scenarios describe various dialogue establishment sequences using the TP-BEGIN-DIALOGUE (Confirmation="always") service related to aborting, rejecting, and failure cases.

C.3.7.3.1 Aborting the dialogue establishment

The scenario of Figure C.33 describes sequences of primitives for the case when dialogue establishment is attempted with a TP-BEGIN-DIALOGUE (Confirmation="always") request and then aborted, by the requestor, with a TP-U-ABORT request.

When a TP-U-ABORT indication is received following a TP-BEGIN-DIALOGUE (confirmation="always") indication and before the indication has been responded to, the TP-U-ABORT indication will carry the Rollback parameter set to "false", and no further actions are required by the subordinate.

When a TP-U-ABORT indication is received following a TP-BEGIN-DIALOGUE (Confirmation="always") indication but after the indication has been positively responded to, the TP-U-ABORT indication will carry the Rollback parameter set to "true" and the subordinate must complete normal rollback actions, as shown in Figure C.34.

The scenario in Figure C.35 shows that the recipient of a TP-BEGIN-DIALOGUE (Confirmation="always") indication, if it wants to abort the dialogue, shall issue the TP-BEGIN-DIALOGUE response before the TP-U-ABORT request can be issued.

C.3.7.3.2 Dialogue establishment followed by rollback from the requestor

These scenarios describe two sequences of primitives in the cases when dialogue establishment is attempted with a TP-BEGIN-DIALOGUE (Confirmation="always") request and then rolled back by the requestor with a TP-ROLLBACK request.

When a TP-ROLLBACK indication is received before a TP-BEGIN-DIALOGUE (Confirmation="always") indication has been responded to, the TP-BEGIN-DIALOGUE response must be issued before the TP-ROLLBACK indication is acted on; a negative response to the TP-BEGIN-DIALOGUE (confirmed) indication completes the subordinate's rollback action, as shown in Figure C.36.

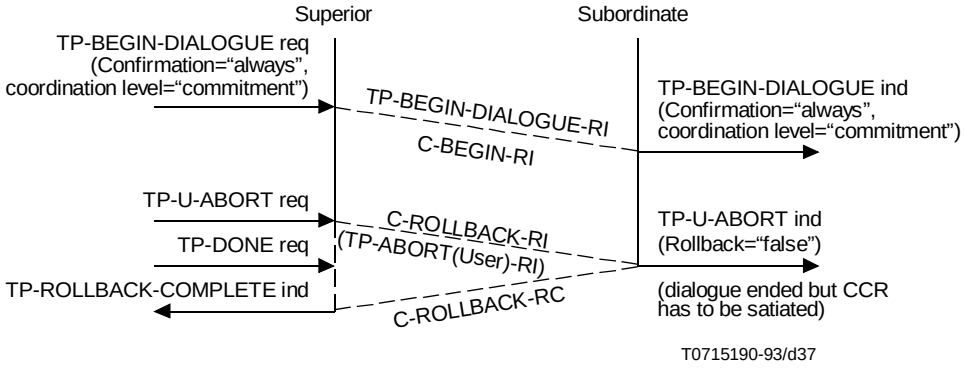


FIGURE C.33/X.862

Abort of dialogue establishment by the requestor (Confirmation="always"), before the recipient has accepted the dialogue

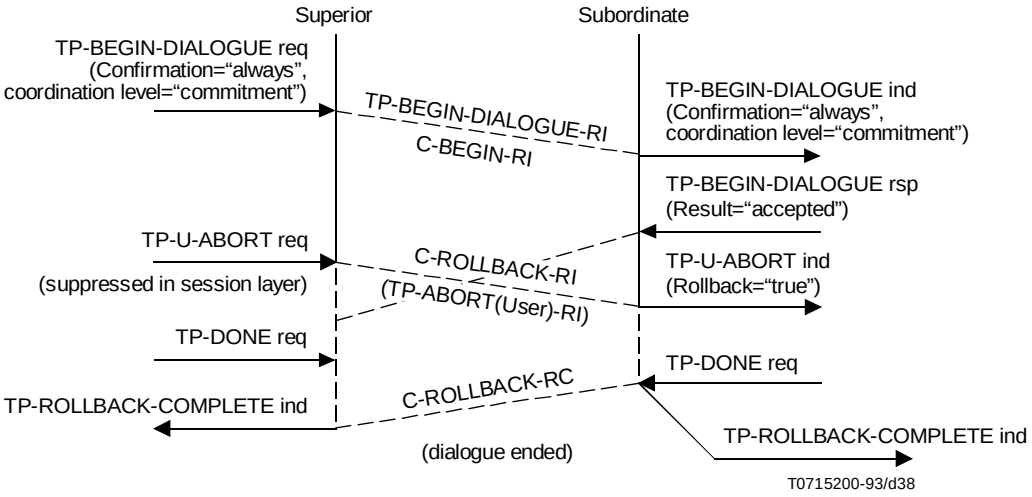


FIGURE C.34/X.862

Abort of a dialogue establishment (Confirmation="always") by the requestor, after the recipient has accepted the dialogue

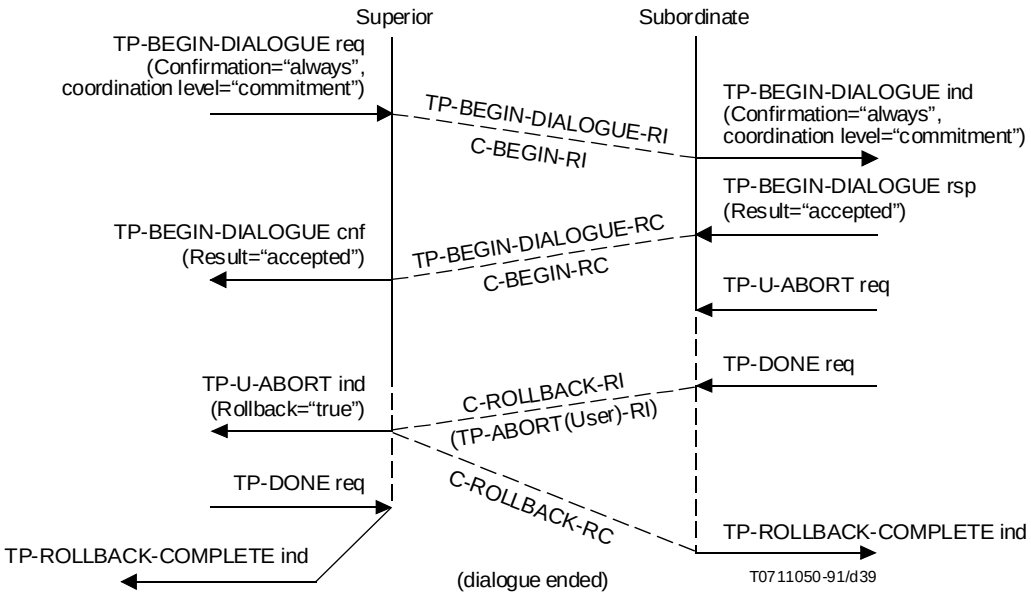


FIGURE C.35/X.862

Abort of a dialogue establishment (Confirmation="always") by the recipient, after the recipient has accepted the dialogue

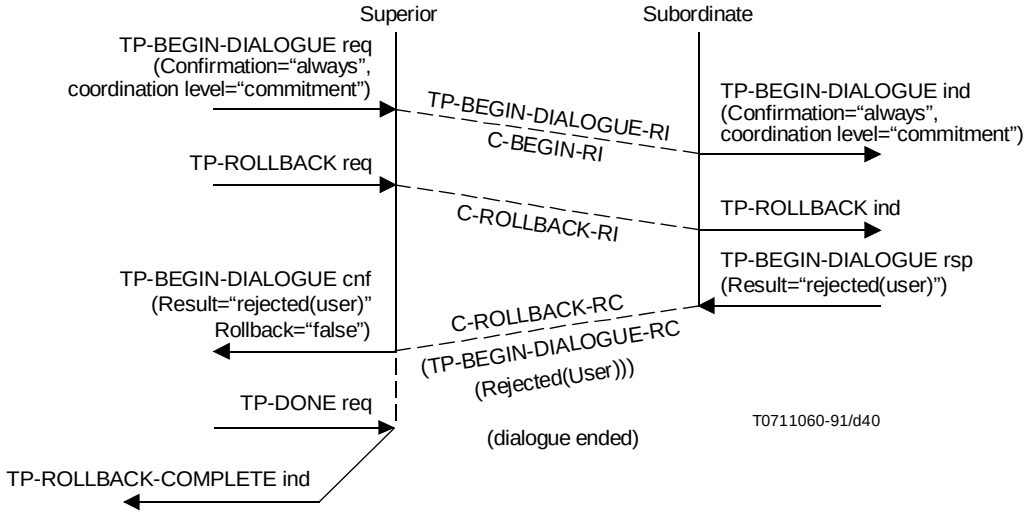


FIGURE C.36/X.862

Dialogue establishment followed by rollback from the requestor; recipient rejects the dialogue

The recipient TPSUI may also issue a positive response to the TP-BEGIN-DIALOGUE (Confirmation="always") indiction, followed by a TP-DONE request, as shown in Figure C.37.

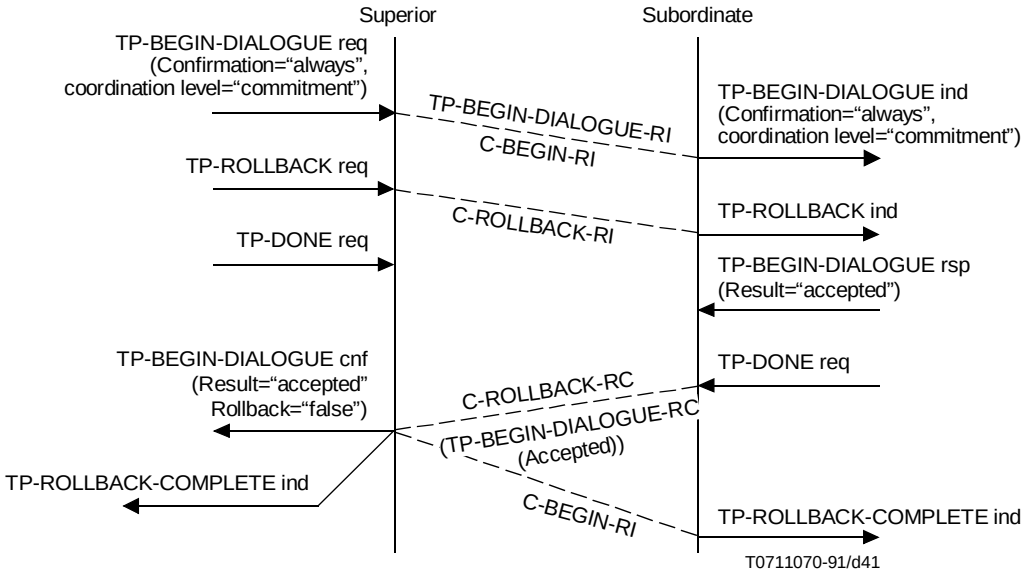


FIGURE C.37/X.862

Dialogue establishment followed by rollback from the requestor; recipient accepts the dialogue and has to complete the rollback procedure (chained transactions)

C.3.7.3.3 Failure during dialogue establishment

The scenario of Figure C.38 describes a sequence of primitives in the case when dialogue establishment is attempted with a TP-BEGIN-DIALOGUE (Confirmation="always") request, followed by a failure. In case of a dialogue failure, a TP-P-ABORT indication will be issued to the superior with the Rollback parameter set to "true" and to the subordinate with the Rollback parameter set to "false".

However, if the subordinate has already issued a positive TP-BEGIN-DIALOGUE response, the TP-P-ABORT will carry the Rollback parameter set to "true" and the subordinate shall complete the rollback actions in the usual manner, as shown in Figure C.39.

C.3.7.3.4 Dialogue establishment with rollback and abort

These scenarios cover the case when dialogue establishment is attempted with a TP-BEGIN-DIALOGUE (Confirmation="always") request and then the transaction is rolled back by the requestor with a TP-ROLLBACK request.

Before a TP-BEGIN-DIALOGUE confirm is received, the dialogue is aborted by either a TP-P-ABORT indication (see Figure C.40) or a TP-U-ABORT request (see Figures C.41 and C.42).

When a TP-P-ABORT indication is received, subsequent to the TP-ROLLBACK indication, this ends the termination phase of the transaction as shown in Figure C.40.

The scenario of Figure C.41 shows the case where the superior issues a TP-U-ABORT request for the dialogue. Here the TP-U-ABORT indication is withheld until the positive dialogue establishment confirmation is received.

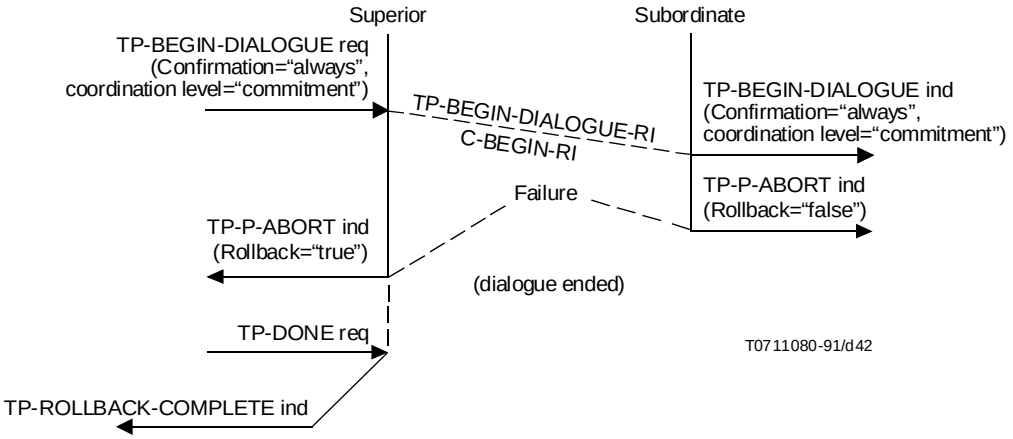


FIGURE C.38/X.862

Dialogue establishment (Confirmation="always") followed by dialogue failure before the recipient has accepted the dialogue

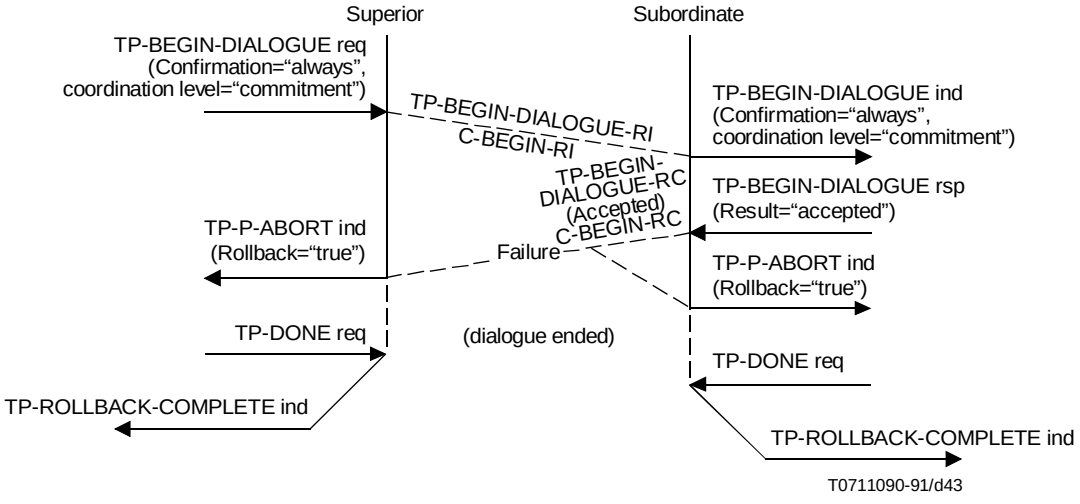


FIGURE C.39/X.862

Dialogue establishment (Confirmation="always") followed by failure after the recipient has accepted the dialogue; the recipient has to complete the rollback procedure

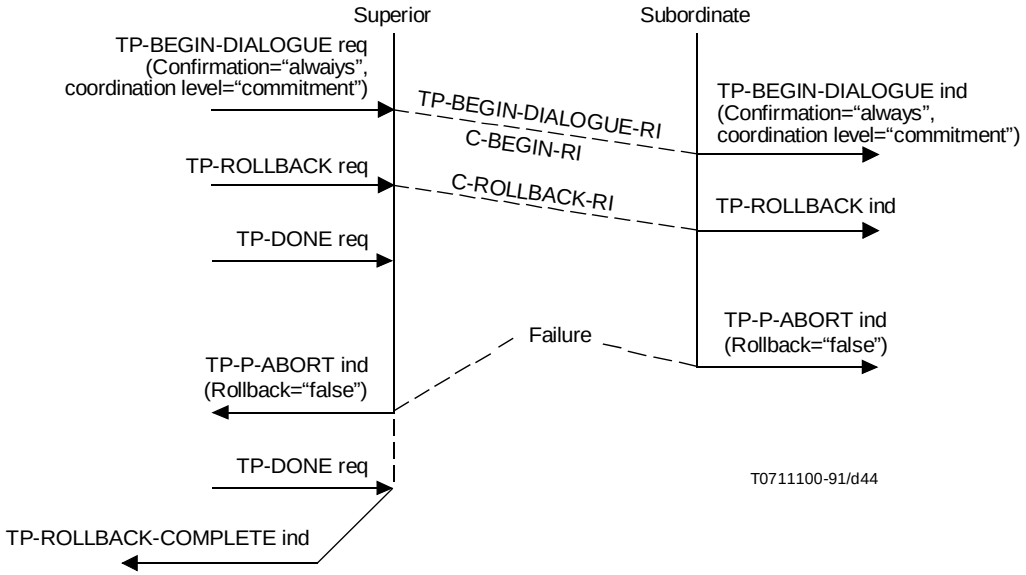


FIGURE C.40/X.862

Dialogue establishment followed by rollback from the requestor and a subsequent dialogue abort

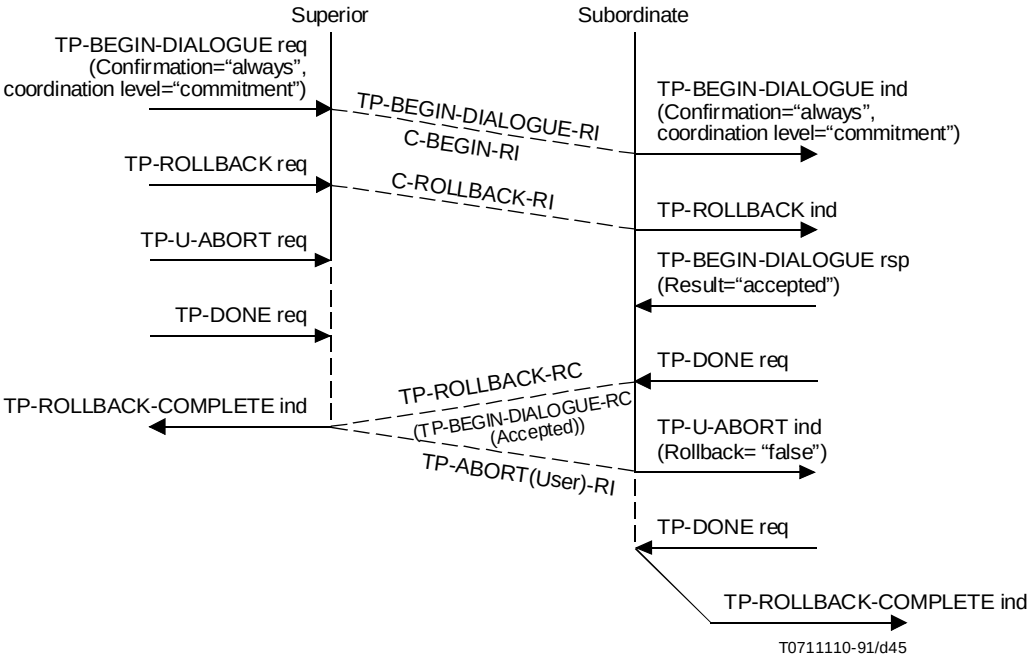


FIGURE C.41/X.862

Dialogue establishment followed by rollback by the requestor and a subsequent collision of TP-U-ABORT req and TP-BEGIN-DIALOGUE rsp (Result="accepted"). The Chained Transactions functional unit is selected

The scenario of Figure C.42 is similar to that shown on Figure C.41 except that the subordinate rejects the dialogue after receiving the TP-ROLLBACK indication.

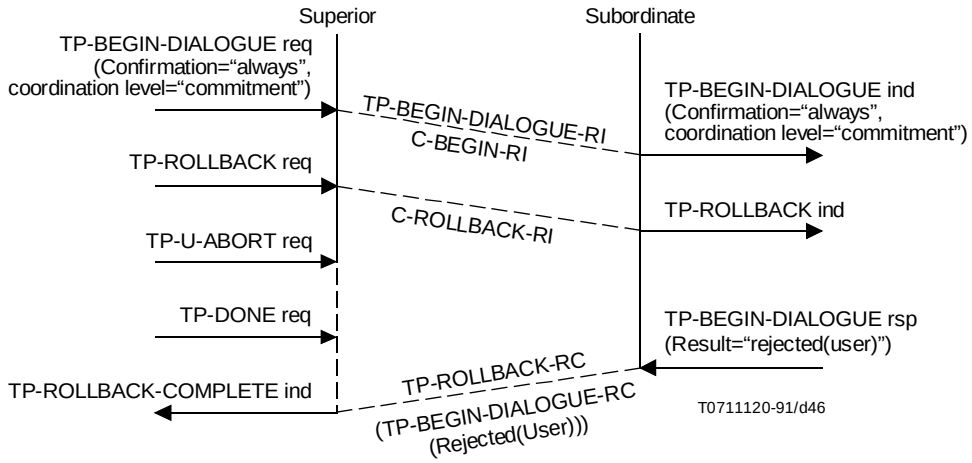


FIGURE C.42/X.862

Dialogue establishment followed by rollback by the requestor and a subsequent collision of TP-U-ABORT req and TP-BEGIN-DIALOGUE rsp (Result="rejected(user)")

C.4 Scenarios with a single dialogue (failure cases)

C.4.1 TP-P-ABORT

These scenarios apply to dialogues with a coordination level of "commitment" with either chained and unchained transactions unless otherwise specified.

C.4.1.1 TP-P-ABORT during active phase

The scenario of Figure C.43 describes a sequence of primitives in the case when a provider-supported transaction is aborted by a communications failure of the dialogue during the active phase.

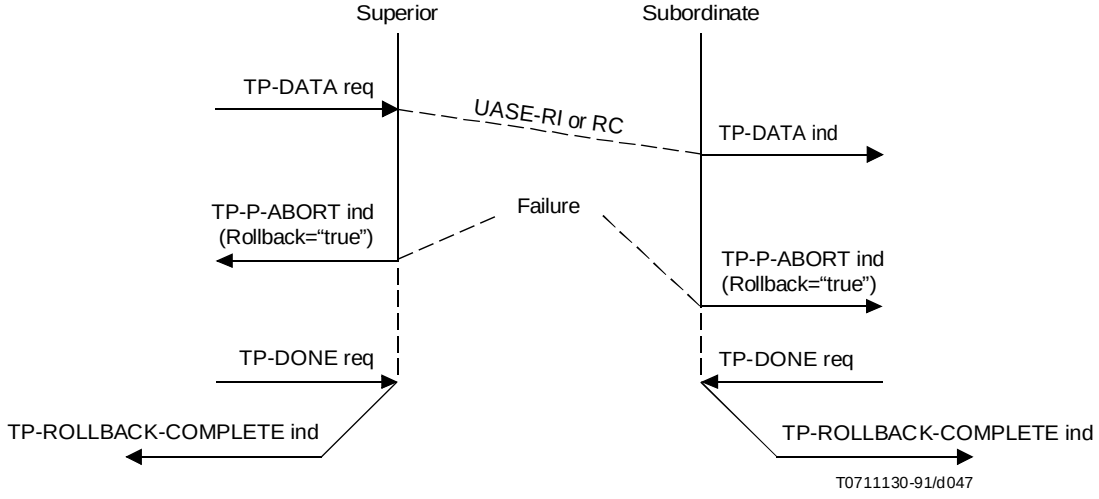


FIGURE C.43/X.862

Failure for a provider-supported transaction in the active phase

C.4.1.2 TP-P-ABORT during the first phase of commitment

The scenario of Figure C.44 describes a sequence of primitives in the case when a provider-supported transaction is aborted by a communications failure of the dialogue during the first phase of commitment.

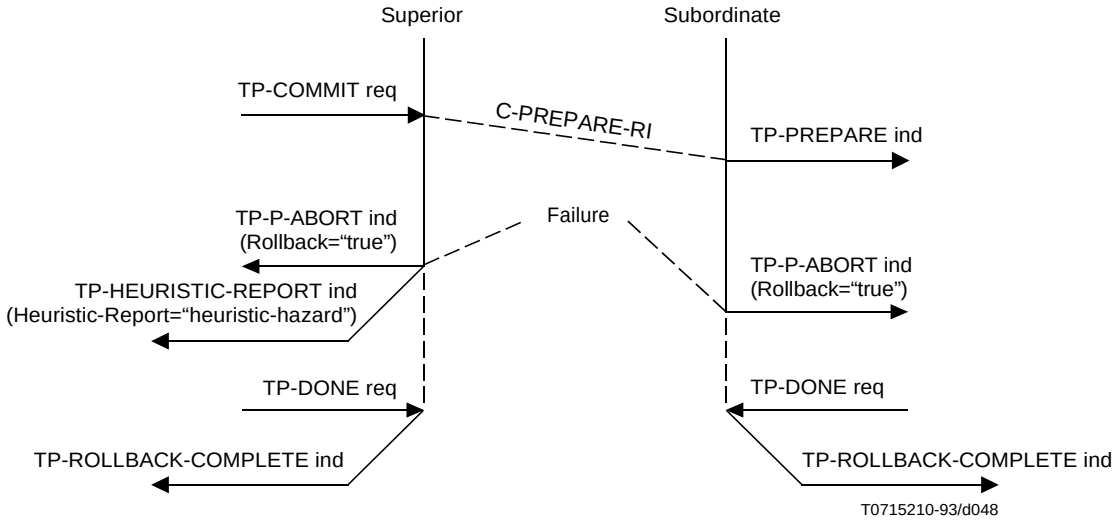


FIGURE C.44/X.862

Failure for a provider-supported transaction during the first phase of commitment

C.4.1.3 TP-P-ABORT during the second phase of commitment

The scenarios of Figures C.45, C.46 and C.47 describe sequences of primitives in the cases when a dialogue is aborted during the second phase of commitment. The three scenarios illustrate the effect that the precise timing of a failure has during commitment.

C.5 Collision scenarios on a single dialogue

C.5.1 Collisions of TP-U-ERROR with TP-COMMIT

The scenario of Figure C.48 shows that, if a TP-U-ERROR and a TP-COMMIT collide, the TP-U-ERROR indication is suppressed and a rollback procedure is triggered.

C.5.2 Collisions with TP-U-ERROR in Polarized Control

After a TP-U-ERROR request issued when the TPSUI does not have the control of the dialogue, any TP-U-ERROR indications and TP-DATA indication are suppressed according to the scenario of Figure C.49.

Due to the transit delay of the Grant Control service, it may happen that two TP-U-ERROR requests sent by TPSUIs not having control collide, this collision is shown by the scenario of Figure C.50.

C.5.3 Collisions with TP-U-ERROR in Shared Control

The scenario of Figure C.51 shows the suppression effect of TP-U-ERROR in Shared Control.

If a collision occurs between two TP-U-ERROR request, the suppression is shown in Figure C.52.

The scenarios of Figures C.53 and C.54 shows that if TP-U-ERROR request is issued between a TP-HANDSHAKE request and the corresponding confirmation, the requestor of TP-U-ERROR request cannot issue a TP-DATA request until it has received the handshake confirmation.

The scenario in Figure C.55 shows that, in Shared Control, a TP-U-ERROR request is not confirmed when colliding with a TP-END-DIALOGUE request (Confirmation = "true"). It would be the same for the TP-U-ERROR request/ TP-HANDSHAKE request collision.

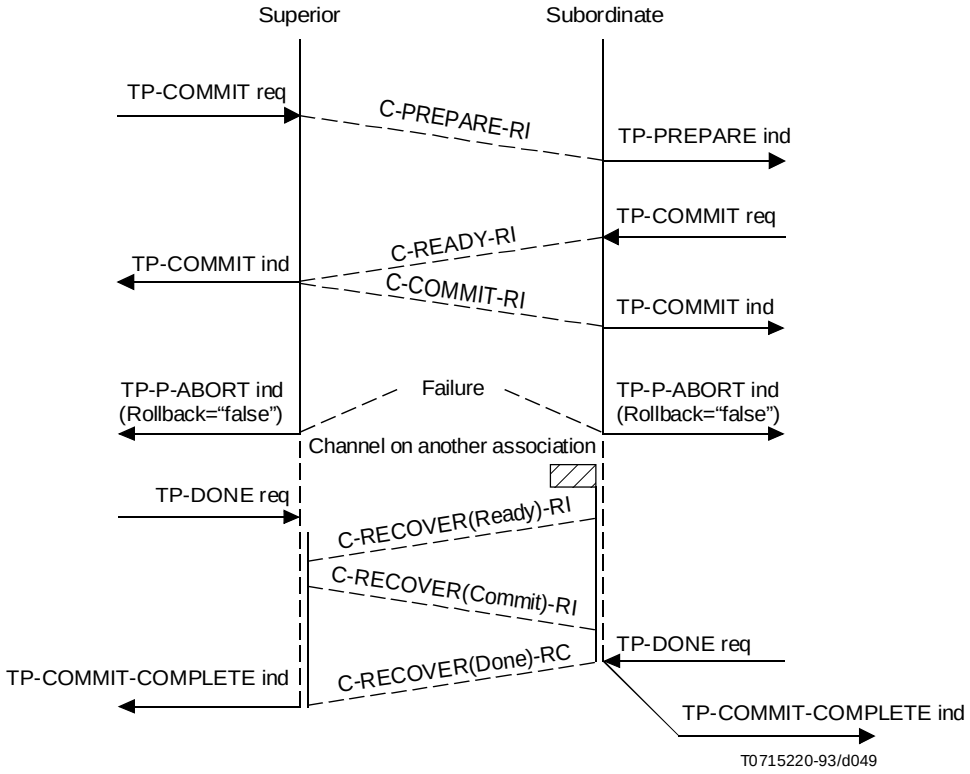


FIGURE C.45/X.862

Failure for a provider-supported transaction during the second phase of commitment

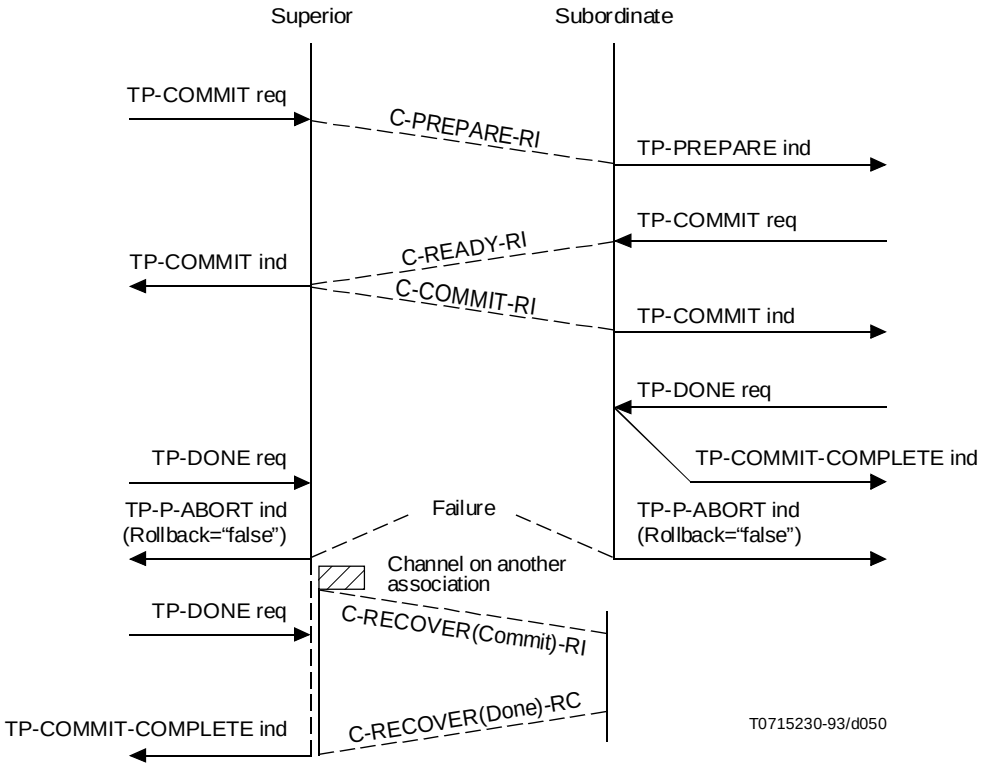


FIGURE C.46/X.862

Failure for a provider-supported transaction during the second phase of commitment when the Unchained Transactions functional unit is selected

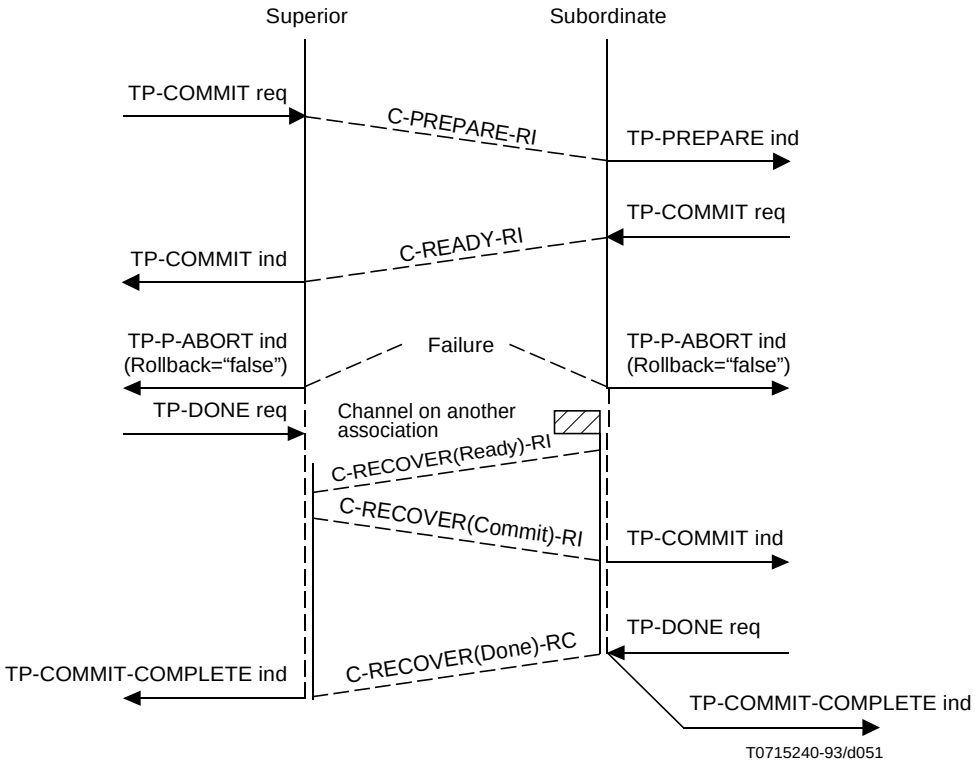


FIGURE C.47/X.862

Failure for a provider-supported transaction during the second phase of commitment

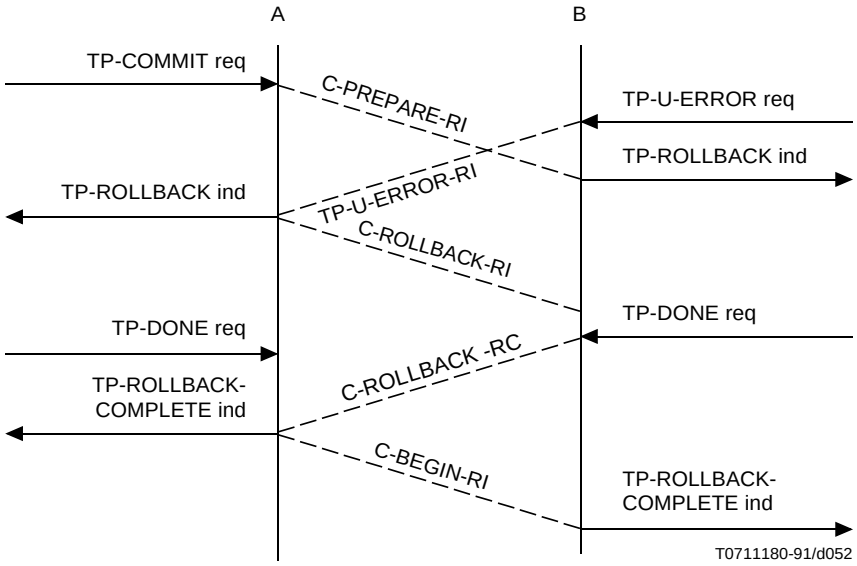


FIGURE C.48/X.862

Collision of TP-COMMIT and TP-U-ERROR

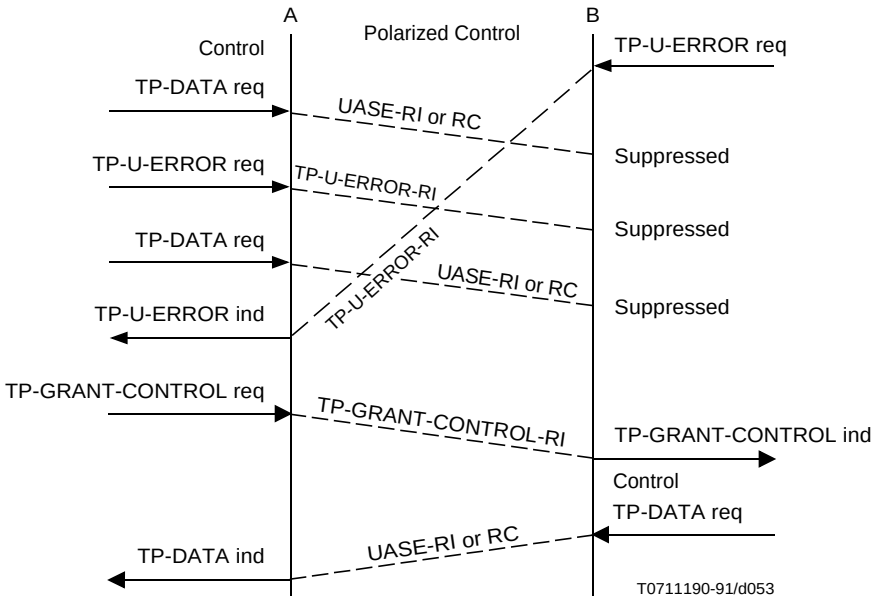


FIGURE C.49/X.862

Suppression effects of TP-U-ERROR

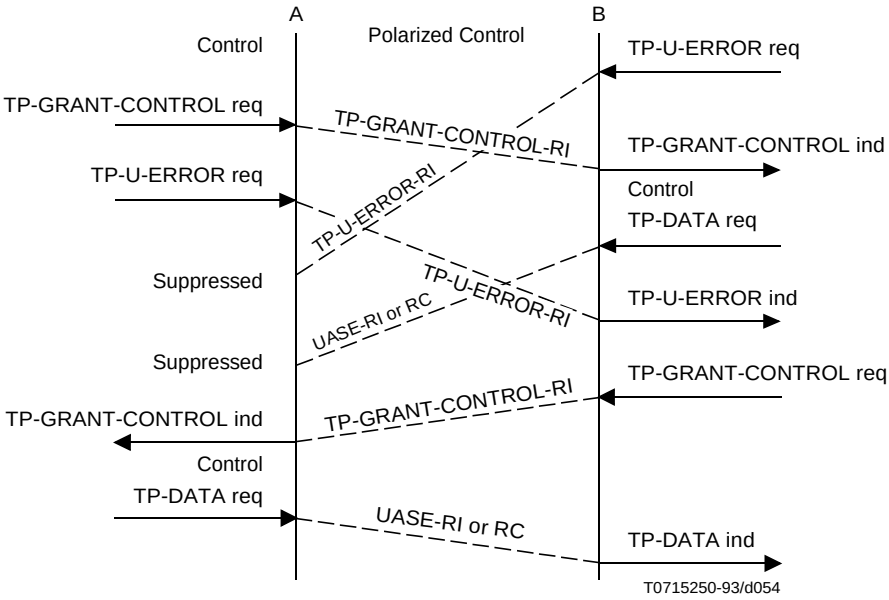


FIGURE C.50/X.862

Collisions of two TP-U-ERRORs issued without having the control

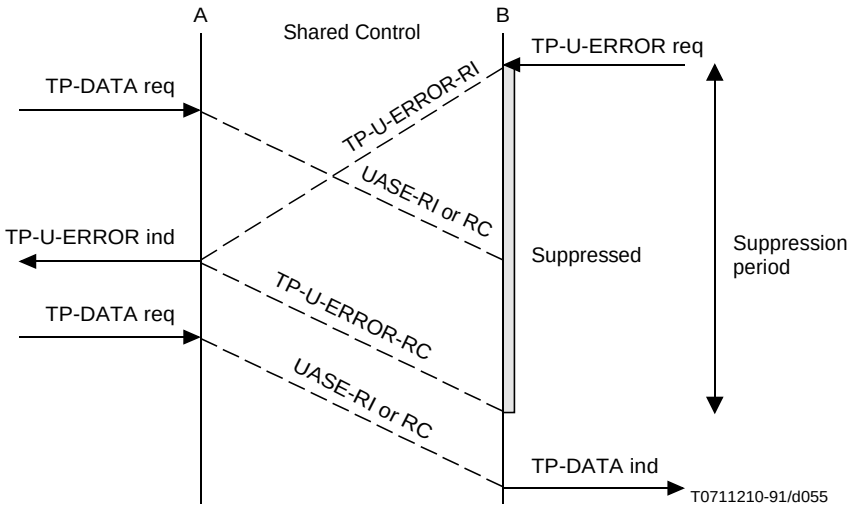


FIGURE C.51/X.862

Suppression effect of TP-U-ERROR in Shared Control

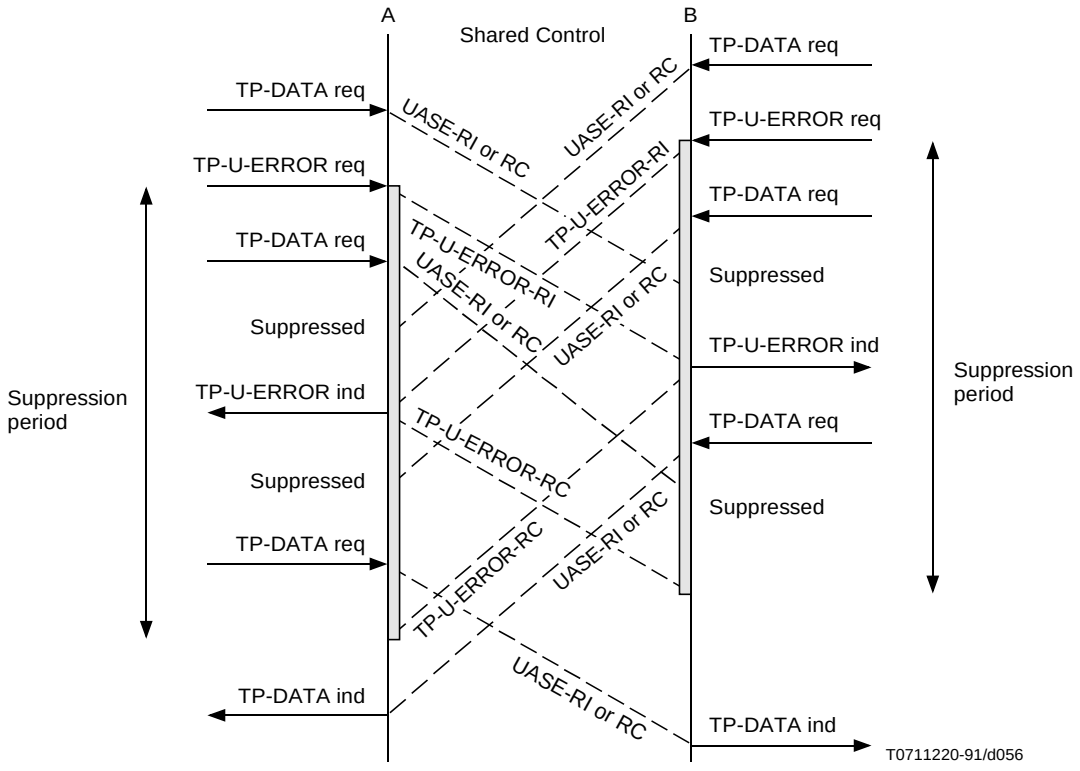


FIGURE C.52/X.862

Collision of TP-U-ERRORs in Shared Control

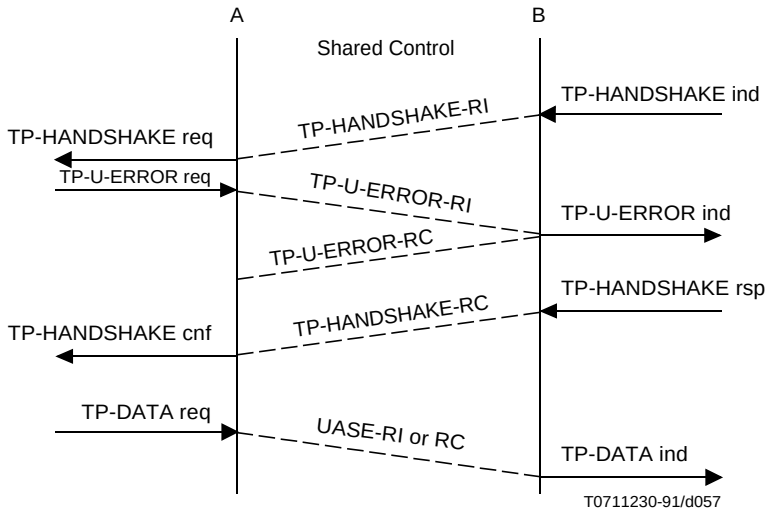


FIGURE C.53/X.862

TP-U-ERROR during an outstanding handshake request

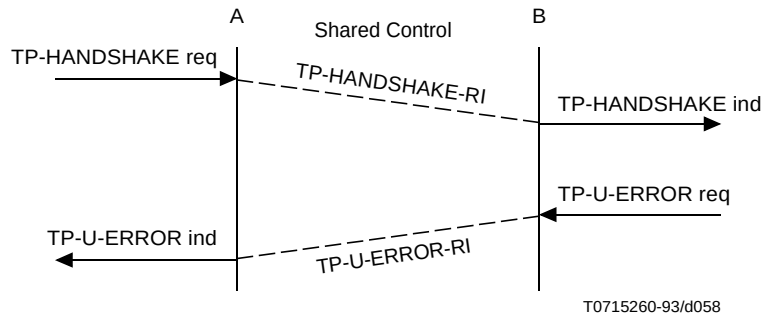


FIGURE C.54/X.862

TP-U-ERROR during an outstanding handshake indication

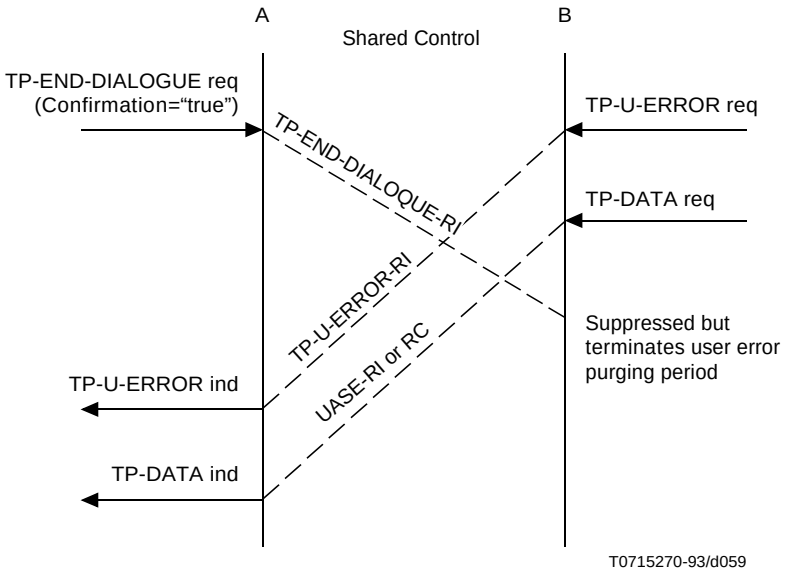


FIGURE C.55/X.862

Collision of a TP-U-ERROR request with a TP-END-DIALOGUE indication

The scenario in Figure C.56 shows a case when, in Shared Control, two TP-U-ERROR requests collide with a TP-HANDSHAKE request; only the first TP-U-ERROR-RI is not confirmed.

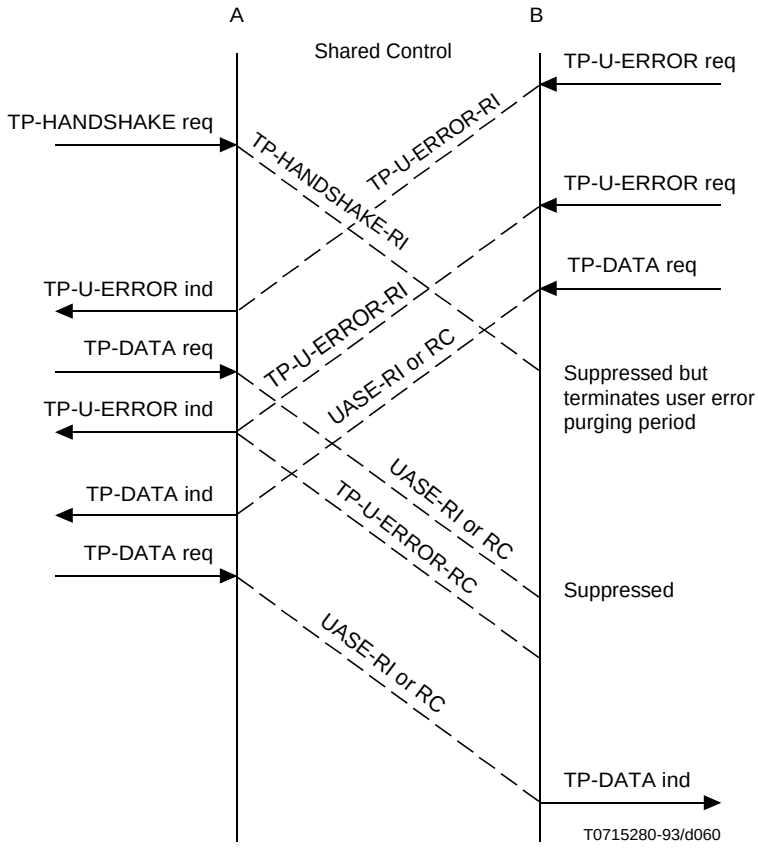


FIGURE C.56/X.862

Collision of two TP-U-ERROR requests with a TP-HANDSHAKE indication in Shared Control

The scenario in Figure C.57 shows that TP-U-ERROR-RC are not sent when a dialogue establishment indication is outstanding; they are sent after the TP-BEGIN-DIALOGUE-RC, and after a C-BEGIN-RC (if any).

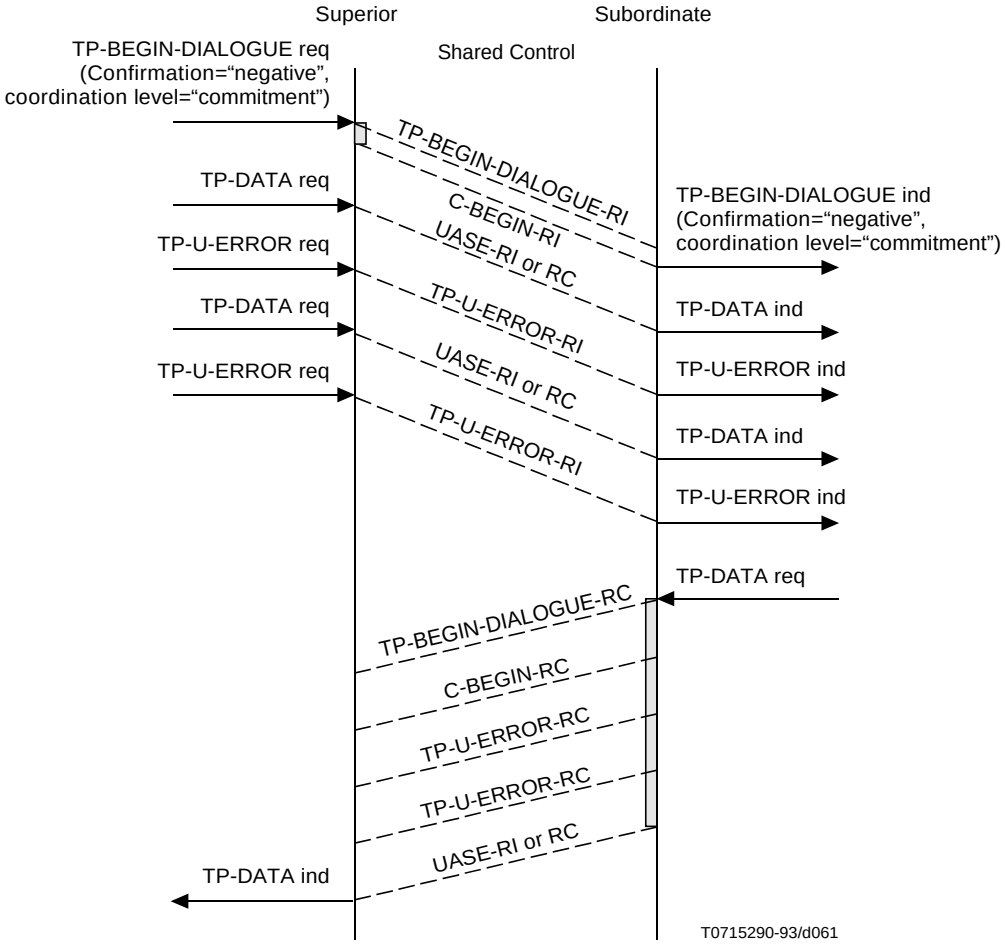


FIGURE C.57/X.862

Queuing TP-U-ERROR-RC before TP-BEGIN-DIALOGUE-RC is sent in Shared Control

The scenario in Figure C.58 shows that two TP-U-ERROR requests, sent in response to two colliding TP-HANDSHAKE request, are not confirmed.

C.5.4 TP-END-DIALOGUE Collision Scenarios

C.5.4.1 Collision of a TP-END-DIALOGUE (Confirmation = "true") and a TP-END-DIALOGUE (Confirmation = "false")

The scenario of Figure C.59 describes a sequence of primitives in the case when a TP-END-DIALOGUE (Confirmation = "true") request collides with a TP-END-DIALOGUE (Confirmation = "false") request in Shared Control.

C.5.4.2 Collision of a TP-END-DIALOGUE (Confirmation = "true") and a TP-END-DIALOGUE (Confirmation = "true")

The scenario of Figure C.60 describes a sequence of primitives in the case when a TP-END-DIALOGUE (Confirmation = "true") request collides with another TP-END-DIALOGUE (Confirmation = "true") request in Shared Control.

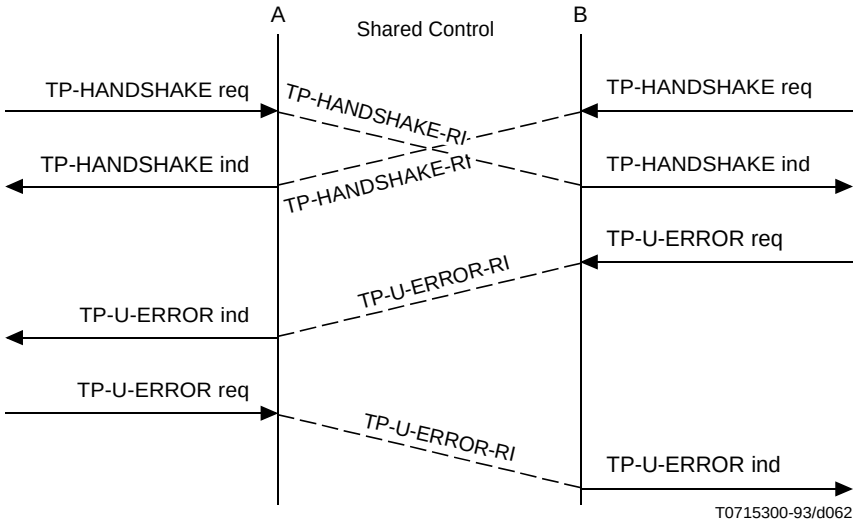


FIGURE C.58/X.862

Two TP-U-ERROR requests after a TP-HANDSHAKE collision in Shared Control

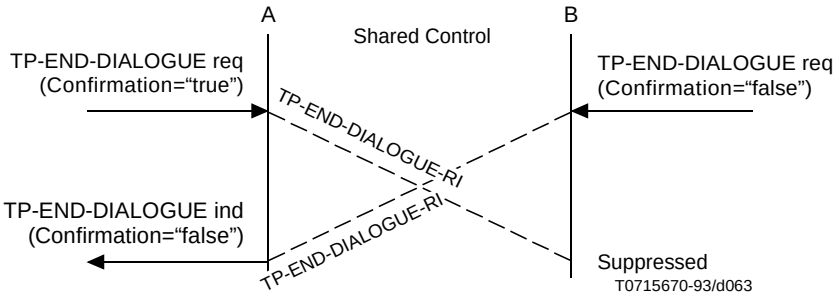


FIGURE C.59/X.862

Collision of a TP-END-DIALOGUE (Confirmation="true") and a TP-END-DIALOGUE (Confirmation="false")

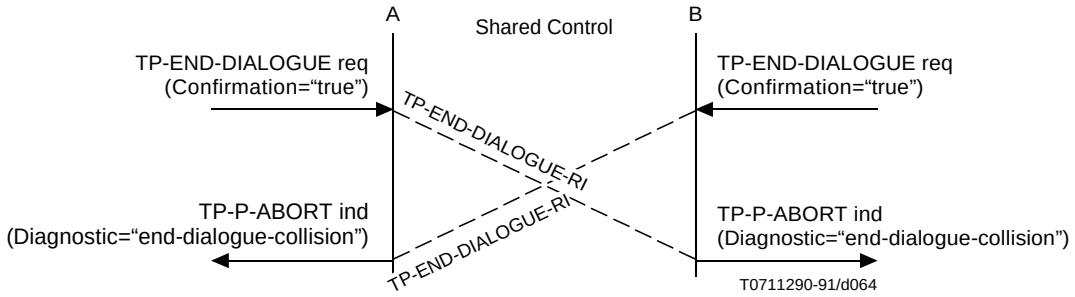


FIGURE C.60/X.862

Collision of a TP-END-DIALOGUE (Confirmation="true") and a TP-END-DIALOGUE (Confirmation="true")

C.5.4.3 Collision of a TP-END-DIALOGUE (Confirmation = "true") and a TP-U-ERROR

The scenario of Figure C.61 describes a sequence of primitives in the case when a TP-END-DIALOGUE (Confirmation = "true") request collides with a TP-U-ERROR request in Polarized Control.

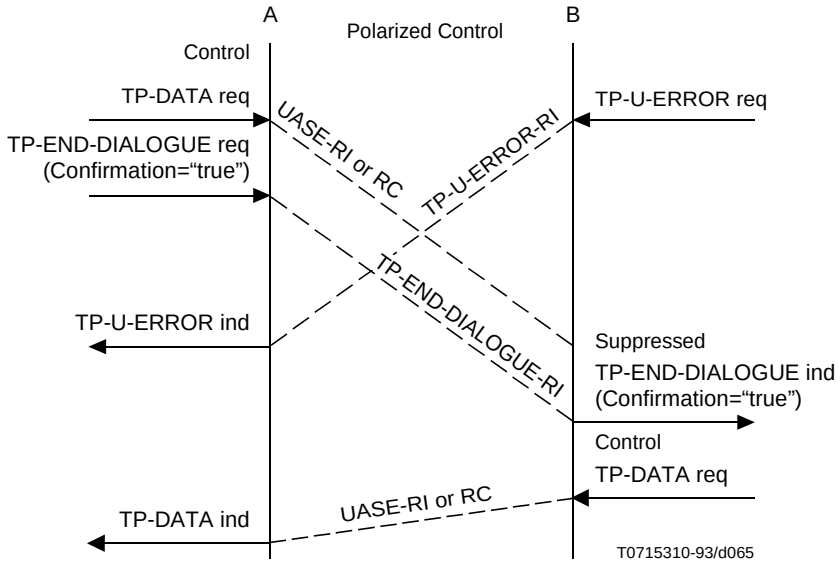


FIGURE C.61/X.862

Collision of a TP-END-DIALOGUE (Confirmation="true") and a TP-U-ERROR in Polarized Control

The scenario of Figure C.62 describes a sequence of primitives in the case when a TP-END-DIALOGUE (Confirmation = "true") request is involved in a collision with a TP-U-ERROR request in Shared Control. The TP-END-DIALOGUE indication is suppressed.

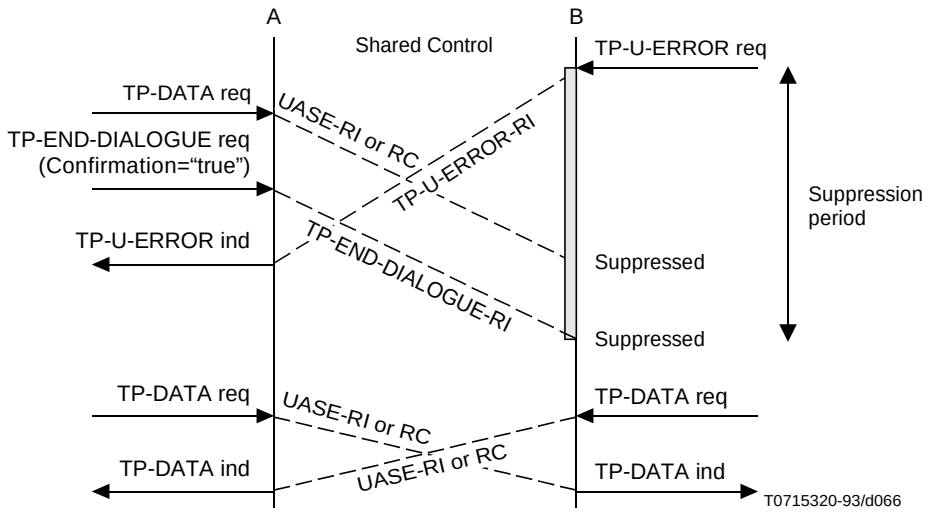


FIGURE C.62/X.862

Collision of a TP-END-DIALOGUE (Confirmation="true") and a TP-U-ERROR in Shared Control

C.5.4.4 Collision of a TP-END-DIALOGUE (Confirmation = "true") with a TP-REQUEST-CONTROL

The scenario of Figure C.63 describes a sequence of primitives in the case when a TP-END-DIALOGUE (Confirmation = "true") request is involved in a collision with a TP-REQUEST-CONTROL request in Polarized Control.

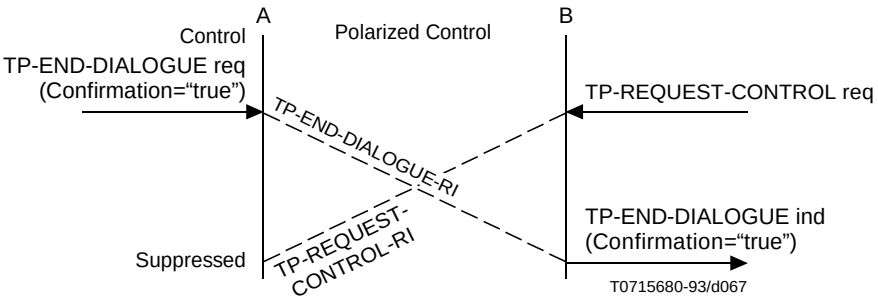


FIGURE C.63/X.862

Collision of a TP-END-DIALOGUE (Confirmation="true") with a TP-REQUEST-CONTROL

C.5.4.5 Collision of a TP-END-DIALOGUE (Confirmation = “true”) and a TP-BEGIN-TRANSACTION

The scenario of Figure C.64 describes a sequence of primitives in the case when a TP-END-DIALOGUE (Confirmation = “true”) request is involved in a collision with a TP-BEGIN-TRANSACTION in Shared Control.

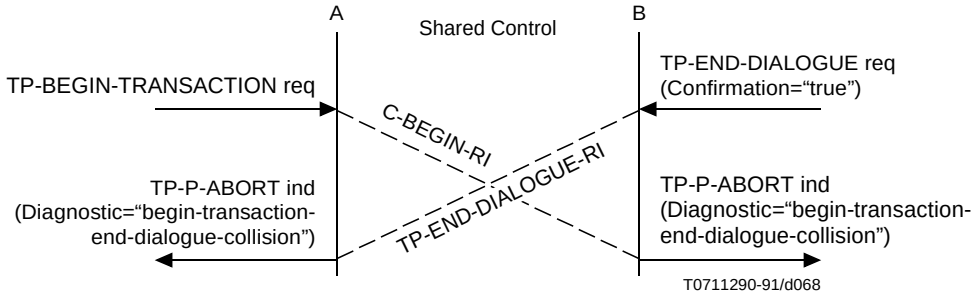


FIGURE C.64/X.862

Collision of a TP-END-DIALOGUE (Confirmation=“true”) and a TP-BEGIN-TRANSACTION

C.5.4.6 Collision of a TP-END-DIALOGUE (Confirmation = “true”) and a TP-HANDSHAKE

The scenario of Figure C.65 describes a sequence of primitives in the case when a TP-END-DIALOGUE (Confirmation = “true”) request is involved in a collision with a TP-HANDSHAKE in Shared Control. TPSUI B shall wait for the TP-HANDSHAKE confirm before issuing the TP-END-DIALOGUE response.

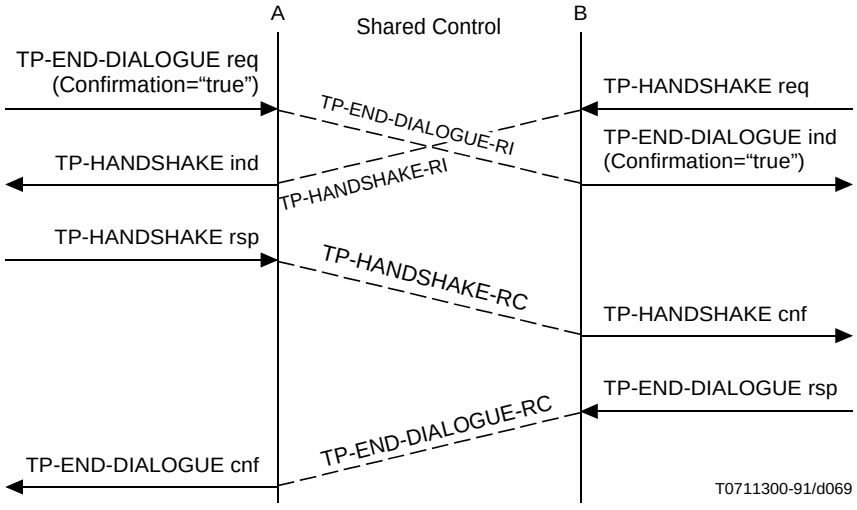


FIGURE C.65/X.862

Collision of a TP-END-DIALOGUE (Confirmation=“true”) and a TP-HANDSHAKE

C.5.5 Other collisions

C.5.5.1 Collision of a TP-COMMIT and a dialogue establishment rejects

The scenarios of Figures C.66 and C.67 show that if TP-COMMIT request is issued before a TP-BEGIN-DIALOGUE confirm (Result = "rejected"), the transaction is rolled back.

C.5.5.2 Collision of a TP-COMMIT and TP-DATA

The scenario of Figure C.68 shows a case where a TP-DATA issued after the Data-Permitted parameter has been set to "true" collides with a TP-COMMIT request; the subordinate is not aware of the collision but the TPSP triggers a rollback because the superior is no longer willing to accept indications from its subordinate.

C.6 Tree with multiple dialogues (successful cases)

The scenarios show how the commitment procedures operate within a transaction tree containing several intermediate and leaf nodes.

In each case at the end of the sequences:

- for unchained transactions, the provider-supported transaction has ended and the coordination level is "none";
- for chained transactions, the new transaction will have begun and the transaction tree would retain the same shape as in the previous transaction.

C.6.1 The committing phase driven by TP-COMMIT

The scenario of Figure C.69 shows the sequence of primitives following issuance of the TP-COMMIT request.

C.6.2 The committing phase with TP-PREPARE and TP-READY

The scenario of Figure C.70 shows the sequence of primitives following invocation of the TP-PREPARE request by the root TPSUI for one of its subordinate (C); this illustrates how a TPSUI (TPSUI A) can initiate commitment on some branches (in this case, the single branch A-C) while remaining active, by using the TP-PREPARE request.

The scenario additionally shows the same function being used by node C on its branche C-D.

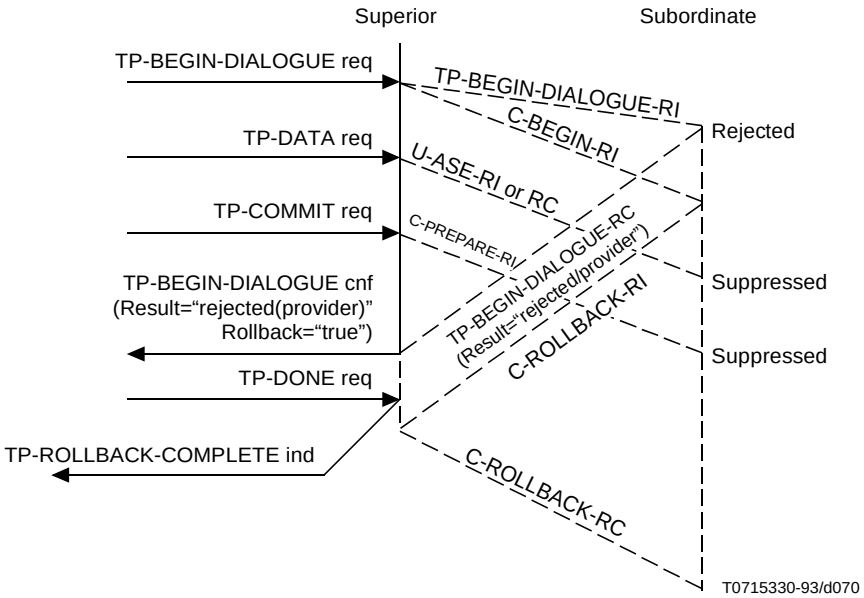
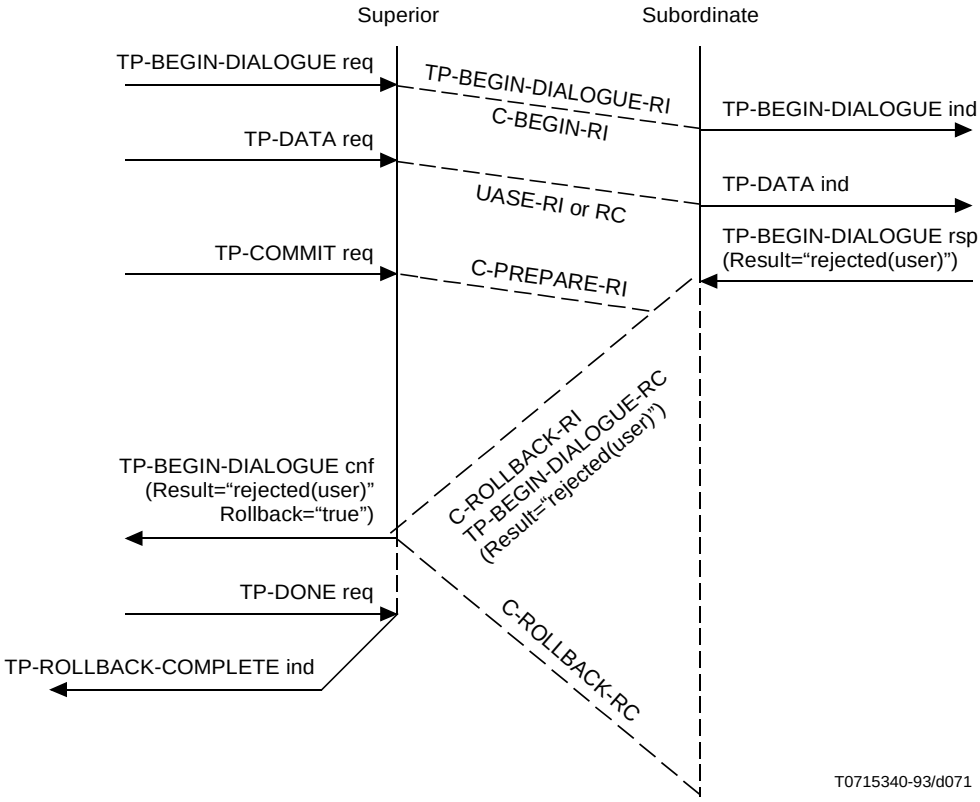


FIGURE C.66/X.862

Collision of a TP-COMMIT request and a TP-BEGIN-DIALOGUE confirm (rejected(provider))



NOTE – The C-PREPARE-RI could result in a TP-PREPARE indication at the subordinate before the TP-BEGIN-DIALOGUE response; the final result would be exactly the same.

FIGURE C.67/X.862

Collision of a TP-COMMIT request and a TP-BEGIN-DIALOGUE confirm (rejected(user))

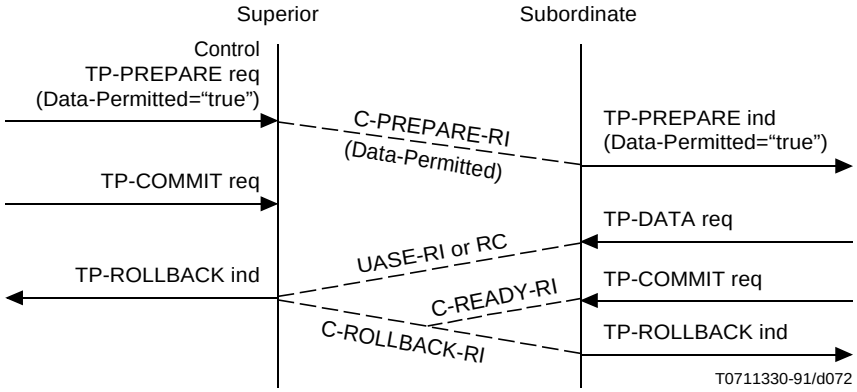


FIGURE C.68/X.862

Collision of TP-COMMIT and TP-DATA

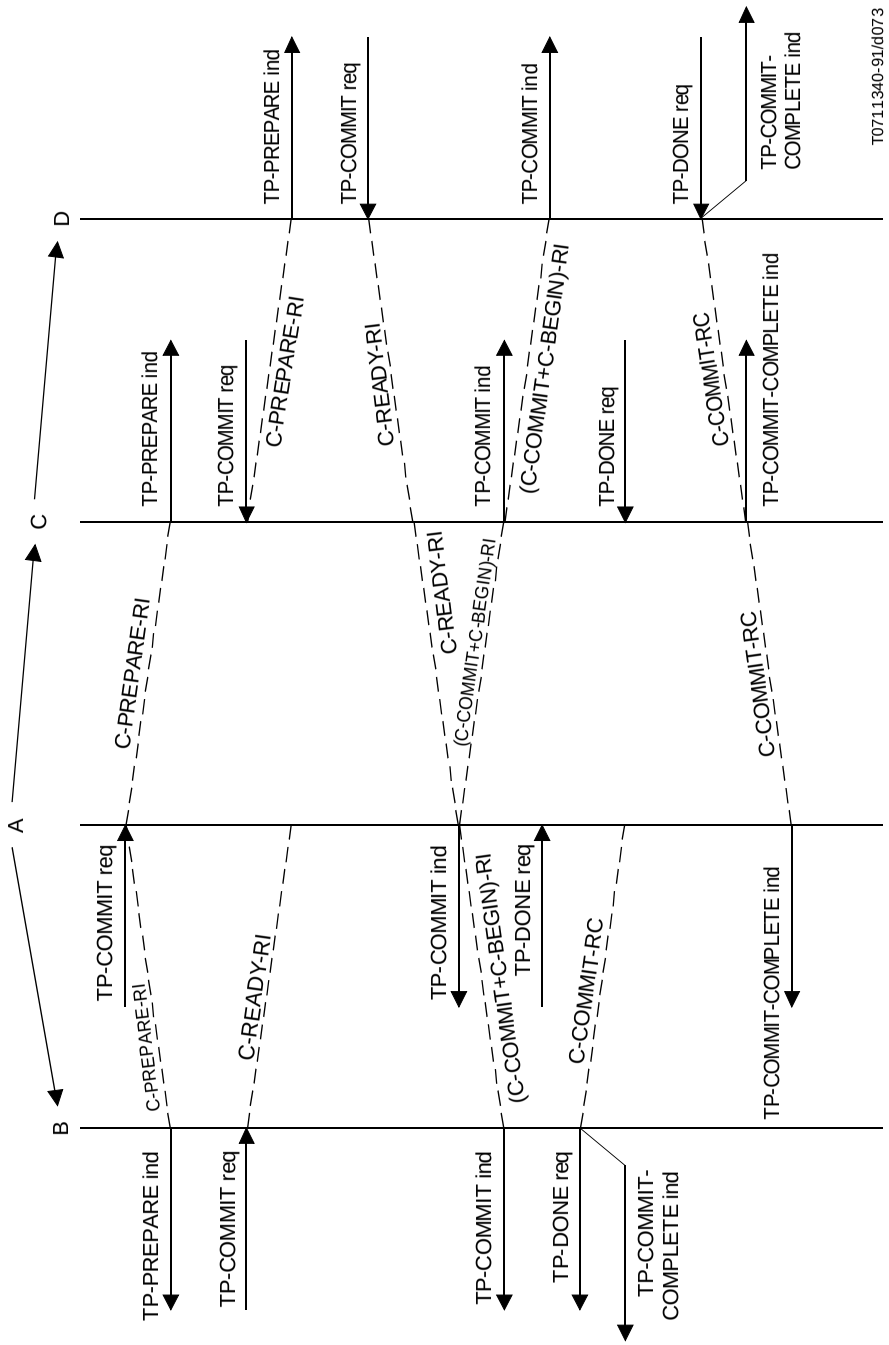


FIGURE C.69/X.862

Commitment in a multi-dialogue tree (Chained Transactions)

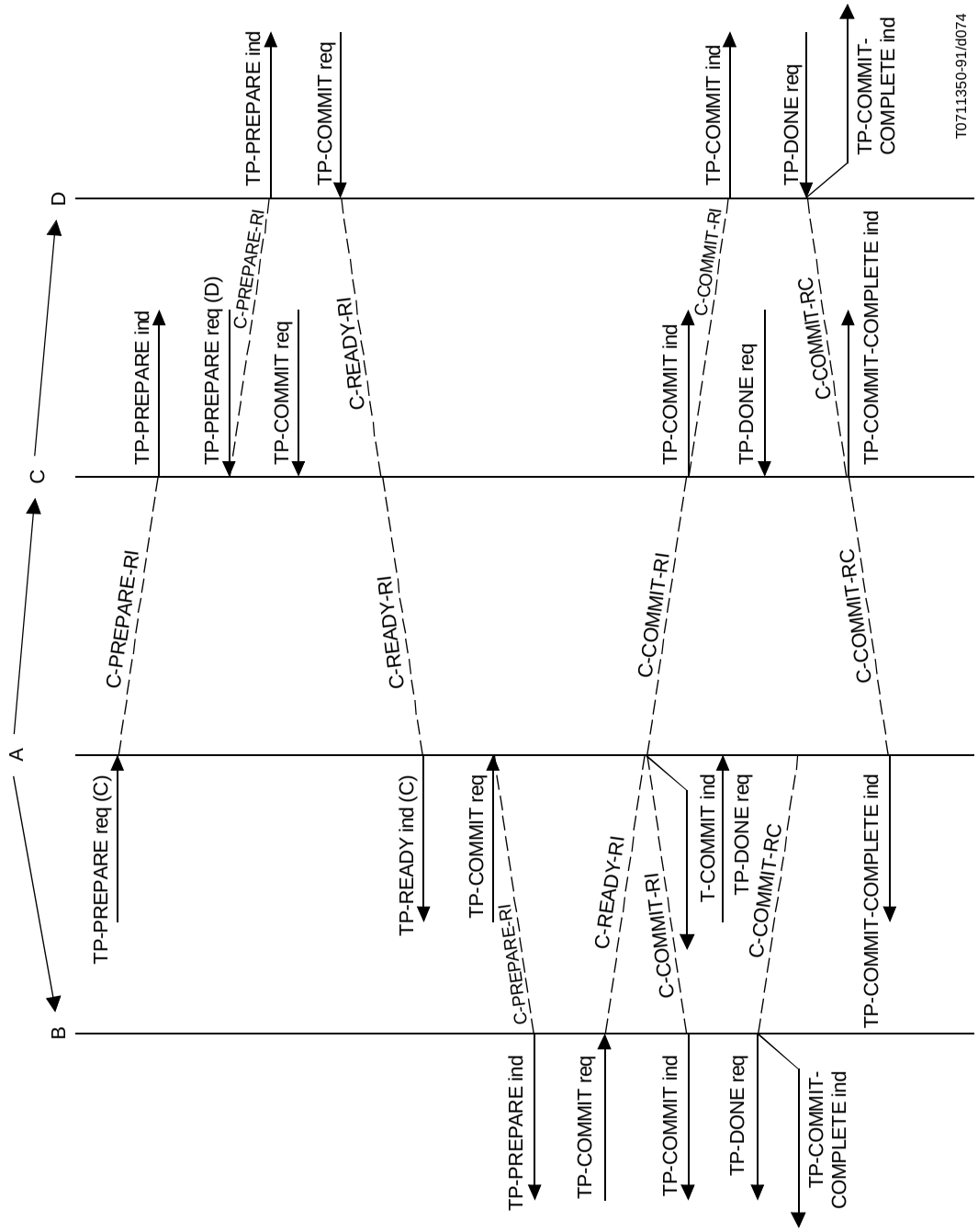


FIGURE C.70/X.862

Commitment in a multi-dialogue tree with use of TP-PREPARE (Unchained Transactions)

C.7 Tree with multiple dialogues (unsuccessful cases)

C.7.1 Rollback from the root during the active phase

The scenario of Figure C.71 shows the sequence of primitives following invocation of TP-ROLLBACK request during the active phase of a transaction, for example as the result of a TPSUI error. This scenario covers the case where TP-ROLLBACK request is invoked in the root node of the transaction tree.

At the end of this scenario, all bound data will have been returned to their initial state. If the chained transactions functional unit has been selected on the dialogues, a new transaction will have begun.

C.7.2 Rollback from a subordinate during the active phase

The scenarios of Figures C.72 and C.73 are similar to the scenario of Figure C.71; however the rollback originates from an intermediate node. Figures C.72 and C.73 show the unchained and chained cases, respectively.

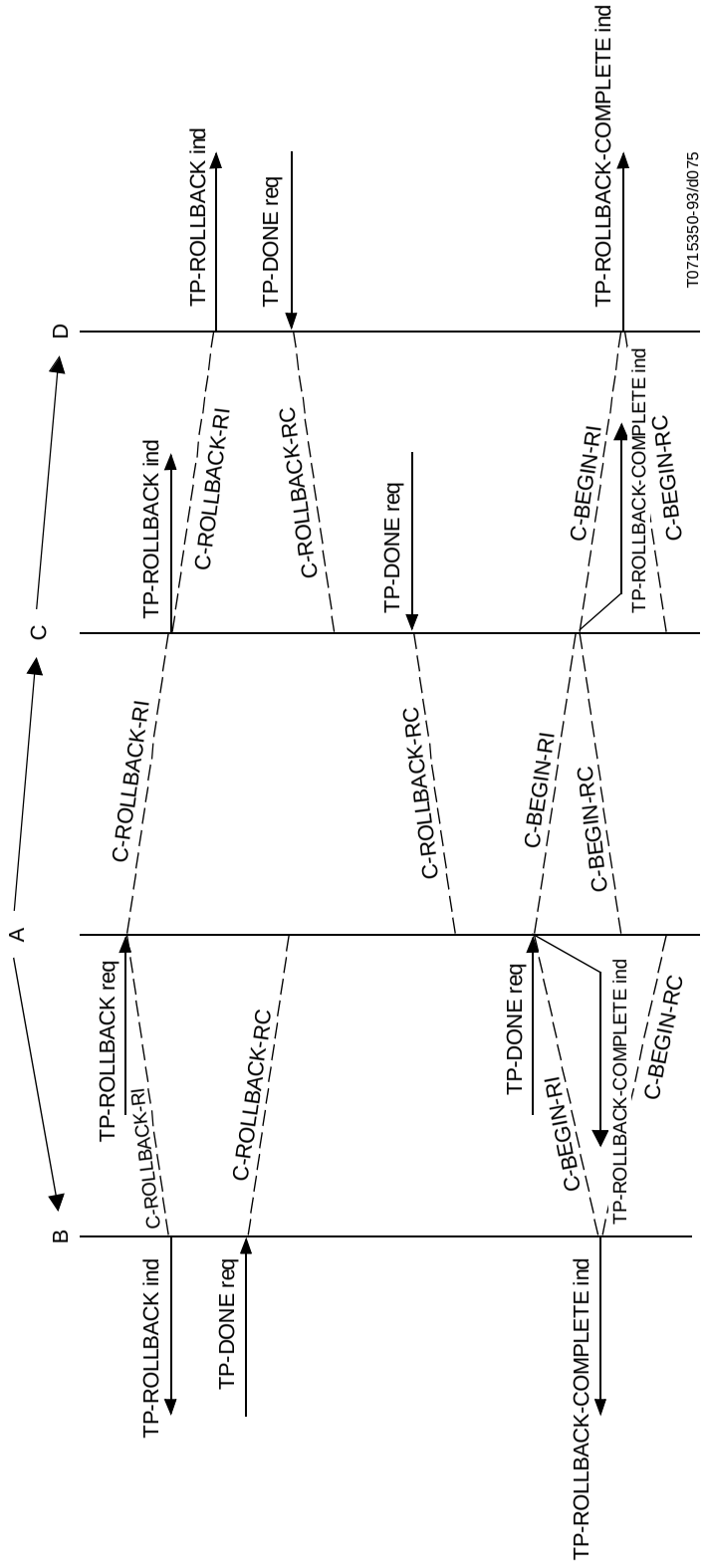


FIGURE C.71/X.862

Rollback from a root node (Chained Transactions)

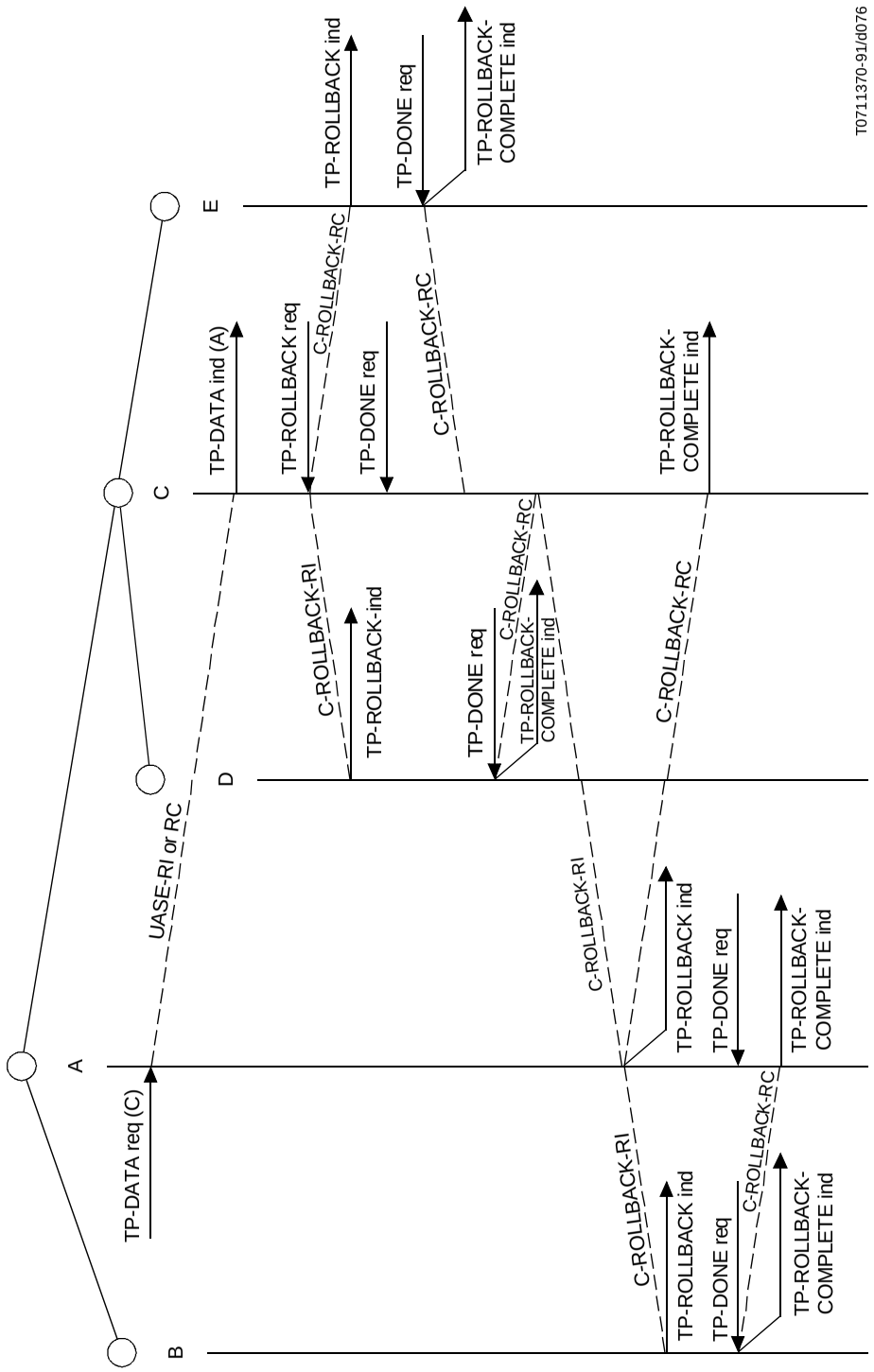


FIGURE C.72/X.862

Rollback from a intermediate node (Unchained Transactions)

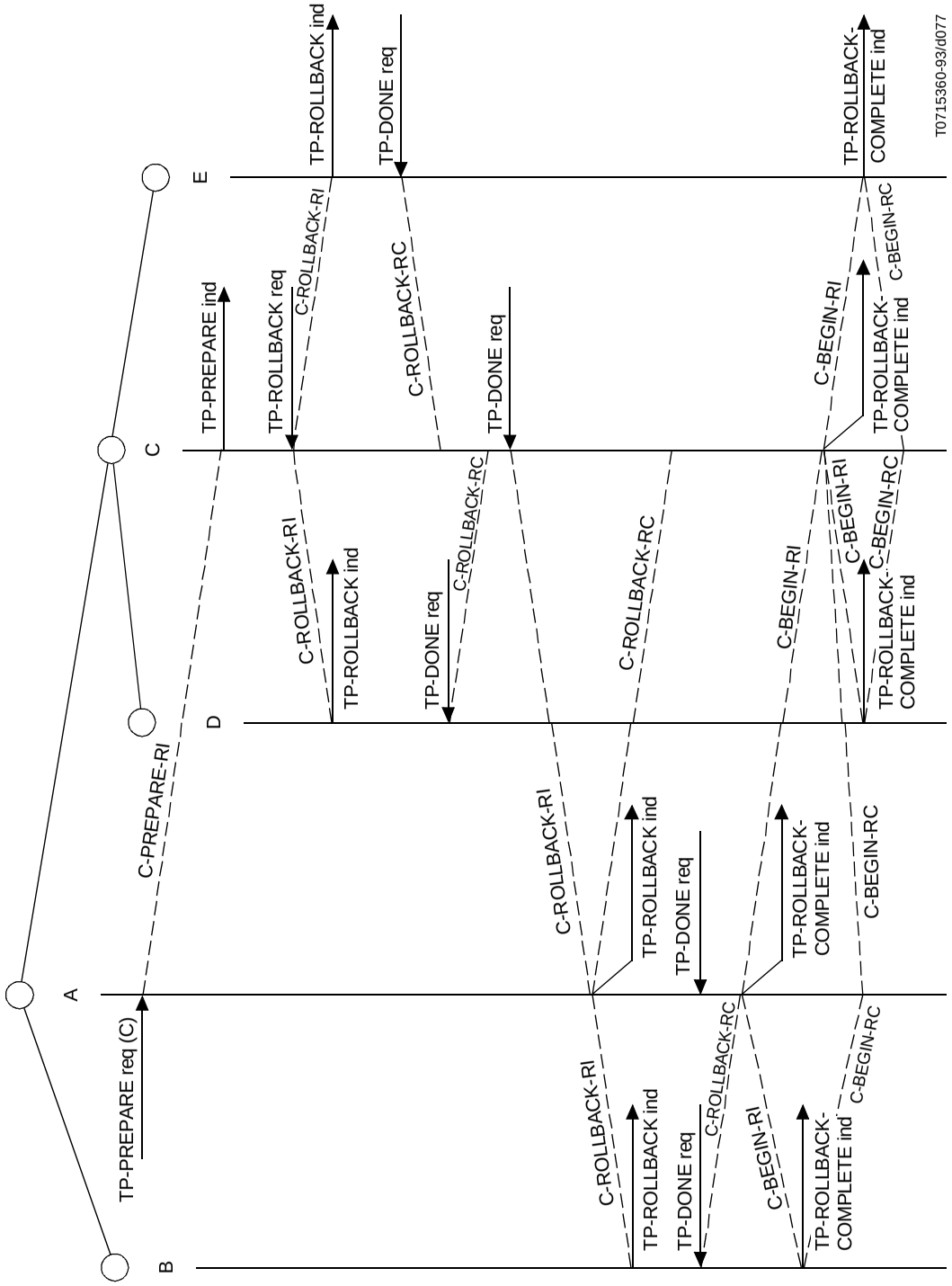


FIGURE C.73/X.862

Rollback from an intermediate node (Chained Transactions)

C.7.3 Dialogue abort during phase I of commitment

The scenario of Figure C.74 is based on scenario of Figure C.69 except that a communications failure (causing TP-P-ABORT indications) occurs between A and B, and C and D, during the first phase of commitment.

As the failure between C and D occurs before the commitment sequence begins, this is equivalent to a dialogue abort in the active phase and so no lather recovery actions are required. Between B and A, transaction recovery is initiated from B and takes place on a new association.

At the end of the sequence, the dialogue tree contains only A and C; then, depending on the functional units selected:

- unchained transactions: the transaction has been rolled back and no new transaction has been started;
- chained transactions: the transaction has been rolled back and a new transaction tree established containing A and C.

Further action is determined by the TPSUIs themselves.

C.7.4 Rollback-related actions

The scenario of Figure C.75 shows a rollback initiated from a leaf node. In reaction to the rollback two other leaf nodes abort their superior dialogue.

In turn, their superior does not accept the situation and aborts its superior dialogue.

At the end of the scenario the tree is limited to two nodes.

C.7.5 Dialogue abort during the active phase

In the scenario of Figure C.76, the dialogue between C and E is aborted during the active phase of the provider-supported transaction in which A, B, C, D, E and E's subordinates are participating. In this case, this provider-supported transaction is rolled back (TP-P-ABORT indication is issued with the Rollback parameter set to "true" to both C and E).

At the end of the scenario, two isolated transaction trees exist:

1) a transaction tree with A as the root and which consist of A, B, C and D;
2) a transaction tree with E as the root.

C.7.6 Dialogue abort during the active phase, transaction tree above the failure disbanded

The beginning of the scenario of Figure C.77 is similar to the beginning of the previous one. But after being aware of the failure with its superior, C aborts the dialogues it has with its superior (A) and its subordinate (D) by issuing TP-U-ABORT request on these dialogues. A, in return, aborts the dialogue with its last subordinate (B).

At the end of this scenario, the transaction tree superior to the failure is completely disbanded and A, B, C and D are isolated. E has been isolated from C by the failure but is still the root of a transaction tree.

C.7.7 Dialogue abort during the second phase of commitment

In the scenario of Figure C.78, the failure between C and E occurs after C has received TP-COMMIT indication, but before E has received TP-COMMIT indication. Therefore, the TP-P-ABORT indication issued to C and E is delivered with the Rollback parameter set to "false" (C knows that the terminating provider-supported transaction is committed, E is in doubt).

After recovery takes place, E receives TP-COMMIT indication and completes the commitment of its subtree.

Since the dialogue between C and E was in chained mode, the next transaction has to be rolled back from node C.

At the end of the scenario, two isolated transaction trees exist:

1) a transaction tree with A as the root and which consist of A, B, C and D;
2) a transaction tree with E as the root.

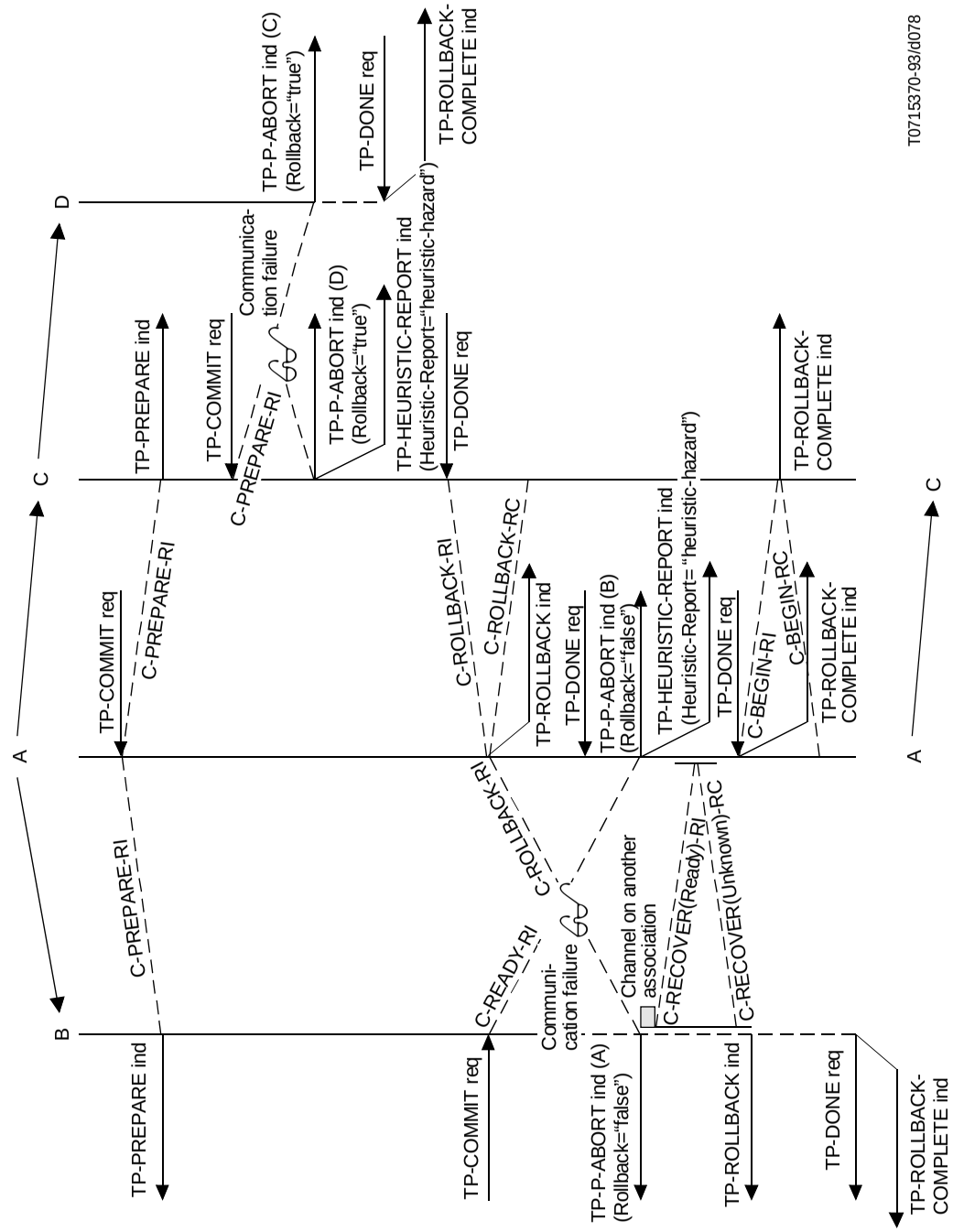


FIGURE C.74/X.862

Two failures during phase I of commitment (Chained Transactions)

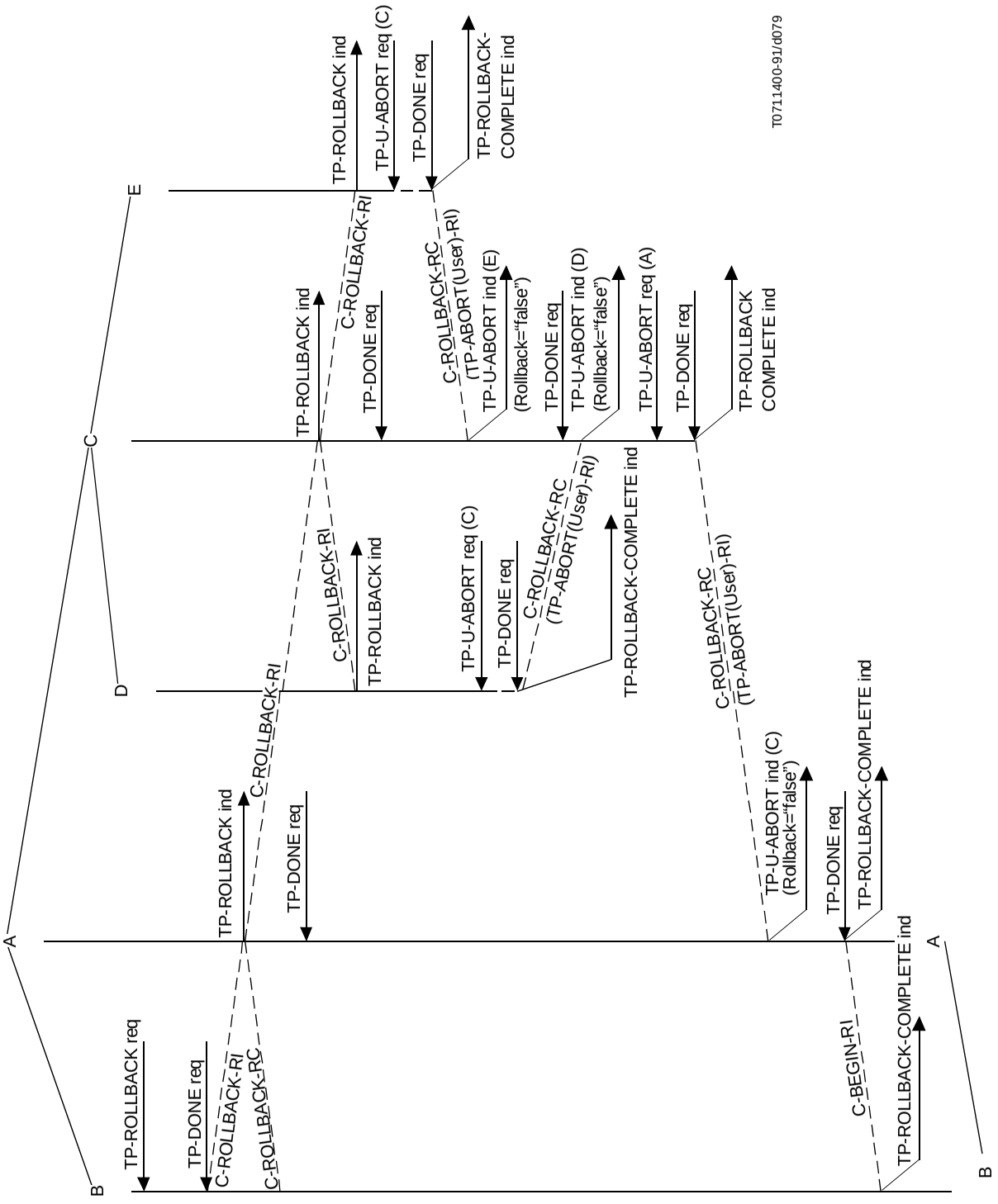


FIGURE C.75/X.862

Rollback-related actions – A and B nodes remain (Chained Transactions)

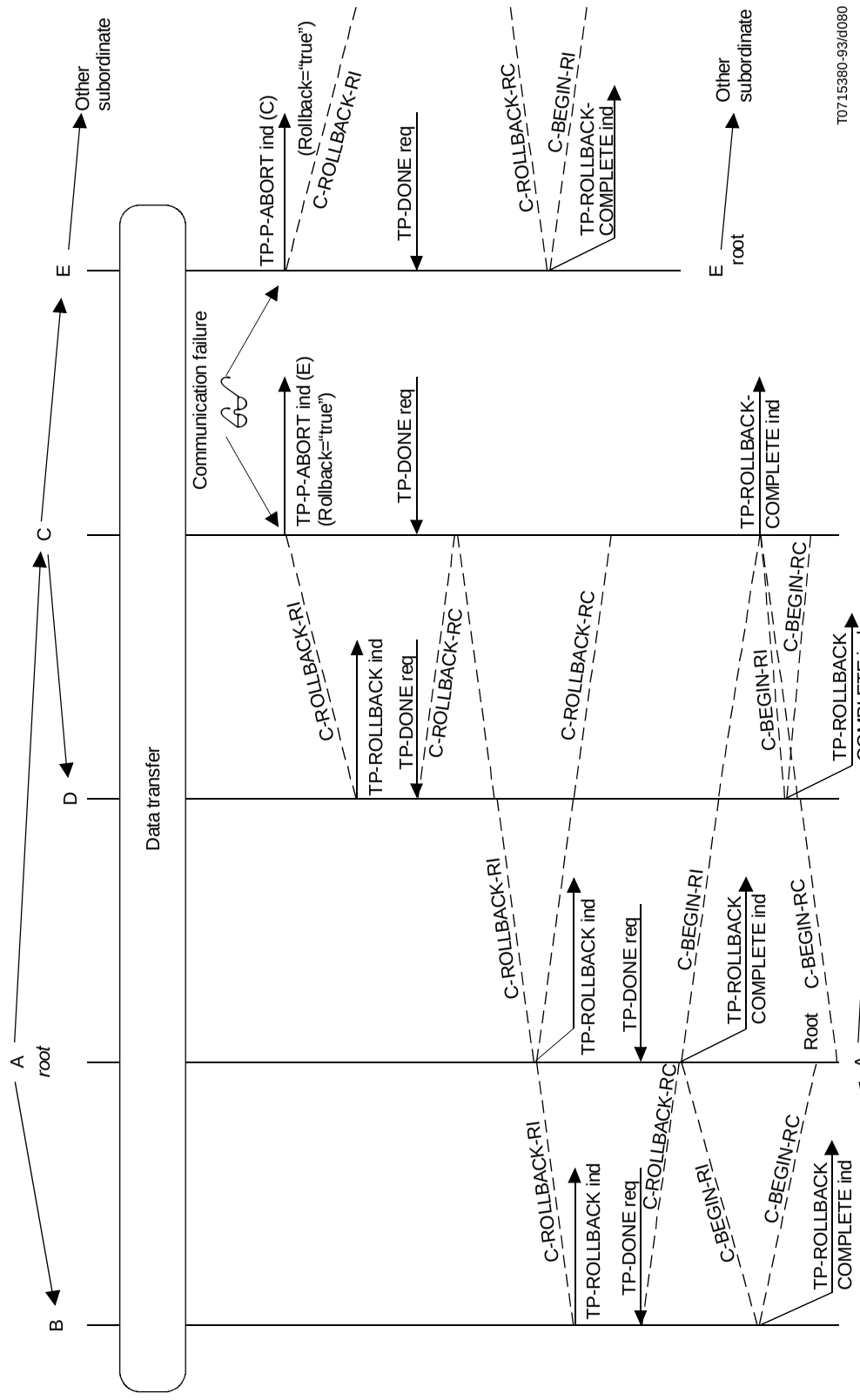


FIGURE C.76/X.862

Failure during phase I – Two isolated transaction trees (Chained Transactions)

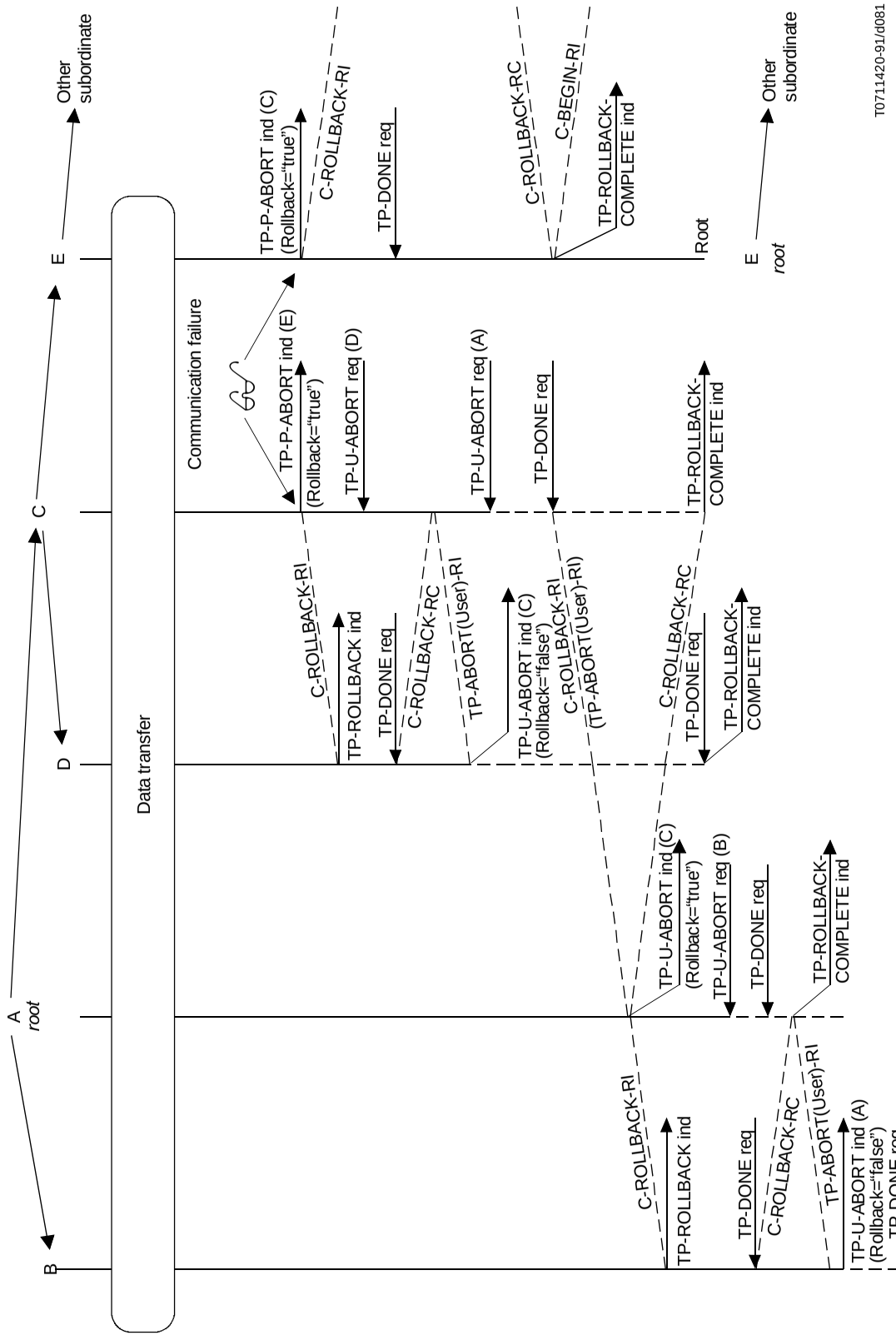


FIGURE C.77/X.862

Failure during phase I – Superior tree aborted (Chained Transactions)

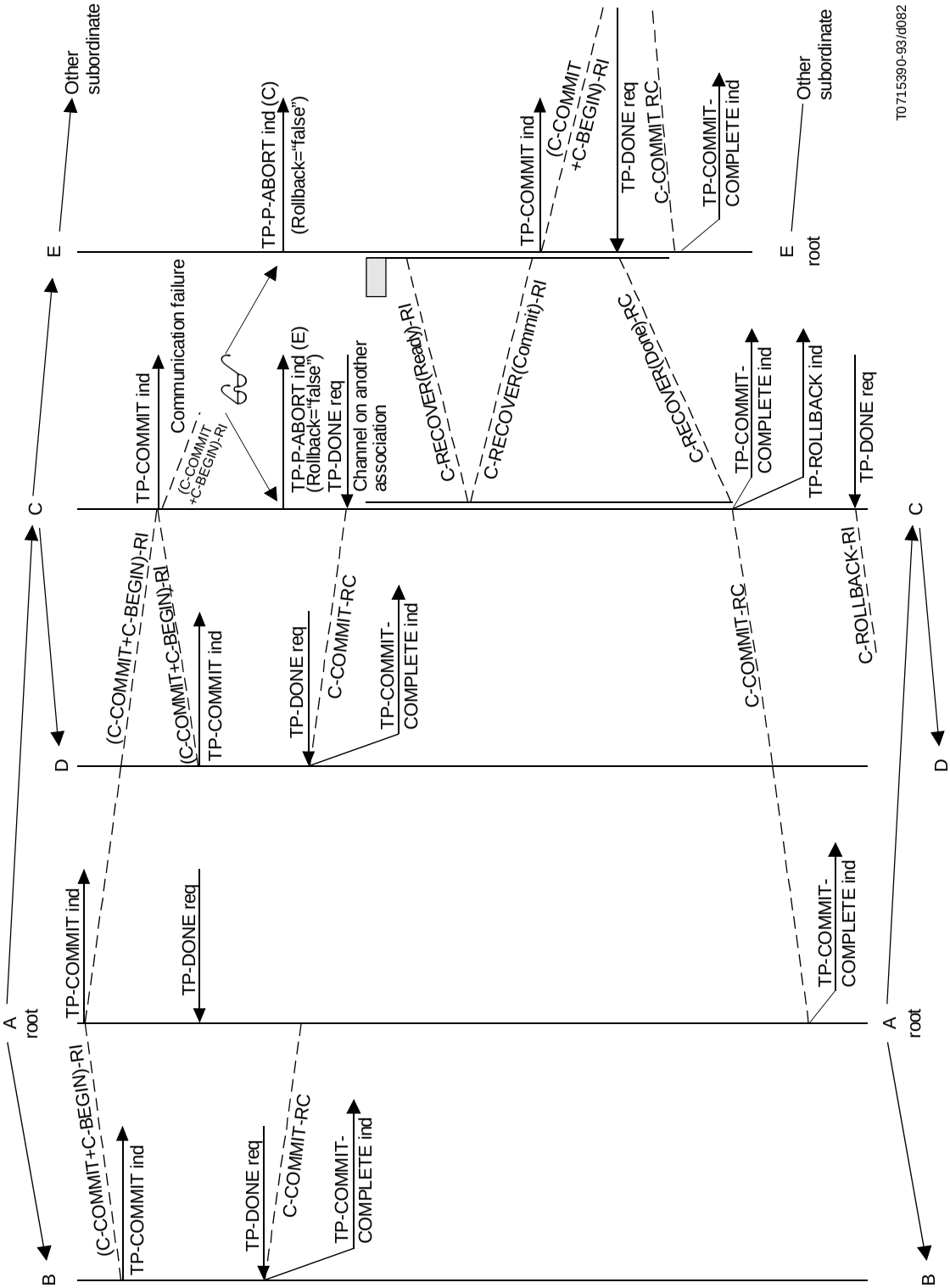


FIGURE C.78/X.862

Failure during phase II – Two isolated transaction trees (Chained Transactions)

C.7.8 Dialogue abort during the second phase of commitment, subordinate of the failed dialogue aborts its other dialogues

In the scenario of Figure C.79, the failure between A and C occurs after A has received TP-COMMIT indication, but before C has received TP-COMMIT indication. Therefore, the TP-P-ABORT indication issued to A and C is delivered with the Rollback parameter set to "false" (A knows that the terminating provider-supported transaction is committed, C is in doubt).

After having received TP-P-ABORT indication, C decides to abort the dialogue it has with its two subordinates (D and E) by issuing TP-U-ABORT request on this dialogue.

Since the dialogue between A and C was in chained mode, the next transaction has to be rolled back from node A.

At the end of the scenario, C, D and E are isolated, A and B form a transaction tree with A as the root.

C.7.9 Dialogue abort with the superior after TP-COMMIT indication has been issued

In the scenario of Figure C.80, a failure occurs between A and its subordinate, C, after C has received TP-COMMIT indication, in this case the next provider-supported transaction has to be rolled back in the subtree which is isolated from the root of the transaction tree (C, D and E).

D and E, which has already received TP-COMMIT-COMPLETE indication and may have begun to perform some actions in the context of the next provider-supported transaction, receive TP-ROLLBACK indication and enter the rollback procedure. A enters the rollback procedure as well.

At the end of the scenario, C is the root of a transaction tree consisting of C, D and E. Another transaction tree consisting of A and B also exists.

C.7.10 Dialogue abort with the superior after TP-COMMIT indication has been issued, node subordinate to the failed dialogue aborts its other dialogues

The beginning of the scenario of Figure C.81 is similar to the beginning of the previous one. But after being aware of the failure with its superior, C decides to abort the dialogue it has with its two subordinates (D and E) by issuing TP-U-ABORT request on these dialogues.

The next transaction is rolled back in both transaction trees.

At the end of the scenario, C, D and E are isolated, A and B form a transaction tree with A as the root.

C.7.11 Dialogue abort with the superior after TP-COMMIT indication has been issued, node superior to the failed dialogue aborts its other dialogues

In the scenario of Figure C.82, a failure occurs between C an its subordinate, E, after C has received TP-COMMIT indication. E has not received TP-COMMIT indication and will receive it after recovery.

D and E, which have already received TP-COMMIT-COMPLETE indication and can have begun to perform some actions in the context of the next provider-supported transaction, receive TP-ROLLBACK indication and enter the rollback procedure. A also enters the rollback procedure.

C decides to abort the dialogues it has with its superior (A) and its subordinate (D) by issuing TP-U-ABORT request on these dialogues.

At the end of the scenario, C and D are isolated, A and B form a transaction tree with A as the root, and the E, since it has not performed any action related to this failure, is the root of a new transaction tree.

C.7.12 Dialogue abort with the superior after TP-COMMIT-COMPLETE indication has been issued, node superior to the failed dialogue aborts its other dialogues

In the scenario of Figure C.83, a failure occurs between B ans its subordinate, C, after C has received TP-COMMIT-COMPLETE indication.

C receives the TP-P-ABORT indication with the Rollback parameter set to "true" while being in the next transaction.

B receives, the TP-P-ABORT indication with the Rollback parameter set to "false" before receiving TP-COMMIT-COMPLETE indication, but the next transaction is rolled back.

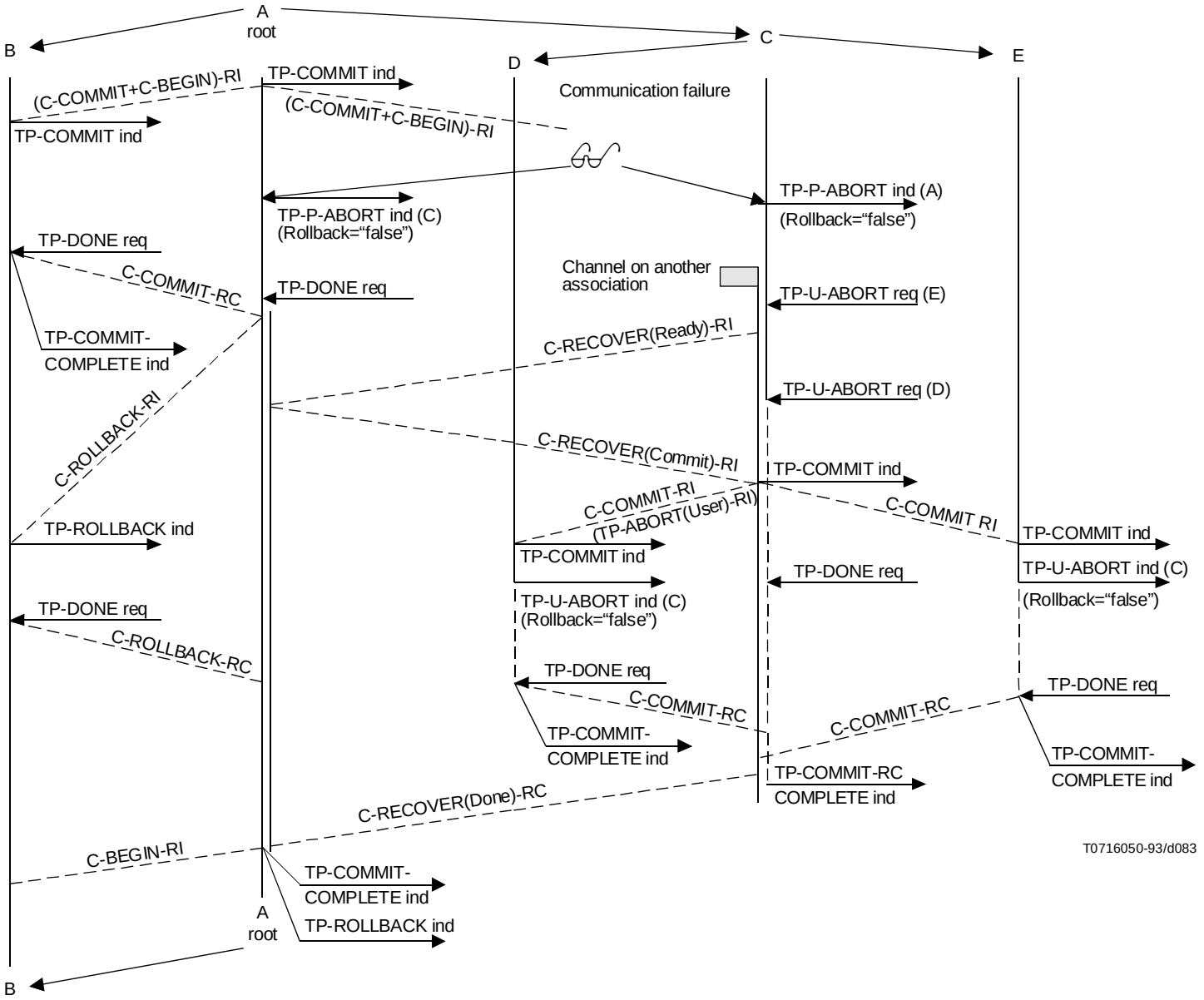


FIGURE C.79/X.862

Failure during phase II – Subordinate refuses to become root (Chained Transactions)

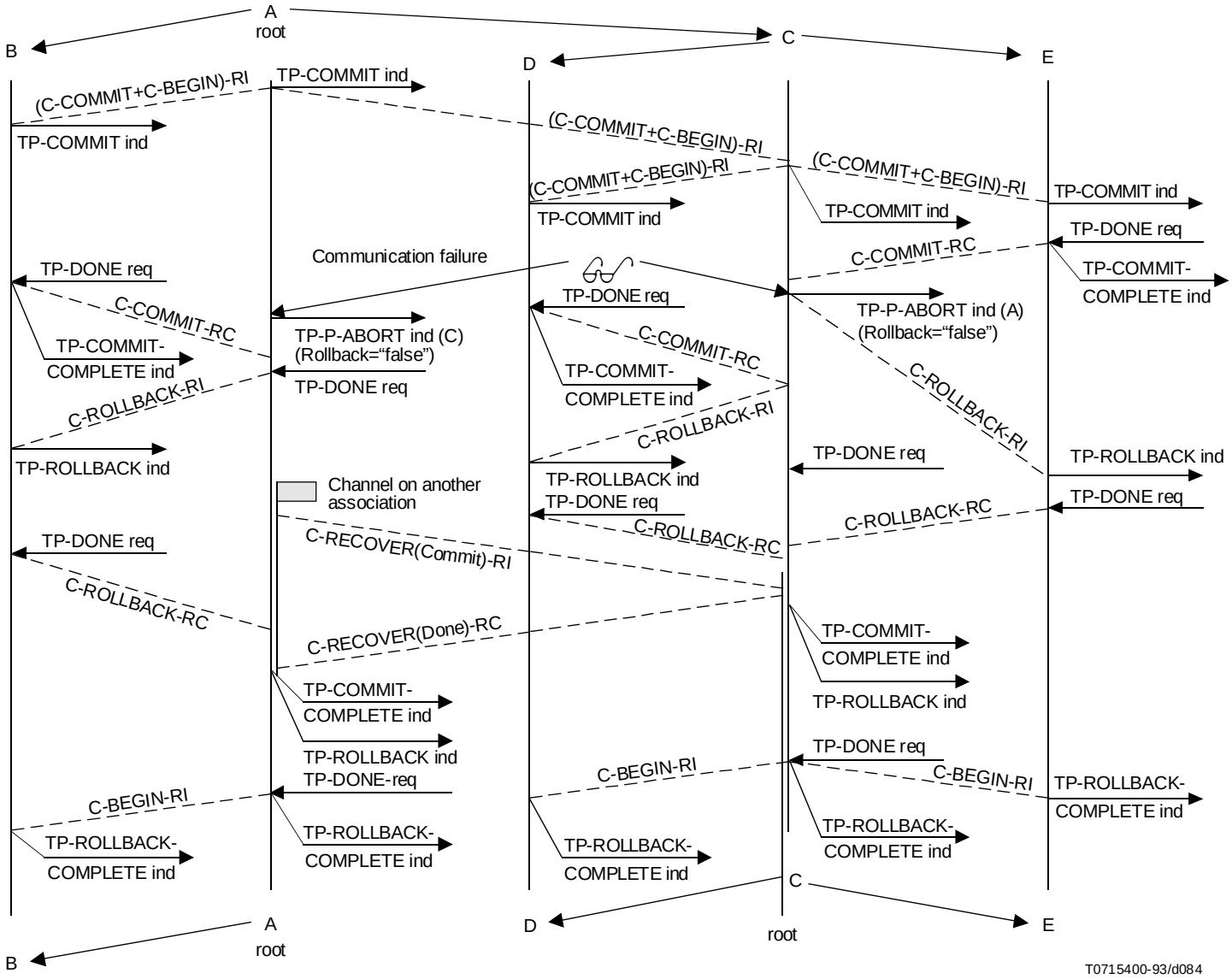


FIGURE C.80/X.862

Failure during phase II – Isolated node becomes root (Chained Transactions)

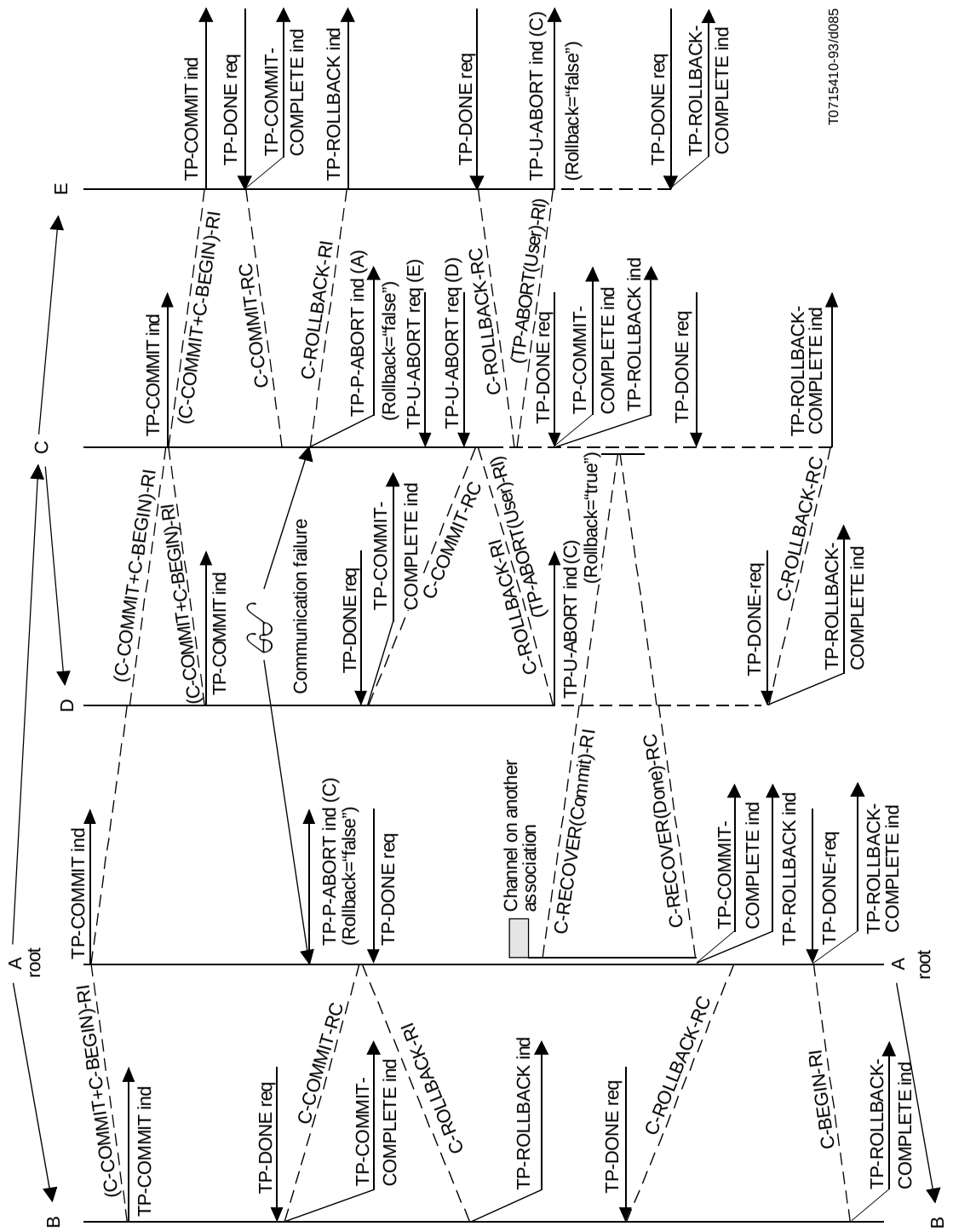


FIGURE C.81/X.862

Failure during phase II – Intermediate aborts all dialogues (Chained Transactions)

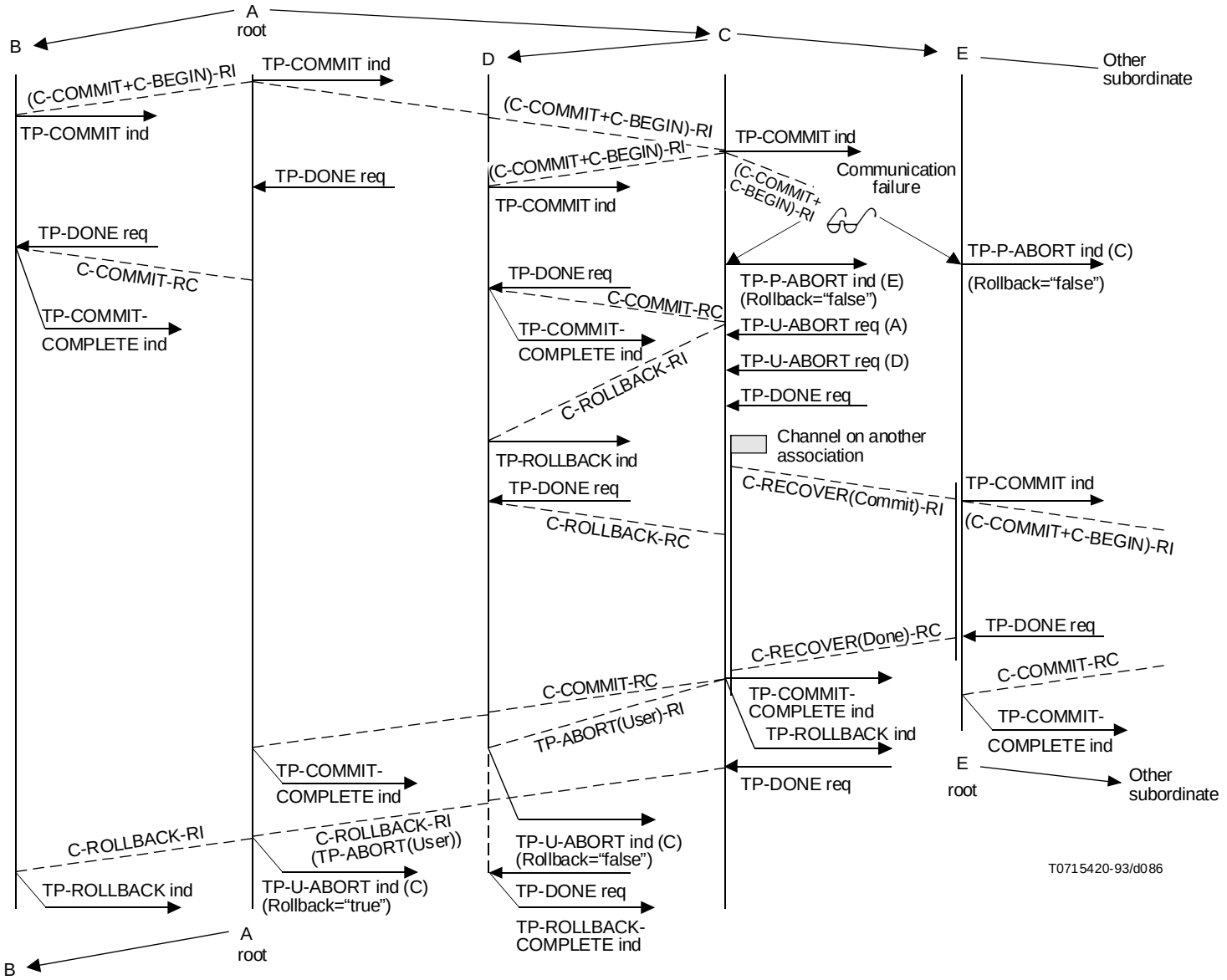


FIGURE C.82/X.862

Failure during phase II – Failure after subordinate has issued TP-COMMIT-COMPLETE indication

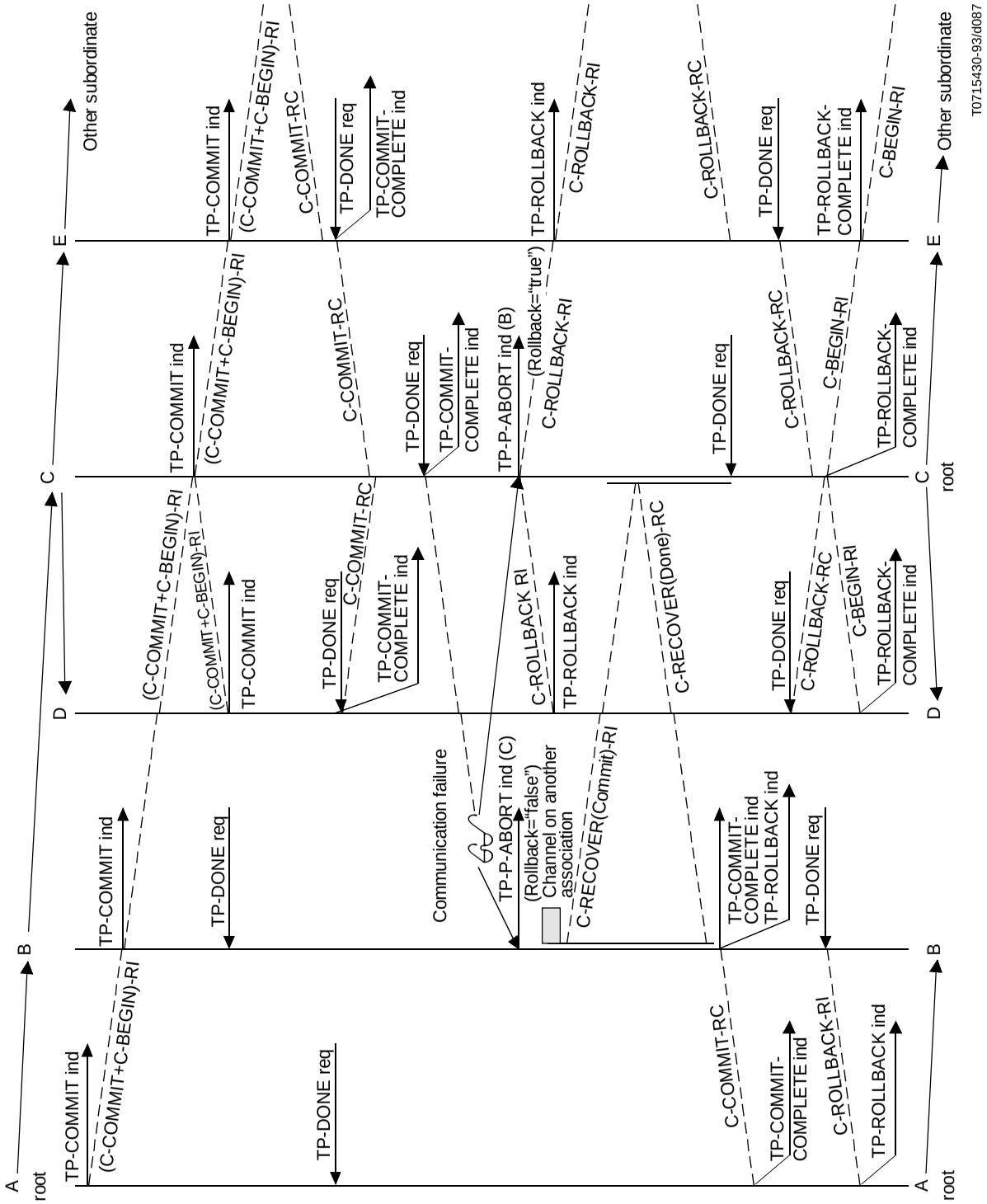


FIGURE C.83/X.862

Failure during phase II – Failure after subordinate has issued TP-COMMIT-COMPLETE indication

C.8 Heuristic decisions and reporting

In all cases other than scenario of Figure C.90, a subordinate has issued TP-COMMIT request and then has not received either TP-COMMIT indication or TP-ROLLBACK indication. Its patience exhausted, the subordinate takes a heuristic decision. The following scenarios are provided:

C.8.1 Heuristic decisions when the outcome of the transaction is commit

C.8.1.1 Subordinate rolls back, mix detected

The scenario of Figure C.84 shows a case where the subordinate decides to heuristically roll back; since the outcome is commit, a recovery occurs and a heuristic-mix report is given to the superior.

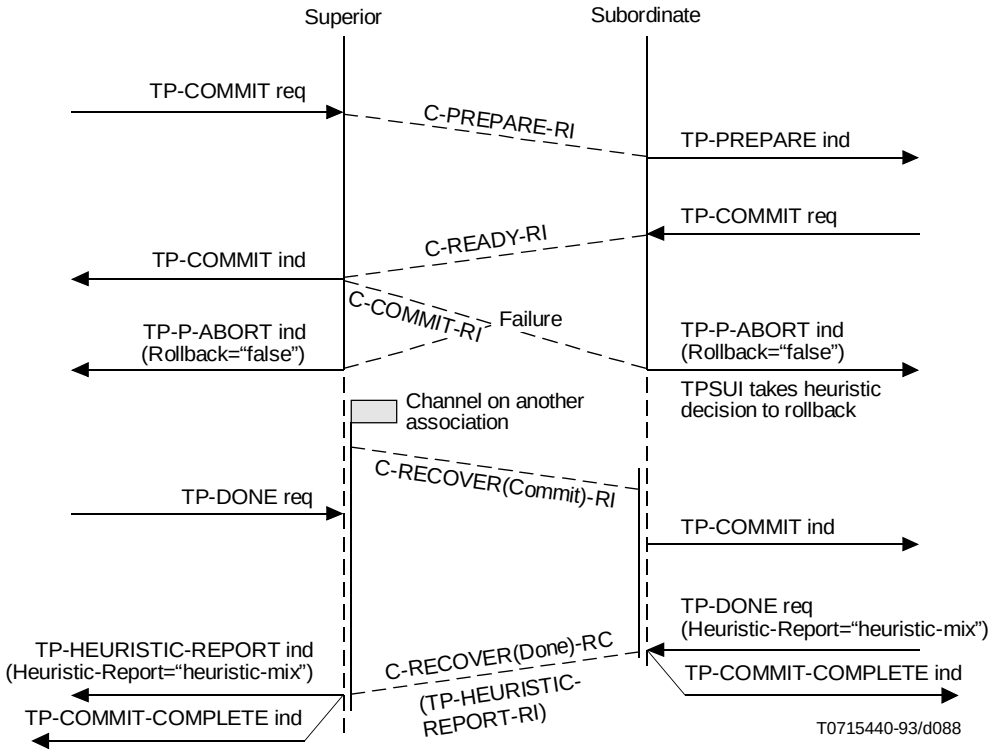


FIGURE C.84/X.862

Dialogue aborted during commitment, subordinate takes (wrong) decision to rollback

C.8.1.2 Subordinate commits, no damage

The scenario of Figure C.85 shows a case where the subordinate decides to heuristically commit; since the outcome is commit, a recovery occurs and no damage exists.

C.8.1.3 Subordinate rolls back but is able to compensate, no damage

The scenario of Figure C.86 shows a case where the subordinate decides to heuristically rollback; since the outcome is commit, a recovery occurs, but, since the subordinate is able to compensate, no damage is reported.

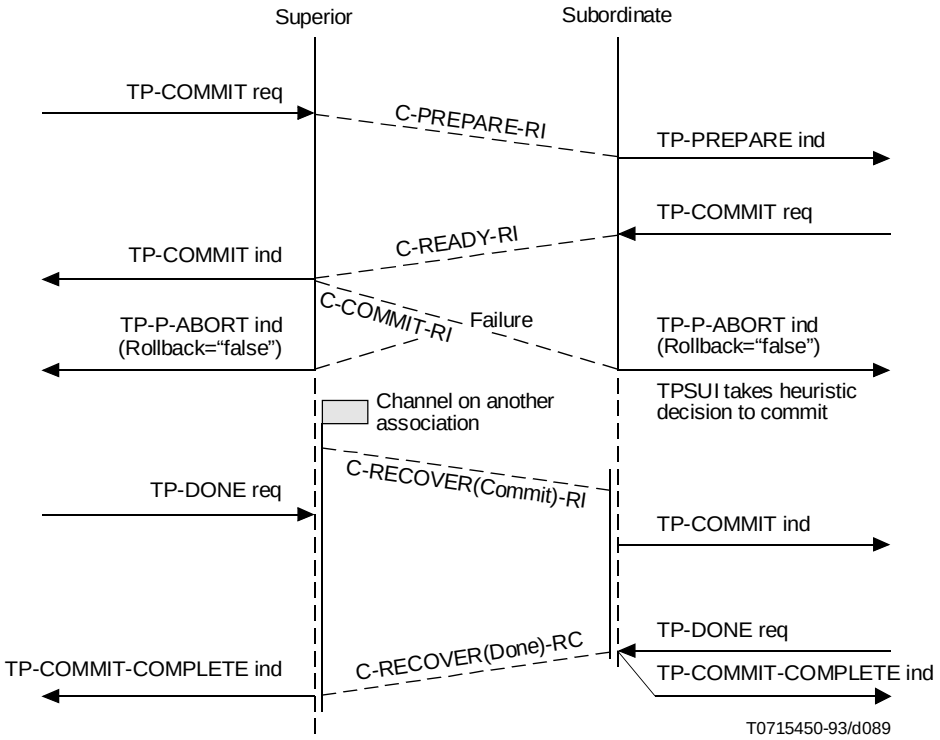


FIGURE C.85/X.862

Dialogue aborted during commitment; subordinate takes (correct) decision to commit

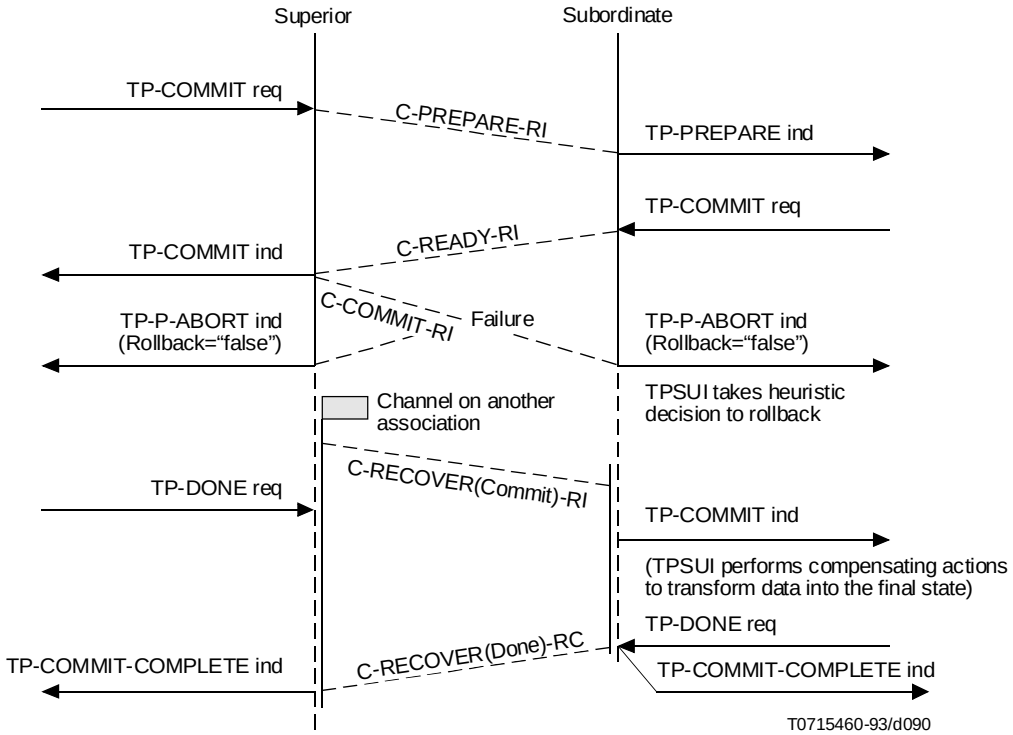


FIGURE C.86/X.862

Dialogue aborted during commitment; subordinate takes (wrong) decision to rollback but is able to compensate

C.8.1.4 Subordinate TPSUI commits, TPSP rolls back, mix detected

The scenario of Figure C.87 shows a case where the subordinate TPSUI decides to heuristically commit whereas the TPSP decides to roll back; since the outcome is commit, a recovery occurs and a heuristic-mix report is given to the superior.

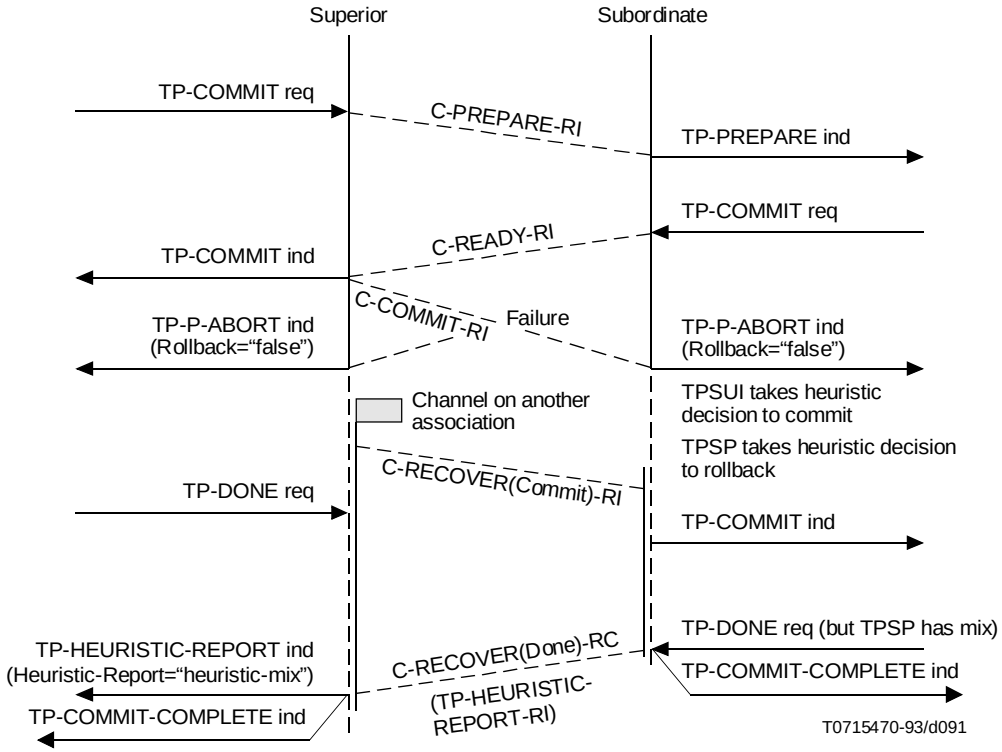


FIGURE C.87/X.862

Dialogue aborted during commitment; subordinate takes contradicting heuristic decisions producing an internal mix

C.8.2 Heuristic decisions when the outcome of the transaction is rollback

C.8.2.1 Subordinate commits, heuristic-hazard reported

The scenario of Figure C.88 shows a case where the subordinate decides to heuristically commit; since the dialogue has failed with the superior before TP-COMMIT indication is issued, the superior rolls back and no recovery occurs, a heuristic-hazard report is given to the superior.

C.8.2.2 Subordinate rolls back, no damage, heuristic-hazard reported

The scenario of Figure C.89 shows a case where the subordinate decides to heuristically rollback; since the dialogue has failed with the superior before TP-COMMIT indication is issued, the superior rolls back and no recovery occurs, there is no damage but a heuristic-hazard report is given to the superior.

C.8.2.3 Subordinate rolls back, no damage, heuristic-hazard reported

The scenario of Figure C.90 shows a case where the subordinate receives a TP-P-ABORT indication with Rollback set to "true" in the active phase. No heuristic decision has been taken but, since the superior has issued TP-COMMIT request, a heuristic-hazard is reported.

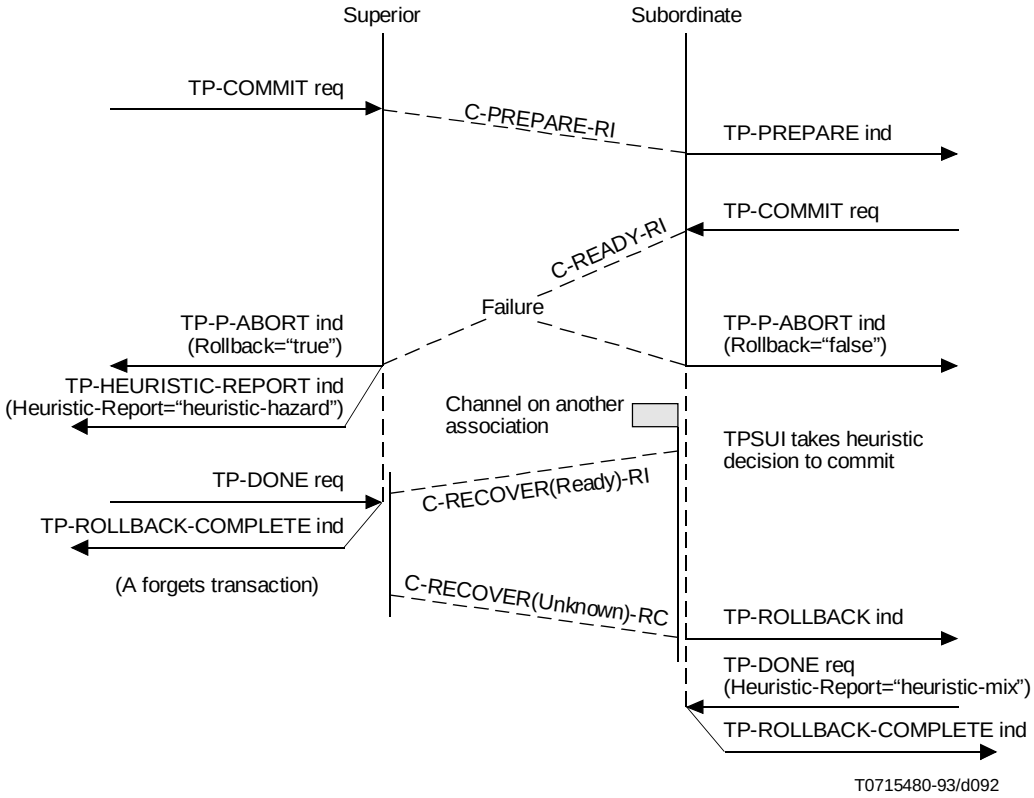


FIGURE C.88/X.862

Dialogue aborted during commitment; subordinate takes (wrong) heuristic decision to rollback

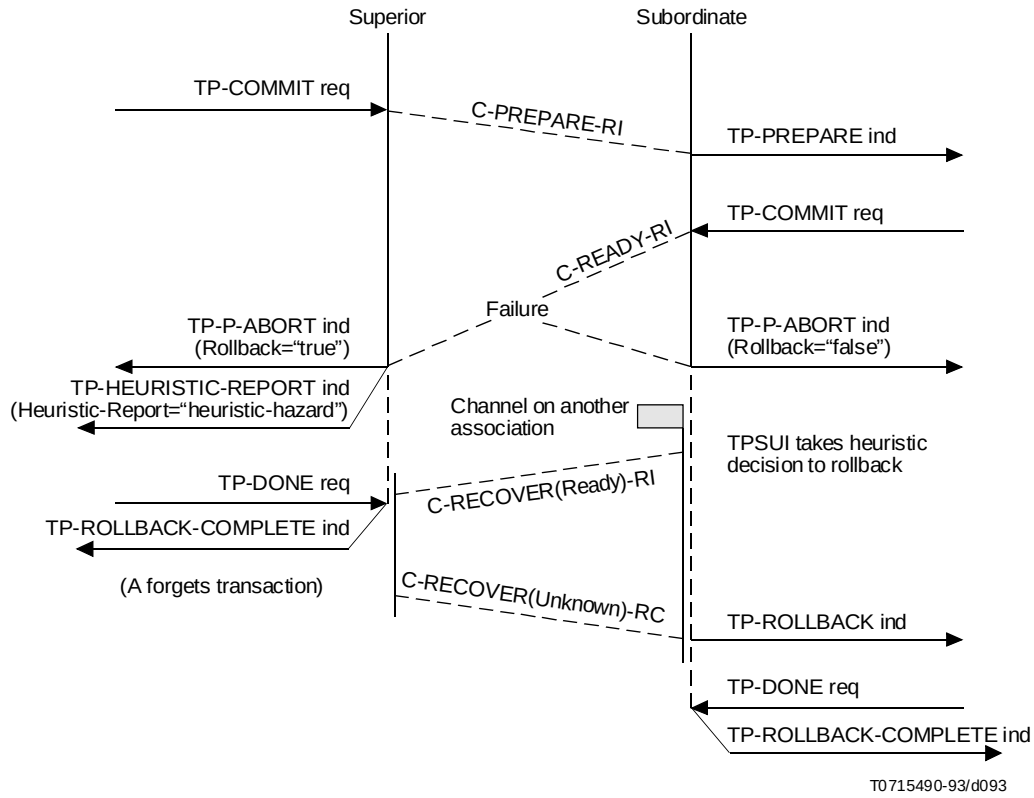


FIGURE C.89/X.862

Dialogue aborted during commitment; subordinate takes (correct) decision to rollback but a heuristic-damage is reported

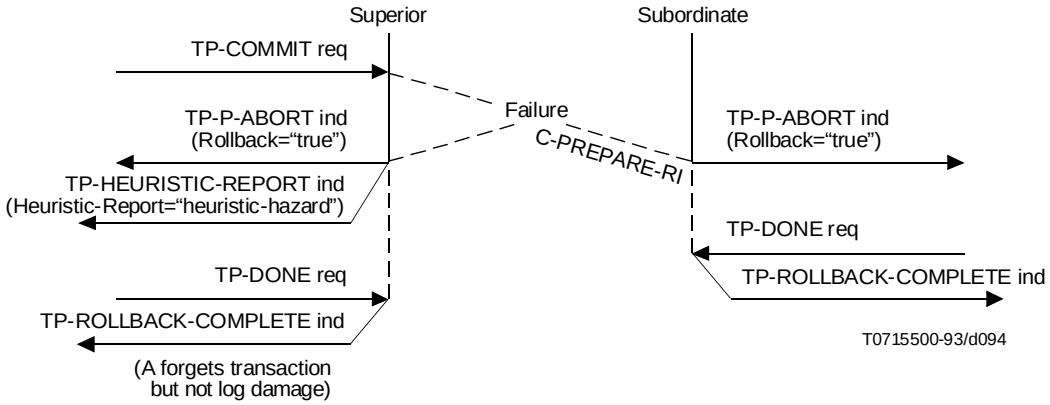


FIGURE C.90/X.862

Dialogue aborted before subordinate is aware of transaction termination; no heuristic decision taken but a heuristic-damage is reported

C.8.3 Heuristic decisions in trees with multiple dialogues

The following scenarios show three examples of propagation of heuristic report within a tree having three nodes.

The scenario of Figure C.91 shows a case where the leaf TPSUI decides to heuristically rollback while the outcome of the transaction is commit. The heuristic-mix report is given to the TPSUIs at B node and at A node.

The scenario of Figure C.92 shows a similar case except that the A node is able to compensate and does not issue any heuristic report to its TPSUI.

The scenario of Figure C.93 shows a case where the leaf TPSUI decides to heuristically commit while the outcome of the transaction is rollback. The heuristic-mix report is given to the TPSUIs at B node and A node.

C.9 Scenarios for SACF

The scenario of Figure C.94 shows a case where a contention-loser uses BID to establish a dialogue with provider-supported transaction.

The scenario of Figure C.95 shows a case where a contention-loser does not use BID to establish a dialogue with provider-supported transaction. Figure C.95 is a complicated case where stray APDUs occur.

C.10 Scenarios for CPM

C.10.1 Scenarios for channel establishment

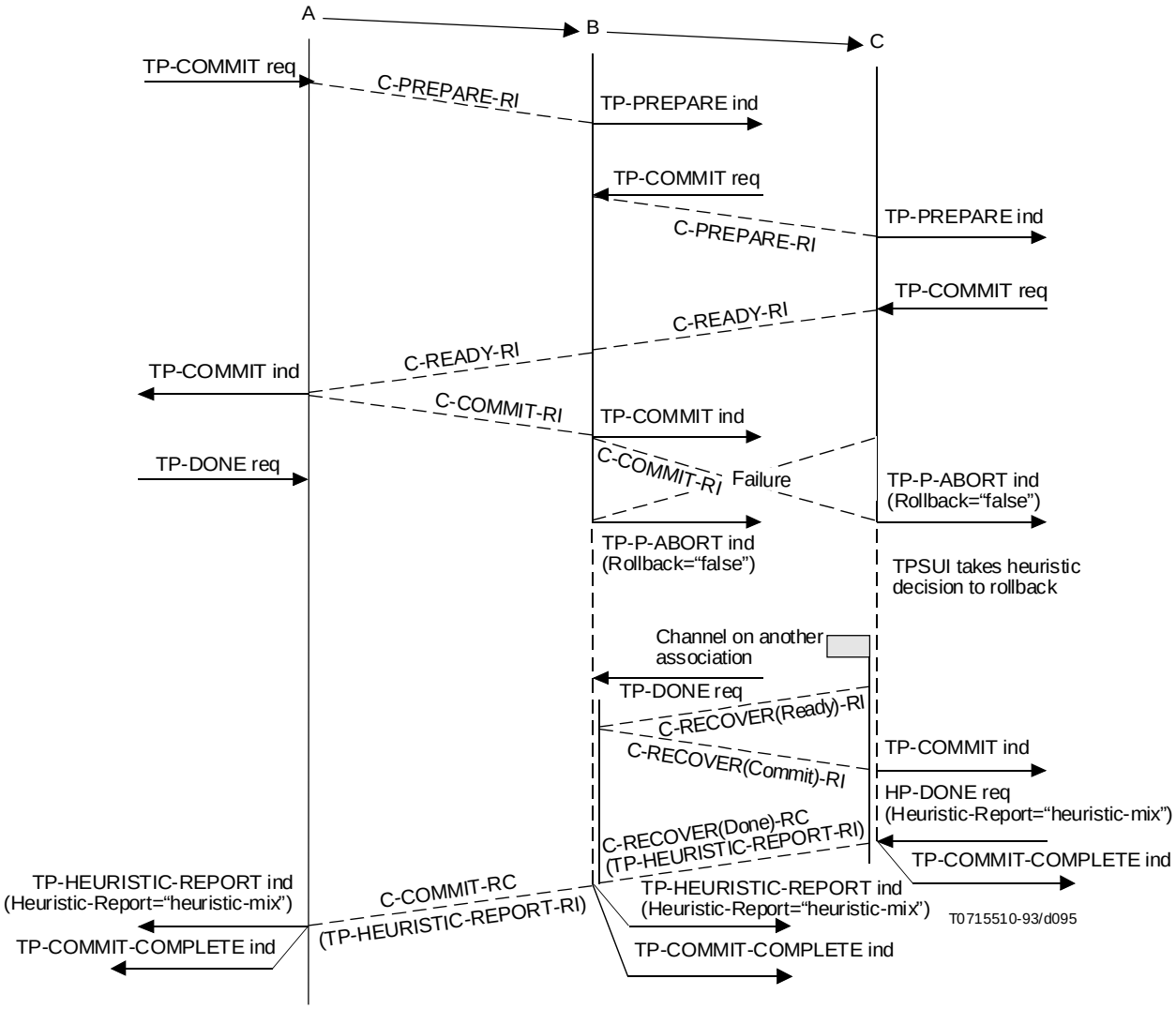
The scenario of Figure C.96 shows a simple sequence for channel establishment from a contention-winner.

The scenario of Figure C.97 shows a simple sequence for channel establishment from a contention-loser.

The scenario of Figure C.98 shows a complex sequence for channel establishment from a contention-loser. In this figure, due to stray APDUs, the token is delayed.

C.10.2 Scenarios for two way recovery

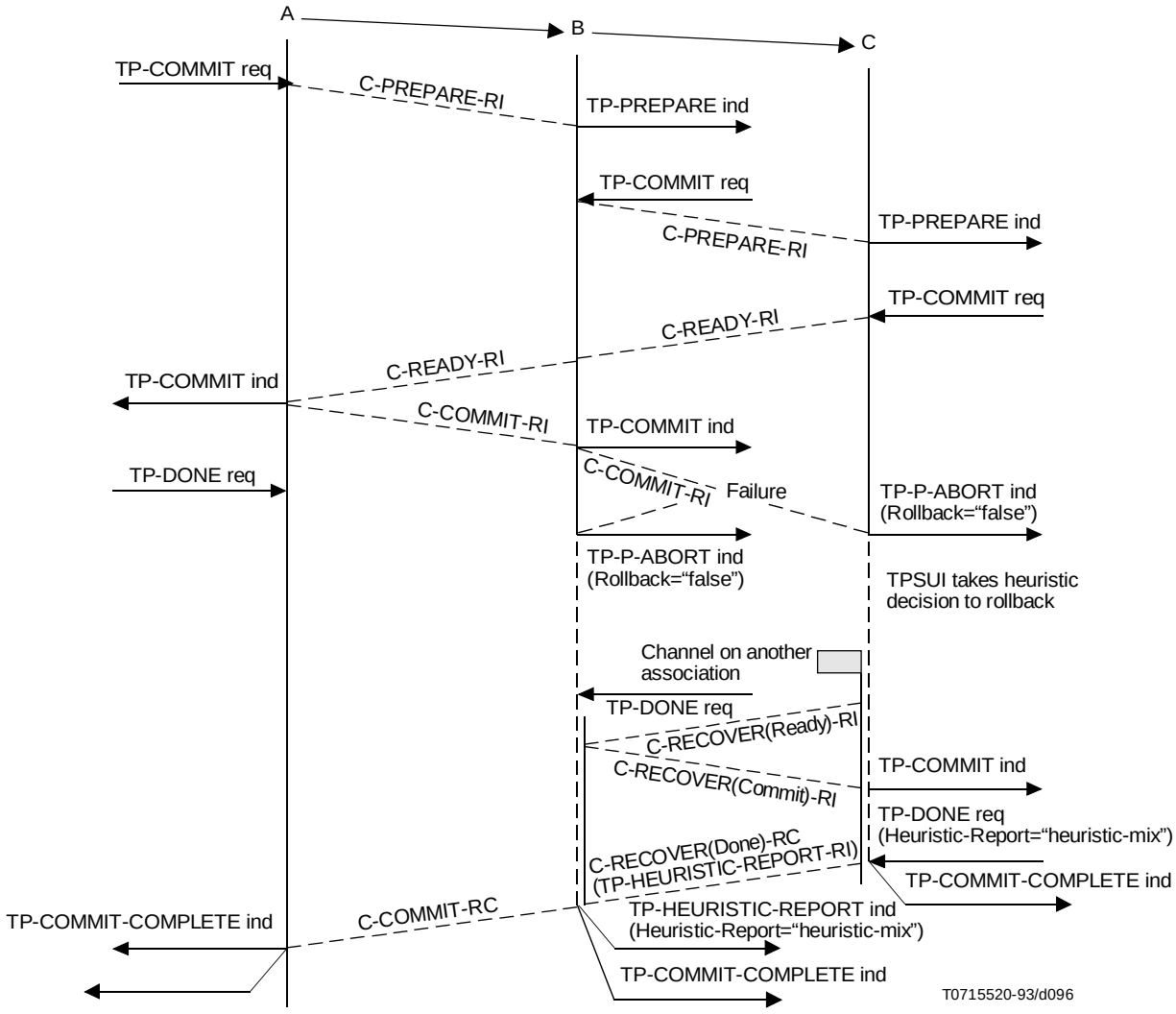
The scenario of Figure C.99 shows some sequences for two way recovery.



NOTE – As drawn, this scenario applies to unchained transactions.

FIGURE C.91/X.862

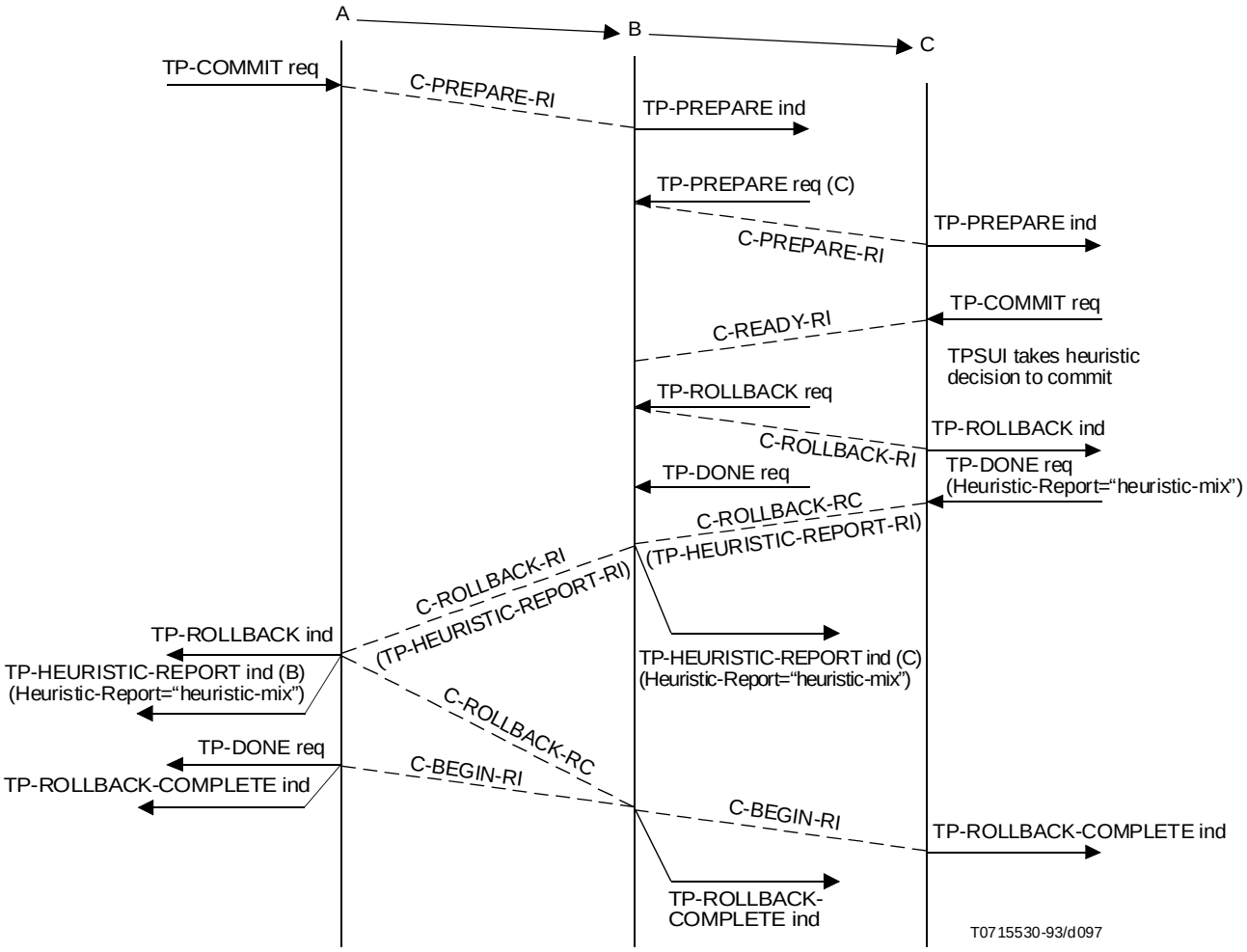
Heuristic decisions and reporting in a multi-dialogue tree – All nodes above failure receive heuristic report



NOTE – As drawn, this scenario applies to unchained transactions.

FIGURE C.92/X.862

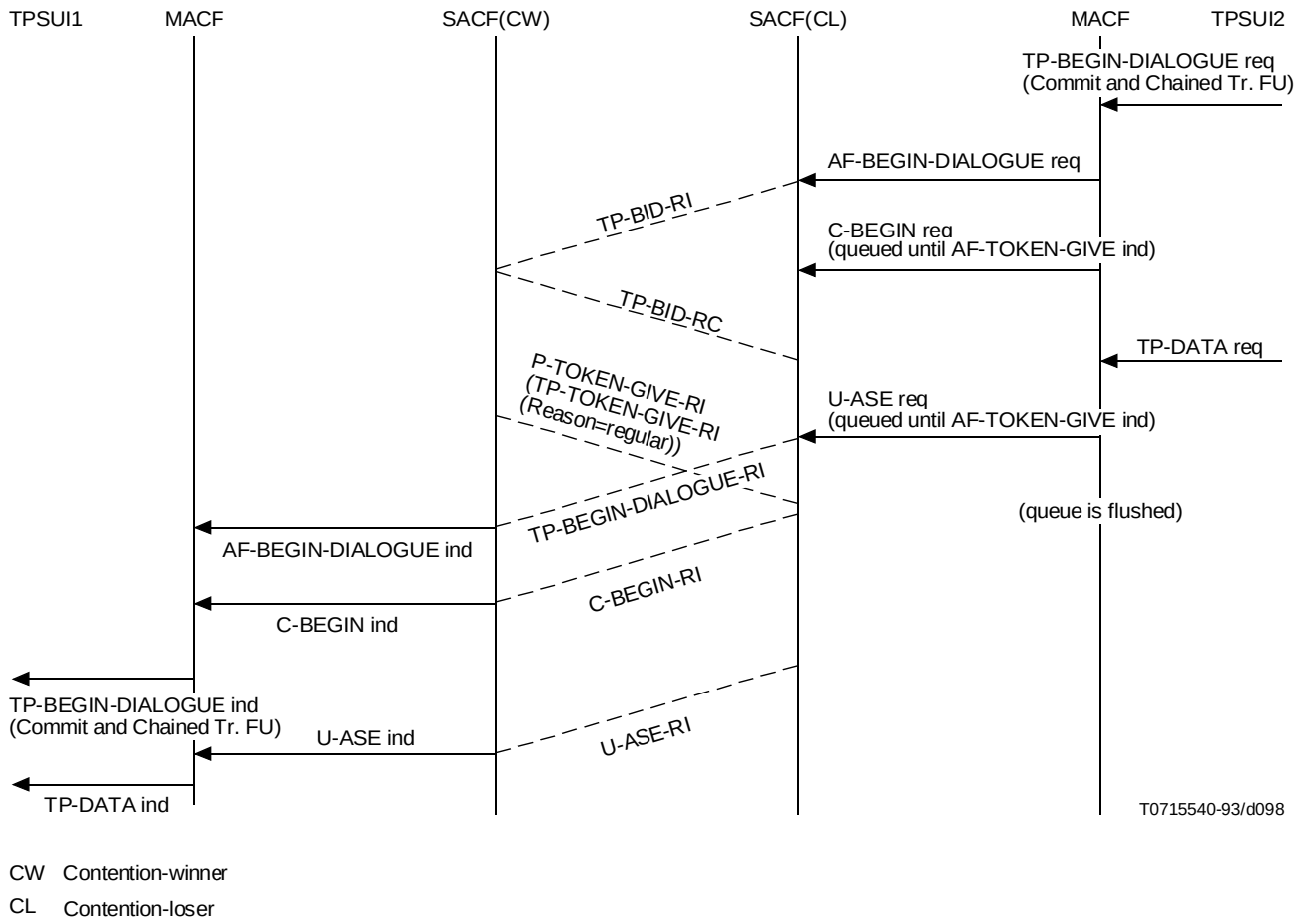
Heuristic decisions and reporting in a multi-dialogue tree – Node B compensates before reporting



NOTE – As drawn, this scenario applies to chained transactions.

FIGURE C.93/X.862

Heuristic decisions and reporting in a multi-dialogue tree – Heuristic report during rollback procedure



CW Contention-winner

CL Contention-loser

FIGURE C.94/X.862

BID used in the commit

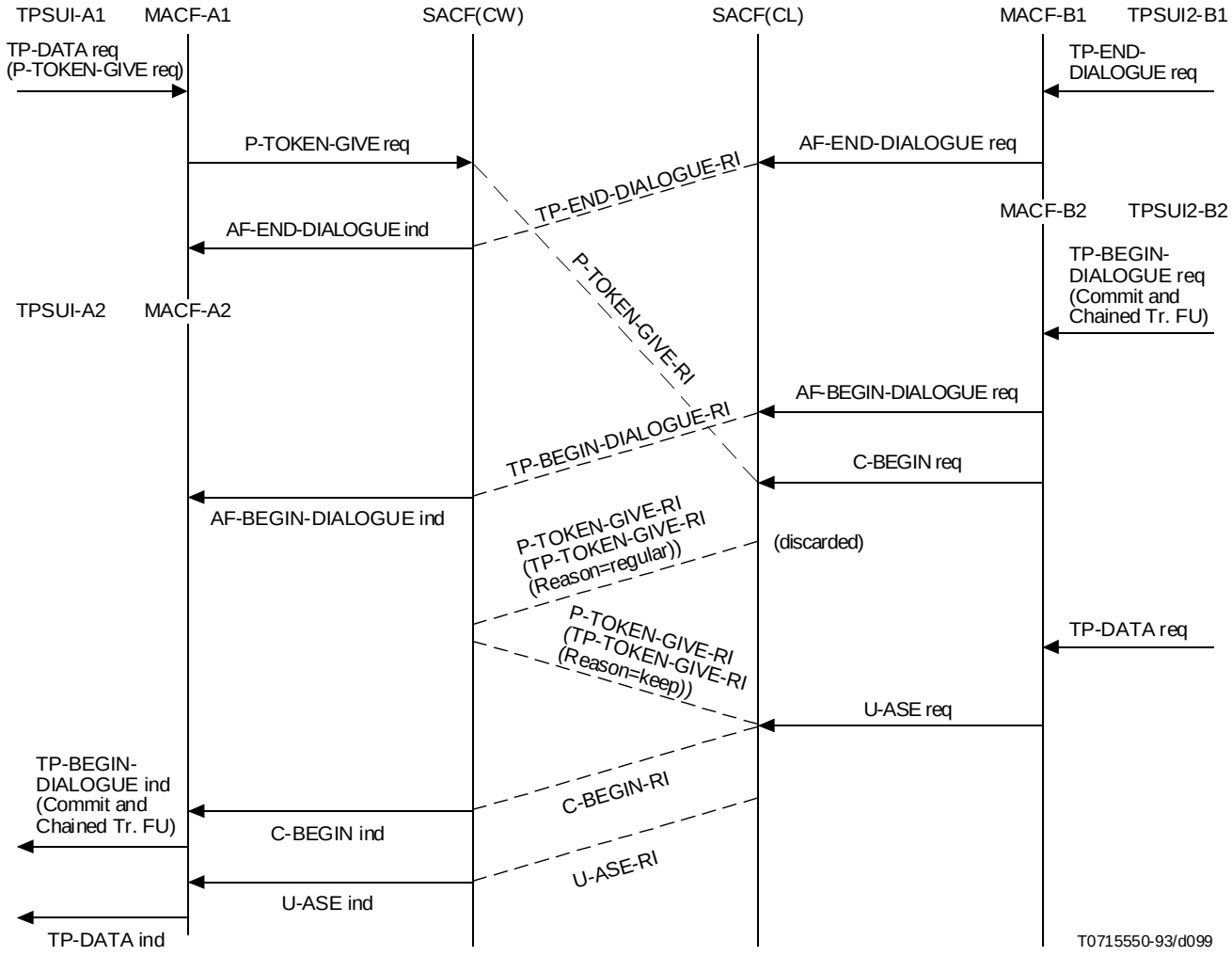


FIGURE C.95/X.862

BID not used in the commit

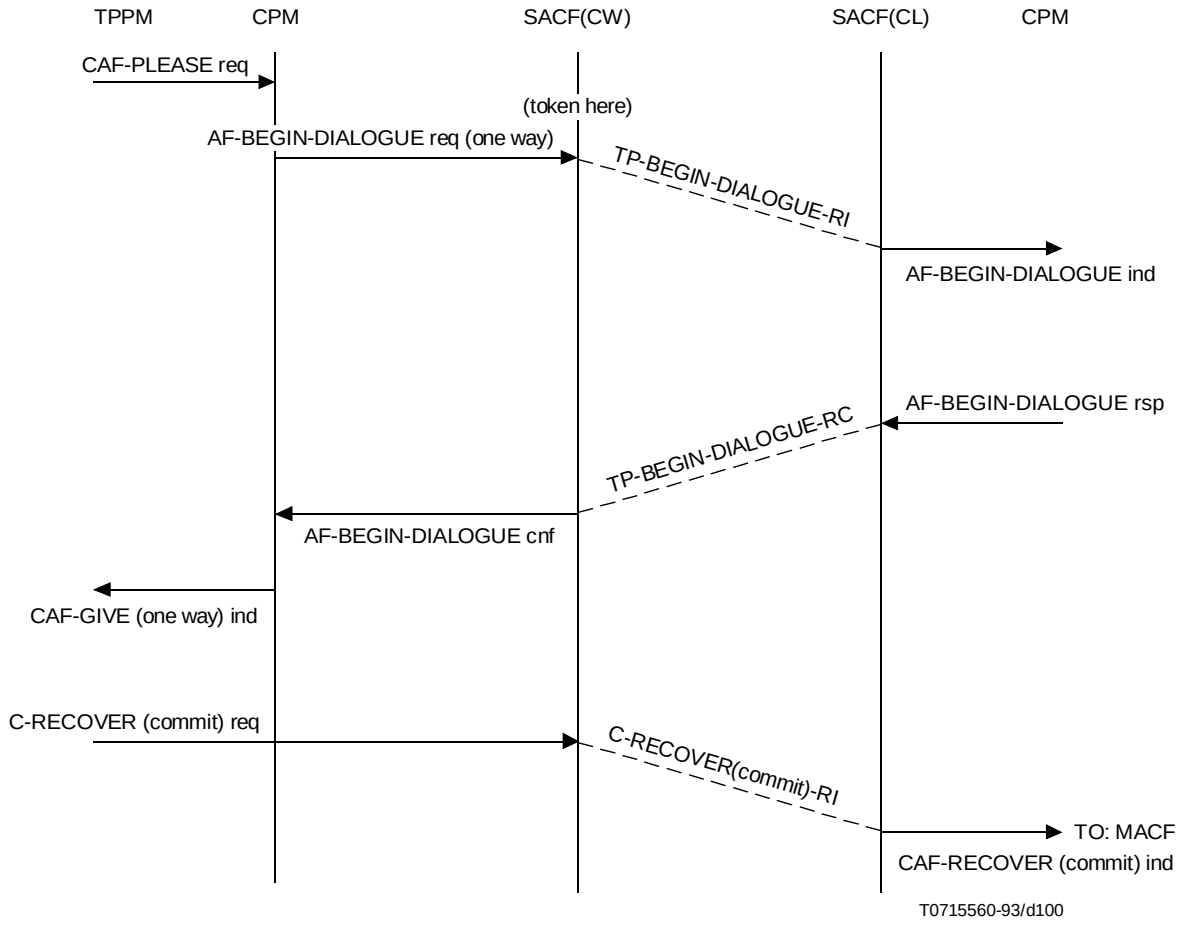


FIGURE C.96/X.862

Channel establishment requested by contention-winner (simple case)

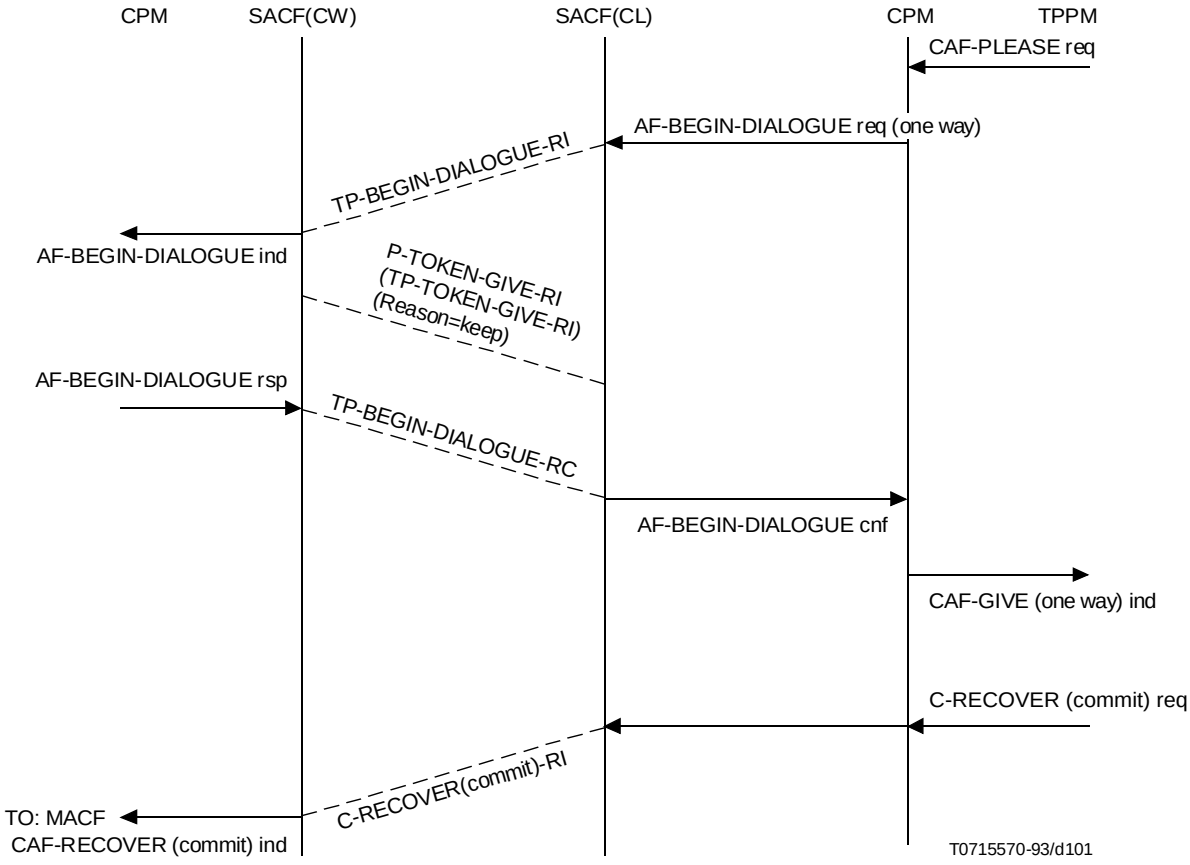


FIGURE C.97/X.862

Channel establishment requested by contention-loser (simple case)

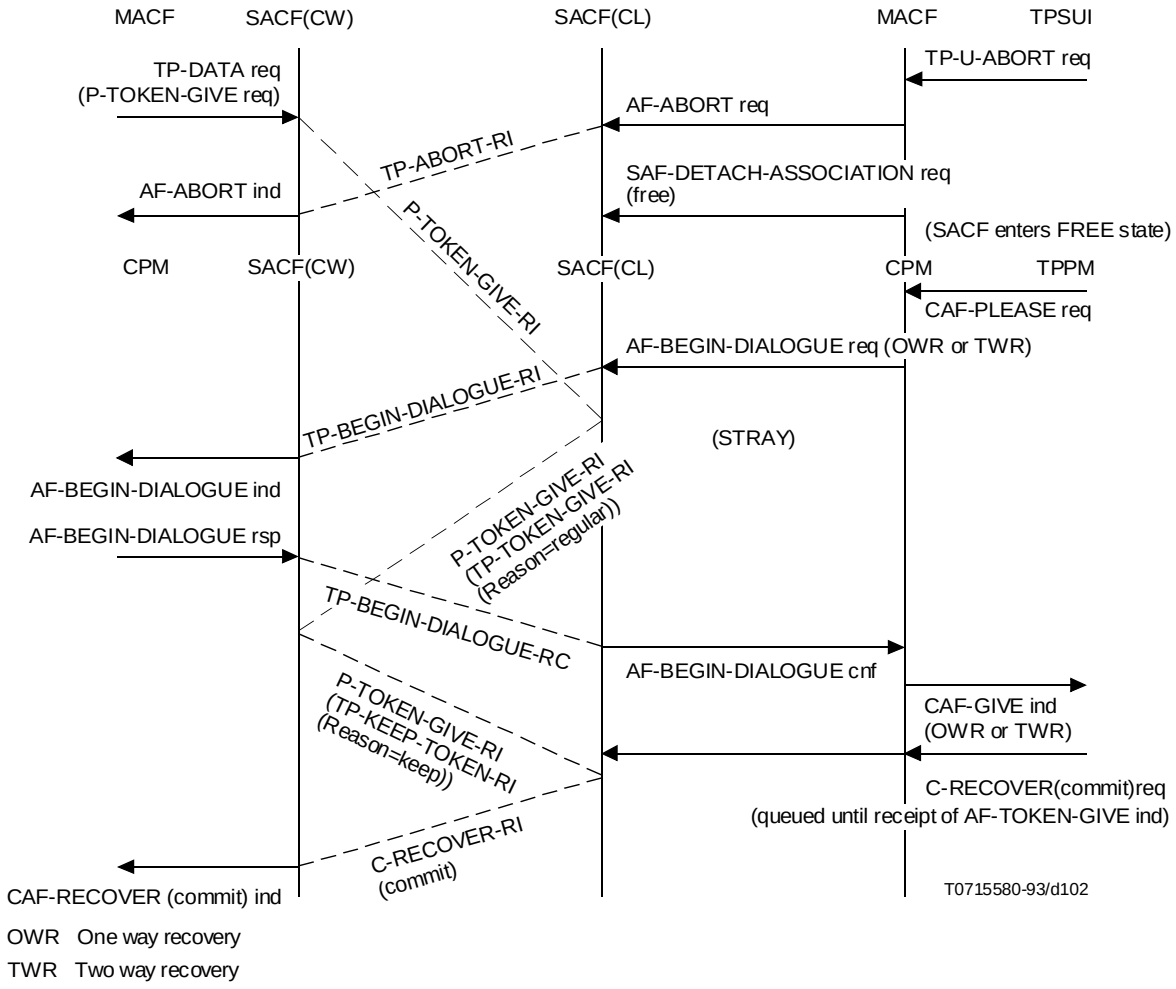


FIGURE C.98/X.862

Channel establishment requested by contention-loser (complex case)

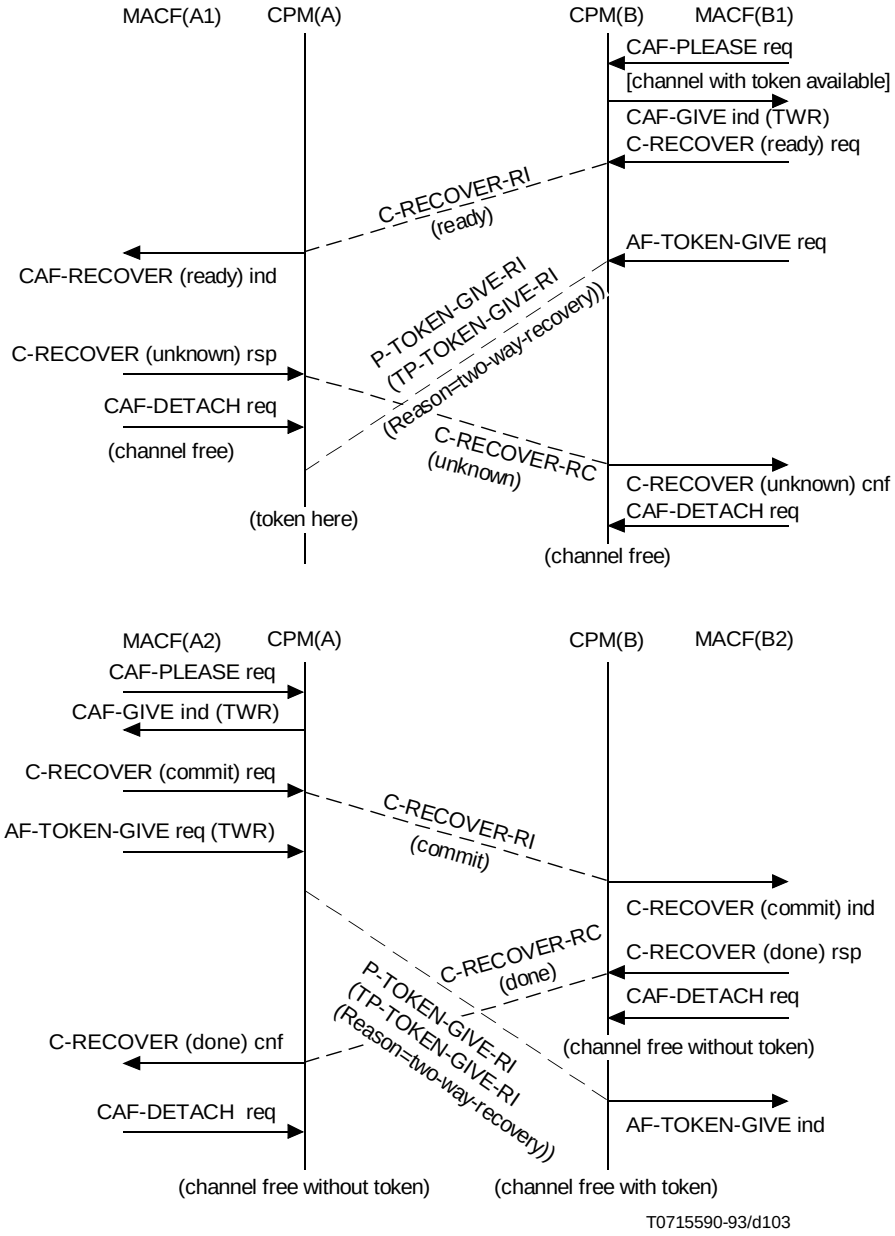


FIGURE C.99/X.862

Two way recovery

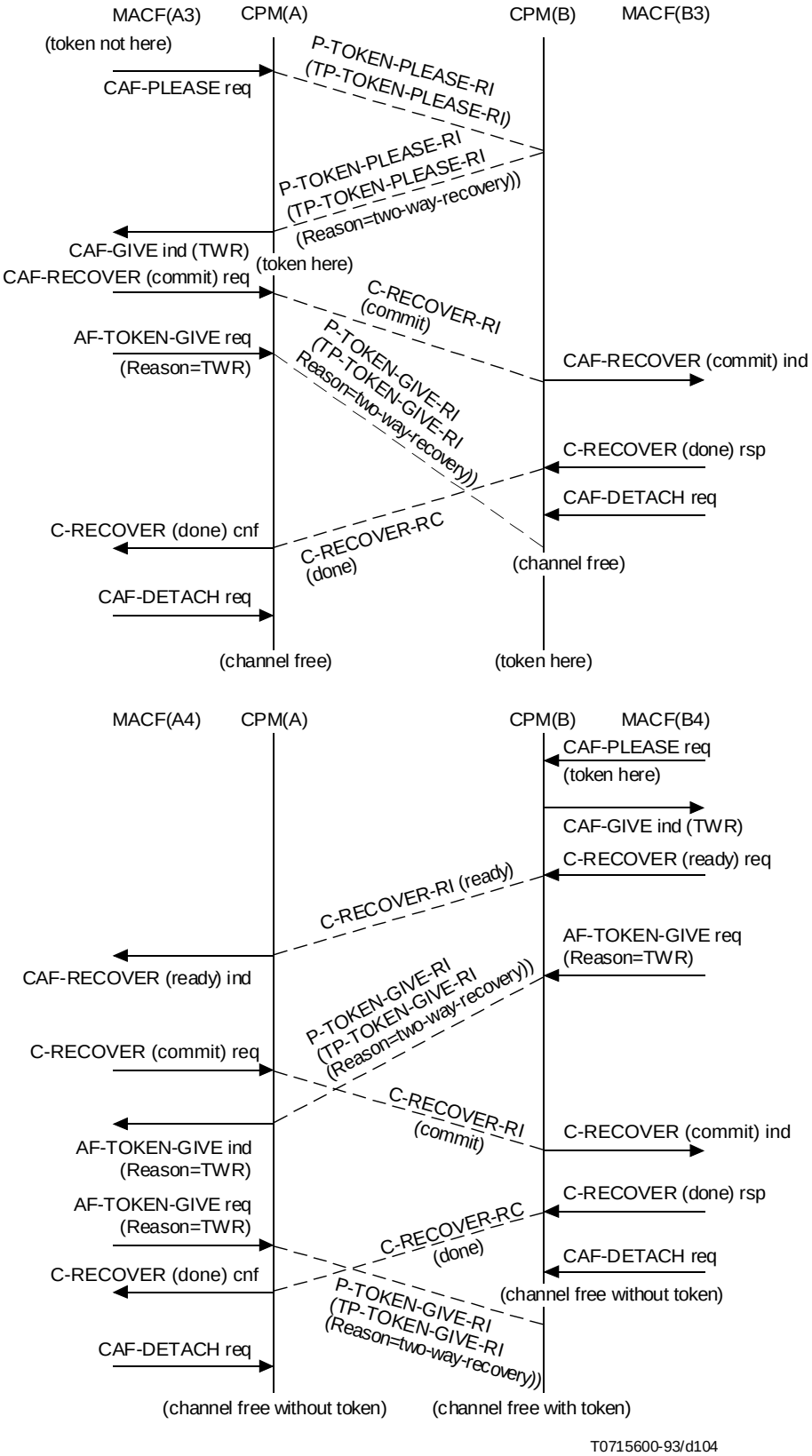


FIGURE C.99/X.862 (*end*)

Two way recovery

C.10.3 Scenarios for recovery collision on separate one way channels

The scenario of Figure C.100 shows a case when recovery collision occurs because both a superior and a subordiante initiate recovery. This case can occur when, for example, C-READY-RI or C-COMMIT-RI cannot reach the partner MACF due to the communication failure. When recovery collision occurs, the superior always issues C-RECOVER (retry-later) response as a response to CAF-RECOVER(ready)indd and the subordinate always issues C-RECOVER(done)response as a response to CAF-RECOVER(commit)ind.

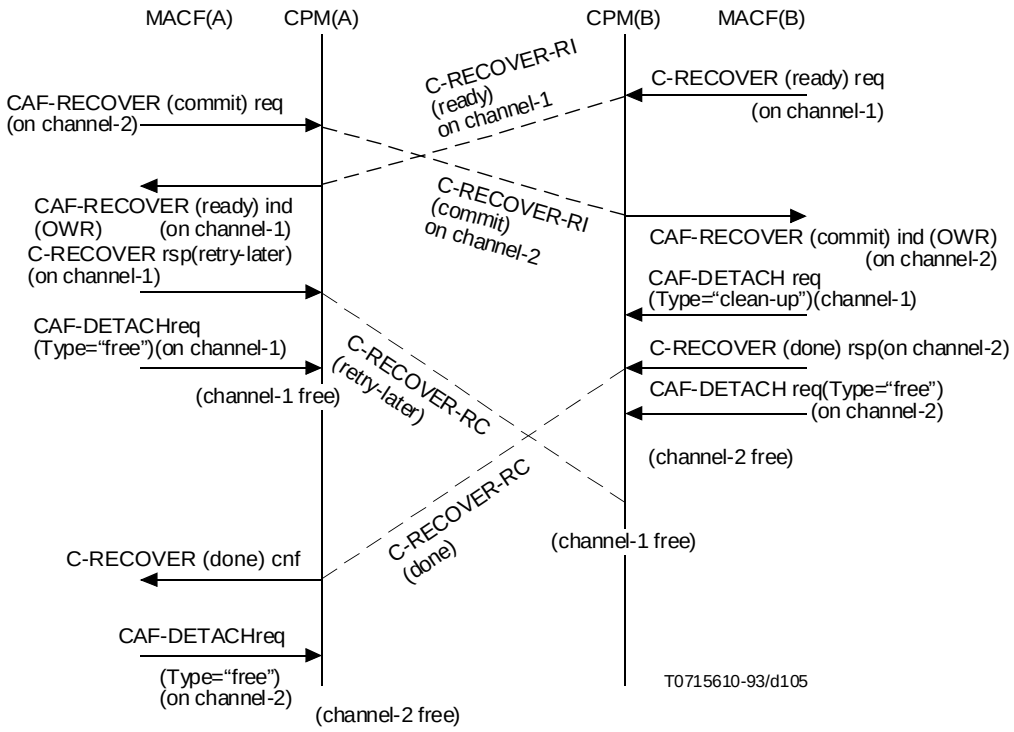


FIGURE C.100/X.862

Recovery collision due to request by both a superior and a subordinate

Annex D

Summary of assigned object identifier values

(This annex does not form an integral part of this Recommendation)

This annex summarizes the OBJECT IDENTIFIER values assigned in this Recommendation and ISO/IEC 10026-3.

tpASE1 APPLICATION-SERVICE-ELEMENT ::=

{ joint-iso-ccitt transaction-processing(10) ase-id(0) tp-ase(1) version1(0) }

-- may be used to identify the transaction processing ASE defined in Recommendation X.862 and

-- ISO/IEC 10026-3.

{ joint-iso-ccitt transaction-processing(10) modules(1) apdus-abstract-syntax(1) version1(0) }

-- used to reference the ASN.1 module defined in 12.1/X.862 and

-- ISO/IEC 10026-3.

id-as-tpase OBJECT IDENTIFIER ::=

{ joint-iso-ccitt transaction-processing(10) abstract-syntax(2) tp-apdus(1) }

-- may be used to reference the abstract syntax of the

-- transaction processing ASE APDUs

Superseded by a more recent version

Annex E

Recovery from destruction of atomic action data

(This annex does not form an integral part of this Recommendation)

E.1 Introduction

The correct operation of OSI TP provider supported transactions is dependent on the availability of a reliable recovery log as described in Recommendation X.860. The loss of some or all of the recovery log would mean that a system cannot respond to requests to recover any or selected transactions; such failures could include total destruction of a real system with all its data, or partial failure such as loss of part or all of a recovery log.

If such a failure occurs during the later phases of a distributed transaction, then recovery of the transaction in the other nodes in the transaction tree would be unable to proceed; transactions will remain in the READY or DECIDED (COMMIT) state (depending on the role of the individual nodes) and recovery actions will either be rejected if a TP channel cannot be established or receive a "retry-later" response.

Intermediate or leaf nodes which are affected because a superior node has suffered such a failure, may take heuristic decisions but that does not change the requirement to complete recovery and enter the "transaction forgotten" state. Such a node will have a log-ready record (and a log-heuristic record if a heuristic decision was taken) but using the mechanisms of OSI TP will not be able to determine the final outcome of the transaction (and whether any heuristic decision was correct or not).

Loss of atomic action data could occur as a result of several failures:

- partial loss of recovery log (for example due to media errors);
- complete loss of recovery log (for example due to a disc crash);
- destruction of system (for example by fire or flood);
- human operator error.

Because of the dependence on the recovery log for the correct operation of distributed transaction processing, many real systems will maintain multiple copies of the recovery log to minimize the chances of loss of all copies and may take other precautions against destruction of a system for example by dispersing the multiple copies across several geographical locations.

This annex is concerned with the case that in spite of measures to protect the recovery log contents, some loss has occurred.

E.2 Recovery actions

The following viewpoints are considered:

- a system which has been destroyed;
- a system which has lost part of its recovery log;
- a system which cannot complete recovery because of lack of response from a further damaged system.

E.2.1 Actions after a system has been destroyed

This covers the case where a system cannot run at all or that it is sufficiently damaged that the TP Protocol machine cannot make any response to requests to establish a TP Channel for recovery. Such a system cannot take any useful action and is not considered further.

E.2.2 Actions of a node which has lost recovery records

Such a node must distinguish between recovery requests for transactions that it can be sure it has no record of and therefore must have completed as defined in the Recommendation, and recovery requests for transactions where the inaccessible recovery records might relate to the transaction in question. A node must not respond "unknown" or "done"

for a transaction for which the recovery log record has been or may have been lost as this would imply that the transaction was terminated normally by either commit or rollback.

For example, a node may be certain that any recovery record related to a transaction is not affected by the loss because of the use of a recovery-context-handle which points to a set of recovery records which are unaffected.

Typically an alert would be raised for system management attention when loss of recovery records is detected; a system might also record requests for recovery to which it can not safely respond to assist in the determination of the management actions that are required. Actions to determine the desired outcome of the transaction and to repair damage to applications and their bound data will be application dependent. Eventually the affected node must be repaired such that it can again function normally.

E.2.3 Actions of a node which cannot complete recovery

This concerns the case where a system cannot complete recovery of a transaction because of lack of response from a further damaged system which could either be a superior or subordinate node. It may be the case that a direct subordinate or superior is undamaged but that recovery is delayed because of a lack of response from a subordinate or superior node further down/up the transaction tree.

Such a node cannot directly determine whether recovery is delayed but will be possible eventually, or that recovery will never be possible. The node will observe either that a TP channel to the affected system cannot be established or that requests for recovery of the transaction are responded to by “retry-later”.

In either case, typically after the expiration of a timer, the node may raise an alert for system management attention; this could prompt determination of the reason for lack of response and whether recovery will become possible or will remain impossible because of the conditions highlighted in this annex.

In the latter case, actions to determine the desired outcome of the transaction and to repair damage to applications and their bound data will be system or application dependent. When the desired outcome is determined, then an event must be caused to the TP implementation to remove recovery records related to the transaction such that it can finally be forgotten by the OSI TP Service Provider. In the terms of the main text and state tables for the OSI TP Protocol, this is equivalent to an internal event which instructs the TPPM to locally terminate the transaction. Such an action would be required in all affected nodes in the same transaction as there would be no means to propagate such an outcome throughout the transaction tree.

Annex F

TPPM transaction states

(This annex does not form an integral part of this Recommendation)

F.1 TPPM transaction states

At any time, a TPPM is either not part of a transaction tree or is in one of the following states:

- ACTIVE state;
- READY state;
- DECIDED (commit) state;
- DECIDED (rollback) state.

The root TPPM of a transaction tree will never be in the READY state. In the following subclauses, these states are defined by listing all legal state transitions (with reference numbers) and the conditions under which they occur. Figure F.1 gives a complete state transition diagram, and labels the arcs with the applicable state transition reference numbers.

The transaction state may change during the course of an action sequence according to the following rules. Should a node crash occur, the transaction state is derived from the existence of a log record.

F.1.1 State transitions of a root TPPM

1) A TPPM which is not part of a transaction tree becomes the root TPPM and enters the ACTIVE state when the TPPM receives

   – a TP-BEGIN-DIALOGUE request with the Chained Transactions functional unit selected; or

   – a TP-BEGIN-DIALOGUE request with the Unchained Transactions functional unit selected and the Begin-Transaction parameter set to "true"; or

   – a TP-BEGIN-TRANSACTION request.

   This occurs in the "Initiating a transaction branch" procedure (see 11.5.4).

2) A root TPPM makes the transition from the ACTIVE state to the DECIDED (commit) state when the *last ready has been received* and the log-commit record is written.

   This occurs in the "Making commitment decision" procedure (see 11.5.7).

3) A root TPPM makes the transition from the ACTIVE state to the DECIDED (rollback) state when the TPPM issues or receives a rollback-initiating service primitive.

   This occurs in the "Initiating rollback at TPPM" procedure (see 11.5.5).

4) A root TPPM in the ACTIVE state with only one subordinate ceases to be part of the transaction tree when the TPPM receives an AF-BEGIN-DIALOGUE (rejected) confirm or AF-BID (rejected) confirm on the dialogue with that subordinate, or receives an AF-ABORT (user/provider, dataRI) from its sole subordinate before receiving a TP-COMMIT request.

   This occurs in the AF-BEGIN-DIALOGUE (rejected, dataRI) confirm (see 11.3.5), SAF-ASSOCIATION-LOST indication" procedure (see 11.3.9), AF-BEGIN-DIALOGUE (rejected(user), rollbackRI) confirm (see 11.3.6), and AF-ABORT (provider, dataRI) indication (see 11.3.20) procedures.

5) A root TPPM makes the transition from the DECIDED (commit) state (or DECIDED (rollback) state) to the ACTIVE state when the TPPM issues a TP-COMMIT-COMPLETE indication (or TP-ROLLBACK-COMPLETE indication, respectively) provided at least one subordinate *dialogue is chaining*.

   This occurs in the "Completing commitment" procedure (see 11.5.1) for the case of commitment and in the "Initiating transaction after rollback" procedure (see 11.5.6) for the case of rollback.

6) A root TPPM that is in the DECIDED (commit) state (or DECIDED (rollback) state) ceases to be part of the transaction tree when the TPPM issues a TP-COMMIT-COMPLETE indication (or TP-ROLLBACK-COMPLETE indication) provided that no subordinate *dialogue is chaining*.

   This occurs in the "Completing commitment" procedure (see 11.5.1) for the case of commitment and for the "Initiating transaction after rollback" procedure (see 11.5.6) in the case of rollback.

F.1.2 State transitions of an intermediate TPPM

7) An intermediate TPPM makes the transition from the ACTIVE state to the READY state when the *last ready has been received* and the TPPM has written the log-ready record.

   This occurs in the "Entering READY state" procedure (see 11.5.2).

8) An intermediate TPPM makes the transition from the ACTIVE state to the DECIDED (rollback) state when the TPPM issues or receives a rollback-initiating service primitive.

   This occurs in the "Initiating rollback at TPPM" procedure (see 11.5.5).

9) An intermediate TPPM makes the transition from the READY state to the DECIDED (commit) state when the TPPM receives *a commit indication* from the superior.

   This occurs in the "Receiving commit order" procedure (see 11.5.8).

10) An intermediate TPPM makes the transition from the READY state to the DECIDED (rollback) state when the TPPM receives *a rollback indication* from the superior.

    This occurs in the "Initiating rollback at TPPM" procedure (see 11.5.5).

11) An intermediate TPPM makes the transition from the DECIDED (commit) state (or DECIDED (rollback) state) to the ACTIVE state when the TPPM issues TP-COMMIT-COMPLETE indication (or TP-ROLLBACK-COMPLETE indication, respectively) provided that the superior and at least one subordinate *dialogue is chaining*.

This occurs in the "Completing commitment" procedure (see 11.5.1) for the case of commitment and in the "Initiating transaction after rollback" procedure (see 11.5.6) for the case of rollback.

12) An intermediate TPPM that is in the DECIDED (commit) state (or DECIDED (rollback) state, respectively) ceases to be part of the transaction tree when the TPPM issues TP-COMMIT-COMPLETE indication (or TP-ROLLBACK-COMPLETE indication, respectively) provided that no *dialogue is chaining*.

This occurs in the "Completing commitment" procedure (see 11.5.1) for the case of commitment and in the "Initiating transaction after rollback" procedure (see 11.5.6) in the case of rollback.

13) An intermediate TPPM in the DECIDED (commit) state (or DECIDED (rollback) state, respectively) becomes a leaf TPPM in the ACTIVE state when the TPPM issues TP-COMMIT-COMPLETE indication (or TP-ROLLBACK-COMPLETE indication, respectively) provided that the superior *dialogue is chaining* and no subordinate *dialogue is chaining*.

This occurs in the "Completing commitment" procedure (see 11.5.1) for the case of commitment and in the "Initiating transaction after rollback" procedure (see 11.5.6) in the case of rollback.

14) An intermediate TPPM in the DECIDED (commit) state (or DECIDED (rollback) state, respectively) becomes a root TPPM in the ACTIVE state when the TPPM issues TP-COMMIT-COMPLETE indication (or TP-ROLLBACK-COMPLETE indication, respectively) provided that the superior *dialogue is not chaining* and at least one subordinate *dialogue is chaining*.

This occurs in the "Completing commitment" procedure (see 11.5.1) for the case of commitment and in the "Initiating transaction after rollback" procedure (see 11.5.6) in the case of rollback.

15) An intermediate TPPM makes the transition from the DECIDED (commit) state to the DECIDED (rollback) state when the TPPM issues a TP-COMMIT-COMPLETE indication followed by a TP-ROLLBACK indication.

This occurs in the "Completing commitment" procedure (see 11.5.1) for the case of commitment and in the "Initiating transaction after rollback" procedure (see 11.5.6) in the case of rollback.

F.1.3 State transitions of a leaf TPPM

16) A TPPM which is not part of a transaction tree becomes a leaf TPPM and enters the ACTIVE state when the TPPM receives a C-BEGIN indication.

This occurs in the "C-BEGIN indication" procedure (see 11.3.37).

17) A leaf TPPM makes the transition from the ACTIVE state to the READY state when the *last ready has been received* and the TPPM has written the log-ready record.

This occurs in the "Entering READY state" procedure (see 11.5.2).

18) A leaf TPPM which is in the ACTIVE state ceases to be part of the transaction tree when the TPPM receives a TP-BEGIN-DIALOGUE (rejected) response, or when there is a dialogue establishment indication outstanding and an AF-ABORT (user/provider, rollbackRI) indication is received.

This occurs in the TP-BEGIN-DIALOGUE response" procedure (see 11.3.3) and in the AF-ABORT (user/provider, rollbackRI) indication or AF-ABORT-AND-HEURISTIC-REPORT (rollbackRI) indication procedure (see 11.3.55).

19) A leaf TPPM makes the transition from the ACTIVE state to the DECIDED (rollback) state when the TPPM issues or receives a rollback-initiating service primitive.

This occurs in the "Initiating rollback at TPPM" procedure (see 11.5.5).

20) A leaf TPPM makes the transition from the READY state to the DECIDED (commit) state when the TPPM receives a *commit indication* from the superior.

This occurs in the "Receiving commit order" procedure (see 11.5.8).

21) A leaf TPPM makes the transition from the READY state to the DECIDED (rollback) state when the TPPM receives a *rollback indication* from its superior.

This occurs in the "Initiating rollback at TPPM" procedure (see 11.5.5).

22) A leaf TPPM makes the transition from the DECIDED (commit) state (or DECIDED (rollback) state, respectively) to the ACTIVE state when the TPPM issues TP-COMMIT-COMPLETE ind (or TP-ROLLBACK-COMPLETE indication, respectively) provided that the superior *dialogue is chaining*

This occurs in the "Completing commitment" procedure (see 11.5.1) for the case of commitment and in the "Initiating transaction after rollback" procedure (see 11.5.6) for the case of rollback.

23) A leaf TPPM that is in the DECIDED (commit) state (or DECIDED (rollback) state, respectively) ceases to be part of the transaction tree when the TPPM issues a TP-COMMIT-COMPLETE indication (or TP-ROLLBACK-COMPLETE indication, respectively) provided that the superior *dialogue is not chaining available for the next transaction*.

This occurs in the "Completing commitment" procedure (see 11.5.1) for the case of commitment and in the "Initiating transaction after rollback" procedure (see 11.5.6) for the case of rollback.

A leaf TPPM that is in the DECIDED (rollback) state also ceases to be part of the transaction when the TPPM receives a TP-BEGIN-DIALOGUE (rejected) response.

This occurs in the "TP-BEGIN-DIALOGUE response" procedure (see 11.3.3).

24) A leaf TPPM which is in the ACTIVE state becomes an intermediate TPPM in the ACTIVE state when the TPPM

- issues an AF-BEGIN-DIALOGUE request with selection of the Chained Transactions functional unit; or
- issues an AF-BEGIN-DIALOGUE request with selection of the Unchained Transactions functional unit and the Begin-Transaction parameter set to "commitment"; or
- receives a TP-BEGIN-TRANSACTION request.

This occurs in the "Initiating a transaction branch" procedure (see 11.5.4).

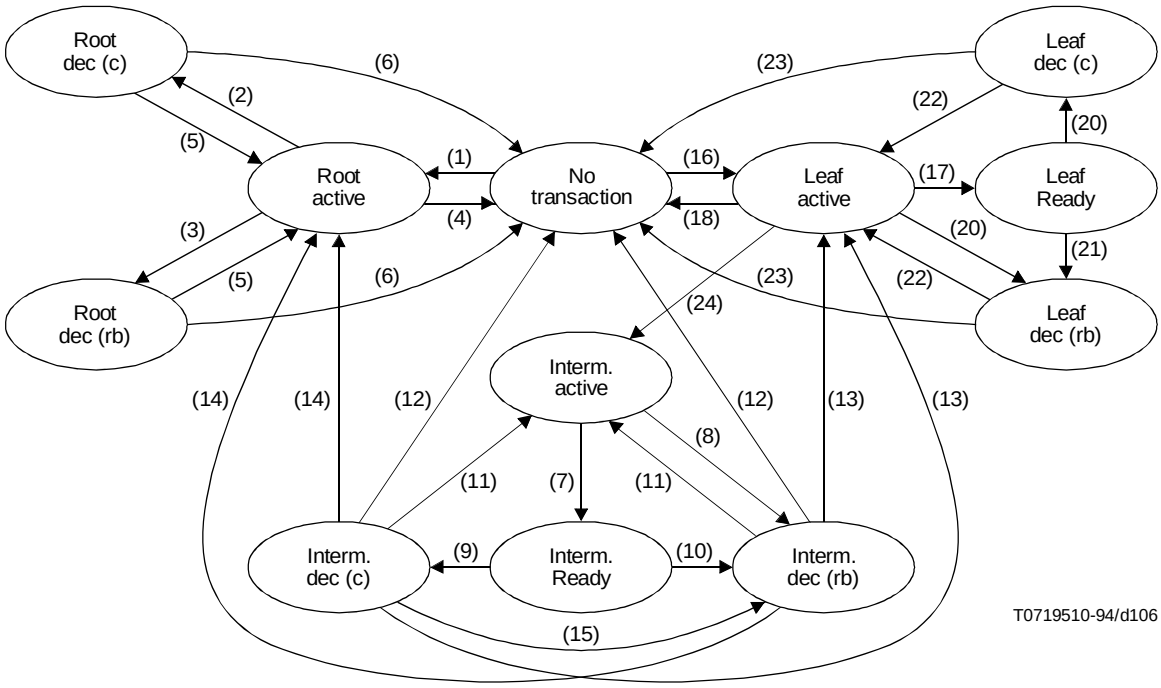


FIGURE F.1/X.862

State Transition Diagram