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SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – Signalling ATM adaptation layer (SAAL)

Signalling Transport Converter on MTP3 and MTP3b

ITU-T Recommendation Q.2150.1

(Formerly CCITT Recommendation)

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING

SIGNALLING IN THE INTERNATIONAL MANUAL SERVICE	Q.1–Q.3
INTERNATIONAL AUTOMATIC AND SEMI-AUTOMATIC WORKING	Q.4–Q.59
FUNCTIONS AND INFORMATION FLOWS FOR SERVICES IN THE ISDN	Q.60–Q.99
CLAUSES APPLICABLE TO ITU-T STANDARD SYSTEMS	Q.100–Q.119
SPECIFICATIONS OF SIGNALLING SYSTEMS No. 4 AND No. 5	Q.120–Q.249
SPECIFICATIONS OF SIGNALLING SYSTEM No. 6	Q.250–Q.309
SPECIFICATIONS OF SIGNALLING SYSTEM R1	Q.310–Q.399
SPECIFICATIONS OF SIGNALLING SYSTEM R2	Q.400–Q.499
DIGITAL EXCHANGES	Q.500–Q.599
INTERWORKING OF SIGNALLING SYSTEMS	Q.600–Q.699
SPECIFICATIONS OF SIGNALLING SYSTEM No. 7	Q.700–Q.799
Q3 INTERFACE	Q.800–Q.849
DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1	Q.850–Q.999
PUBLIC LAND MOBILE NETWORK	Q.1000–Q.1099
INTERWORKING WITH SATELLITE MOBILE SYSTEMS	Q.1100–Q.1199
INTELLIGENT NETWORK	Q.1200–Q.1699
SIGNALLING REQUIREMENTS AND PROTOCOLS FOR IMT-2000	Q.1700–Q.1799
BROADBAND ISDN	Q.2000–Q.2999
General aspects	Q.2000–Q.2099
Signalling ATM adaptation layer (SAAL)	**Q.2100–Q.2199**
Signalling network protocols	Q.2200–Q.2299
Common aspects of B-ISDN application protocols for access signalling and network signalling and interworking	Q.2600–Q.2699
B-ISDN application protocols for the network signalling	Q.2700–Q.2899
B-ISDN application protocols for access signalling	Q.2900–Q.2999

For further details, please refer to the list of ITU-T Recommendations.

ITU-T Recommendation Q.2150.1

Signalling Transport Converter on MTP3 and MTP3b

Summary

This Recommendation specifies the Signalling Transport Converter on MTP3 and MTP3b. This Signalling Transport Converter on MTP utilizes the services offered by the Message Transfer Part of Signalling System No. 7. The sublayer structure, the PDU structures of the signalling transport converter sublayer, and the mechanisms for the provision of the generic signalling transport service are defined in depth.

The intent of this Recommendation is to provide a protocol specification that can be used in the ISDN and B-ISDN environment for the provision of a signalling transport service. In particular, this protocol provides a Generic Signalling Transport Service that is used by AAL type 2 and Bearer Independent Call Control (BICC) signalling protocols.

Source

ITU-T Recommendation Q.2150.1 was revised by ITU-T Study Group 11 (2001-2004) and approved under the WTSA Resolution 1 procedure on 15 May 2001.

Keywords

ATM Adaptation Layer (AAL), Asynchronous Transfer Mode (ATM), Bearer Independent Call Control (BICC), Broadband Integrated Services Digital Network (B-ISDN), Message Transfer Part (MTP), Signalling AAL (SAAL), Signalling Transport Converter (STC).

FOREWORD

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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CONTENTS

ITU-T Recommendation Q.2150.1

Signalling Transport Converter on MTP3 and MTP3b

1 Scope

This Recommendation specifies the signalling transport converter sublayer on top of the message transfer part (MTP) specified in ITU-T Q.704 [4] "MTP3" and ITU-T Q.2210 [6] "MTP3b"; both Recommendations specify the peer-to-peer protocol for the transfer of information and control between any pair of MTP level 3 entities. Since the service provided by either of these Recommendations is the same, this Recommendation only describes the actions in terms of MTP3 for clarity of expression. This Recommendation covers the specification of the sublayer structure, the PDU structures of the signalling transport converter sublayer, and the mechanisms for the provision of the Generic Signalling Transport Service.

When this Signalling Transport Converter on MTP is applied for a signalling protocol entity, that entity is liberated from considering peculiarities of the underlying signalling transport service. This is achieved by relying on a Generic Signalling Transport Service that is provided, for example, by the sublayer specified in this Recommendation.

This Recommendation describes the interactions between the Signalling Transport Converter (STC) and the next higher layer, e.g. the AAL type 2 or BICC signalling protocol entity, between the STC and the Message Transfer Part, and between the STC and layer management.

2 References

2.1 Normative references

The following ITU-T Recommendations and other references 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 other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1] ITU-T Q.2150.0 (2001), *Generic signalling transport service*.

[2] ITU-T Q.701 (1993), *Functional description of the message transfer part (MTP) of Signalling System No. 7*.

[3] ITU-T Q.703 (1996), *Signalling link*.

[4] ITU-T Q.704 (1996), *Signalling network functions and messages*.

[5] ITU-T Q.764 (1999), *Signalling System No. 7 – ISDN User Part signalling procedures*.

[6] ITU-T Q.2210 (1996), *Message transfer part level 3 functions and messages using the services of ITU-T Recommendation Q.2140*.

[7] ITU-T X.200 (1994), *Information technology – Open Systems Interconnection – Basic reference model: The basic model*.

[8] ITU-T X.210 (1993), *Information technology – Open Systems Interconnection – Basic reference model: Conventions for the definition of OSI services*.

2.2 Bibliography

The following ITU-T Recommendations and other publications contain information that may be useful to understanding the usage of this Recommendation. There are no additional provisions of this Recommendation derived from these publications.

[9] ITU-T Q.2140 (1995), *B-ISDN ATM adaptation layer – Service specific coordination function for signalling at the network node interface (SSCF at NNI)*.

[10] ITU-T Q.2630.1 (1999), *AAL type 2 signalling protocol – Capability Set 1*.

[11] ITU-T Q.2630.2 (2000), *AAL type 2 signalling protocol – Capability Set 2*.

[12] ITU-T Q.1901 (2001), *Bearer independent call control protocol*.

[13] ITU-T Q.1902.1 (2001), *Bearer independent call control protocol CS2 functional description*.

[14] IETF RFC 791 (1981), *Internet Protocol*.

[15] IETF RFC 2474 (1998), *Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*.

3 Definitions

This Recommendation is based upon the concepts developed in ITU-T X.200 [7] and X.210 [8].

4 Abbreviations

This Recommendation uses the following abbreviations:

AAL ATM Adaptation Layer

ATM Asynchronous Transfer Mode

CL Congestion Level

DPC Destination Point Code

MTP Message Transfer Part

NI Network Indicator

NNI Network Node Interface

OPC Originating Point Code

PDU Protocol Data Unit

PICS Protocol Implementation Conformance Statement

SAP Service Access Point

SDL Specification and Description Language

SDU Service Data Unit

SI Service Indicator

SIO Service Information Octet

SLS Signalling Link Selection code

STC Signalling Transport Converter

5 General description of the Signalling Transport Converter on MTP3 and MTP3b

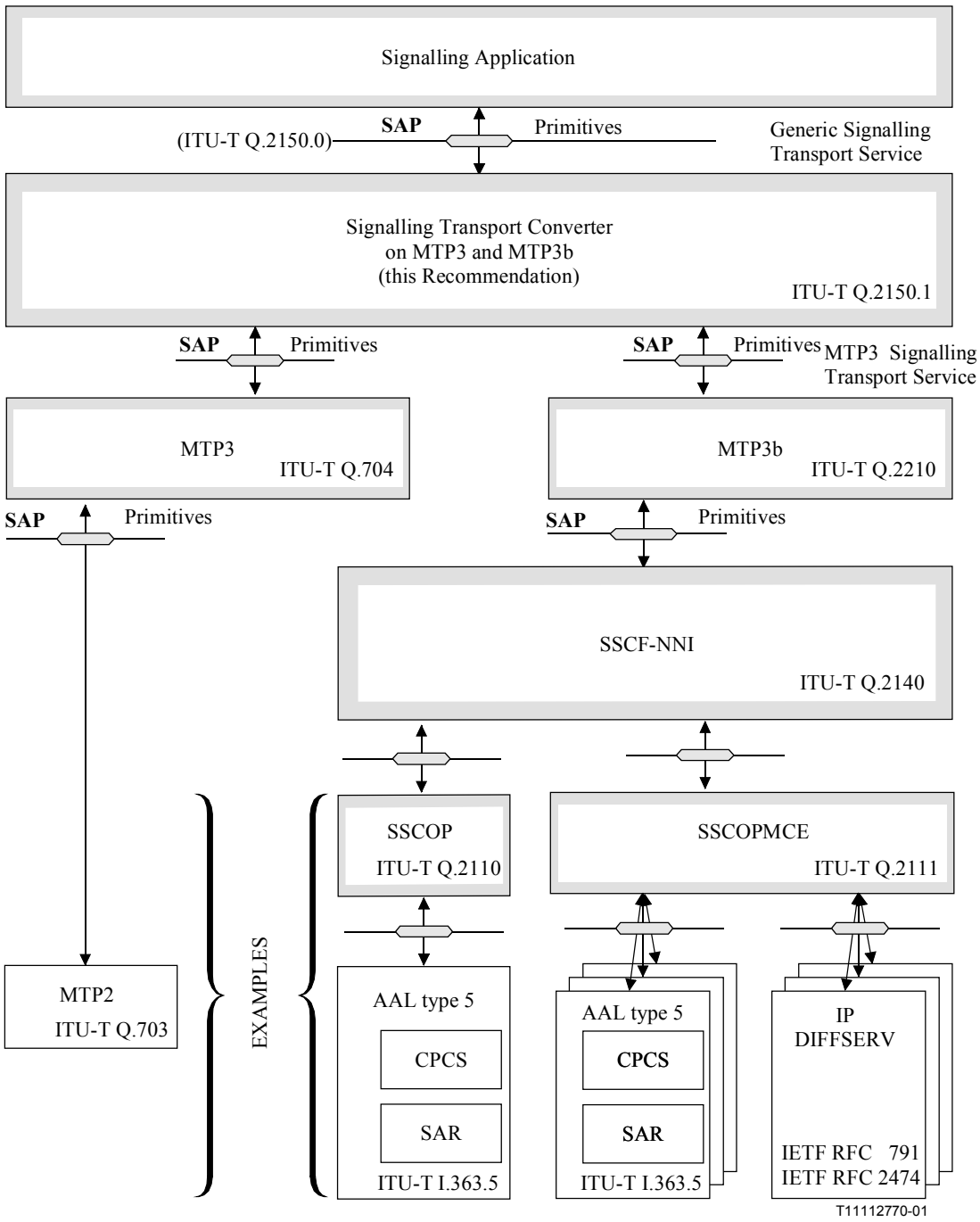
5.1 Structure of the Signalling Transport Converter on MTP

The sublayer providing the Signalling Transport Converter (STC) resides on top of the Message Transfer Part. It uses the services provided by level 3 of the Message Transfer Part defined in ITU-T Q.704 [4] and Q.2210 [6].

The STC provides the service that is requested by the Generic Signalling Transport Service defined in ITU-T Q.2150.0 [1], where the signalling protocol makes use of this service. The complete protocol stack is illustrated in Figure 5-1.

This Recommendation specifies:

- the interactions between the STC and the signalling protocol entity;
- the interactions between the STC and the MTP level 3 sublayer; and
- the interactions between the STC and layer management.



NOTE – The Service Access Points shown in this diagram are for modelling purposes only. They are not necessarily visible or accessible from outside.

Figure 5-1/Q.2150.1 – Structure of the Signalling Transport Converter on MTP

5.2 Services provided by the STC

The STC provides for the transparent transfer of data, i.e. signalling application (STC user) data between peer STC users. The supporting communication resources to achieve this transfer stay invisible to the signalling application.

In particular, the STC service provides for:

a) *Independence from the underlying transmission media*

The STC service relieves its users from all concerns of the manner in which the STC service is provided. Except for possible influences of the quality of service, the transfer of data over different underlying networks is, thus, invisible.

b) *Transparency of the information transferred*

The STC service provides for the transparent transfer of octet-aligned STC user data. It does not restrict the content, format, or coding of the information nor is there ever a need to interpret its structure or meaning.

c) *Service Availability Reporting*

As the underlying service (MTP) reports about availability/unavailability of the data transfer service, after the necessary translation, these notifications are forwarded to the STC user.

5.3 Functions of the STC

The STC performs the following functions:

a) *Data transfer service availability reporting to the STC user*

This function reports the availability or unavailability of the MTP message transfer service to the user of the STC.

b) *Congestion reporting to the STC user*

This function translates and forwards the congestion indications provided by the MTP to the STC user.

c) *Maximum length indication to the STC user*

This function indicates to the STC user the maximum length of the PDU that the STC can transfer; it is indicated at creation of the STC entity.

d) *CIC control indication to the STC user*

This function indicates to the STC user, at creation of the STC entity, whether it serves as the controlling node of the call association.

6 Elements for layer-to-layer communication

6.1 The Generic Signalling Transport Service

The Generic Signalling Transport Service is specified in ITU-T Q.2150.0 [1]. For convenience, a summary of the primitives for accessing the service is reproduced in Table 6-1. In the event of any difference between this table and the definitions in ITU-T Q.2150.0, the definitions in ITU-T Q.2150.0 take precedence.

Table 6-1/Q.2150.1 – Primitives and parameters of the Generic Signalling Transport Sublayer

Primitive Generic Name	Type			
	Request	Indication	Response	Confirm
START-INFO	–	Max_Length CIC_Control	–	–
IN-SERVICE	–	Level	–	–
OUT-OF-SERVICE	–	(Note 1)	–	–
CONGESTION	–	Level	–	–
TRANSFER	Sequence Control STC User Data Priority (Note 2)	STC User Data Priority (Note 2)	–	–
– This primitive is not defined. NOTE 1 – This primitive has no parameters. NOTE 2 – This parameter is a national option.				

On the establishment of a Signalling Transport Converter entity and the associated Signalling Transport Converter user entity, for example at power up, the initial conditions is the same as if an OUT-OF-SERVICE.indication primitive had been conveyed across this SAP. Also at this time the START-INFO.indication is sent to the signalling entity.

6.2 The Service provided by MTP

This clause specifies the information flow across the Signalling Transport Converter-Message Transfer Part (MTP) boundary. This boundary is defined in 8/Q.701 [2] and 6.2/Q.2210 [6] and summarized below. In the event of any difference between the following summary and the definitions in ITU-T Q.701 or Q.2210, the definitions in ITU-T Q.701 or Q.2210 take precedence.

The primitives and parameters between STC and MTP are shown in Table 6-2.

NOTE – This service corresponds to the "Specific Signalling Transport Service" in Figure 5-1 in ITU-T Q.2150.0.

Table 6-2/Q.2150.1 – Primitives and parameters of the Message Transfer Part

Primitive Generic Name	Type			
	Request	Indication	Response	Confirm
MTP-TRANSFER	OPC, DPC, SLS, SIO, UserData	OPC, DPC, SLS, SIO, UserData	–	–
MTP-PAUSE (Stop)	–	Affected DPC	–	–
MTP-RESUME (Start)	–	Affected DPC	–	–
MTP-STATUS	–	Affected DPC Cause	–	–
– This primitive is not defined.				

6.2.1 Primitive definition

The definition of these primitives is as follows:

a) **MTP-TRANSFER**:

The primitive "MTP-TRANSFER" is used between level 4 and level 3 (SMH) to provide the MTP message transfer service, i.e. to transfer STC PDUs from one STC peer entity to the other.

b) **MTP-RESUME**:

The primitive "MTP-RESUME" indicates to the "User" the ability of providing the MTP service to the specified destination (see 7.2.6/Q.701 [2]).

This primitive corresponds to the destination accessible state as defined in ITU-T Q.704 [4].

NOTE 1 – When the MTP-RESUME indication is given to each user, the MTP does not know whether the remote peer user is available. This is the responsibility of each user.

c) **MTP-PAUSE**:

The primitive "MTP-PAUSE" indicates to the "Users" the total inability of providing the MTP service to the specified destination (see 7.2.6/Q.701 [2]).

NOTE 2 – The signalling point is inaccessible via the MTP. The MTP will determine when the signalling point is again accessible and send MTP-RESUME indication. The user should wait for such an indication and, meanwhile is not allowed to send messages to that signalling point. If the remote peer user is thought to be unavailable, that condition may be maintained or cancelled at the local user's discretion.

d) **MTP-STATUS**:

The primitive "MTP-STATUS" indicates to the "Users" the partial inability of providing the MTP service to the specified destination. The primitive is also used to indicate to a User that a remote corresponding User is unavailable and the cause for unavailability (see 11.2.7/Q.704 [4]).

In the case of national option with congestion priorities or multiple signalling link congestion states without priorities as in ITU-T Q.704 [4] are implemented, this "MTP-STATUS" primitive is also used to indicate a change of congestion level.

This primitive corresponds to the destination congested/User Part unavailable state as defined in Q.704 [4].

NOTE 3 – In the case of remote user unavailability, the user is responsible for determining the availability of this peer user. The user is cautioned not to send normal traffic to the peer user because, while such peer is unavailable, no message will be delivered but each will result in a repeated MTP-STATUS indication. The MTP will not send any further indications about the unavailability or availability of this peer user unless the local user continues to send messages to the peer user.

6.2.2 Parameter definition

Table 6-2 lists the parameters associated with each MTP primitive. The definition of the parameters is as follows:

a) **Point code of the originating exchange (OPC)**:

The OPC parameter indicates the originating point of the message (see 2.2.3/Q.704 [4]).

NOTE 1 – This parameter is a fixed value per STC entity.

b) **Point code of the destination exchange (DPC)**:

The DPC parameter indicates the destination point of the message (see 2.2.3/Q.704 [4]).

NOTE 2 – This parameter is a fixed value per STC entity.

c) **Signalling Link Selection code (SLS)**:

Selection of the SLS parameter is based on the Sequence Control parameter received in the TRANSFER.request primitive (see 2.2.4/Q.704 [4]).

NOTE 3 – The MTP users should take into account that this parameter is used for load sharing by the MTP, therefore, the SLS values should be distributed as equally as possible. The MTP guarantees (to a high degree of probability) an in-sequence delivery of messages that contain the same SLS code.

d) **Service Information Octet (SIO)**:

The service information octet of message signal units contains the service indicator (SI) and the subservice field. The service indicator indicates an STC user entity, e.g. BICC, AAL type 2 signalling, etc. (see 14.2/Q.704 [4]).

e) **User Data**:

The User Data parameter carries the PDUs constructed before transmission and interpreted upon receipt by the STC (see 2.3.8/Q.703 [3]).

f) **Cause**:

The cause parameter has, at present, four values:

1) Signalling network congestion (plus optional level).

   The level value is included if national options with congestion priorities or multiple signalling link states without congestion priorities as in ITU-T Q.704 [4] are implemented.

2) User part unavailability – unknown.

3) User part unavailability – unequipped remote user.

4) User part unavailability – inaccessible remote user.

g) **Affected DPC**:

Destination Point Code identifying the node, the state of which is reported by the corresponding primitive (see 7.2.6/Q.701 [2]).

6.2.3 Restart

When the MTP restart procedure is terminated, the MTP indicates the end of MTP restart to all local MTP Users showing each signalling point's accessibility or inaccessibility. The means of doing this is implementation dependent (see 9/Q.704 [4]).

6.3 Primitives between the STC and layer management

This clause specifies the information flow across the STC-Layer Management boundary.

The primitive between STC and layer management is listed in Table 6-3.

Table 6-3/Q.2150.1 – Primitives and parameters between the STC and layer management

Primitive Generic Name	Type			
	Request	Indication	Response	Confirm
MSTC-ERROR	–	Cause	–	–
– This primitive is not defined.				

6.3.1 Primitive definition

- **MSTC-ERROR**:

  MSTC-ERROR primitives are used to inform layer management about errors.

6.3.2 Parameters

- **Cause**:

  The cause parameter can indicate the following errors:

  a) user part unavailable (unknown);

  b) user part unavailable (inaccessible); and

  c) user part unequipped.

6.4 State transition diagram for sequences of primitives at the layer boundaries of the STC

This clause defines the constraints on the sequences in which the primitives may occur at the layer boundaries of the STC. The sequences are related to the states at one STC endpoint between the STC and the STC user and between the STC and MTP.

The possible overall sequences of primitives at an STC connection endpoint are defined in ITU-T Q.2150.0 [1] and shown in the state transition diagram, Figure 6-1, for convenience. The primitives and state transitions are defined in ITU-T Q.2150.0 [1]. If any discrepancy is detected between the representation here and the one in ITU-T Q. 2150.0, the definition in ITU-T Q. 2150.0 shall apply. The model assumes that the primitives are serviced immediately and in zero time.

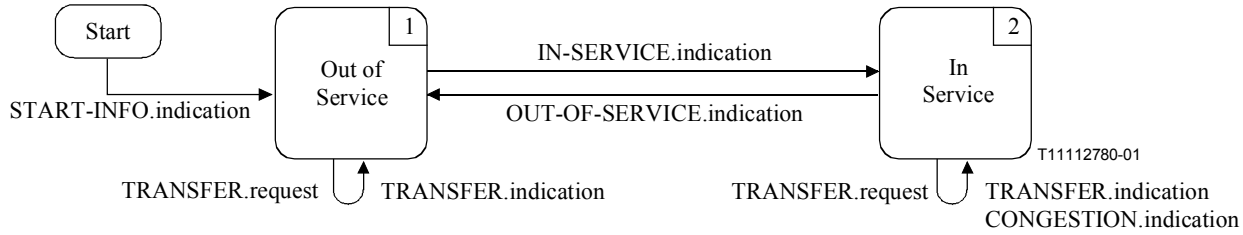


Figure 6-1/Q.2150.1 – State transition diagram for sequences of primitives between the STC and its user

The possible overall sequences of primitives at a MTP endpoint are shown in the state transition diagram in Figure 6-2. These primitives and state transitions are defined in ITU-T Q.2210 [6]. If any discrepancy is detected between the representation here and the one in ITU-T Q.2210, the definition in ITU-T Q.2210 shall apply.

The model in Figure 6-2 illustrates the behaviour of the MTP as seen by the STC. This model assumes that a request or response primitive is never issued at the same time as an indication or confirm primitive. The model also assumes that the primitives are serviced immediately and in zero time. In the diagram:

a) Any primitive that is not shown to result in a transition (from one state to the same state, or from one state to a different state) is not permitted in that state.

b) It is assumed that the primitives passed between STC and the STC user as well as the primitives passed between the STC and MTP are coordinated such that collisions do not occur.

NOTE – The MTP-STATUS.indication can indicate either the unavailability for a remote MTP user or MTP congestion.

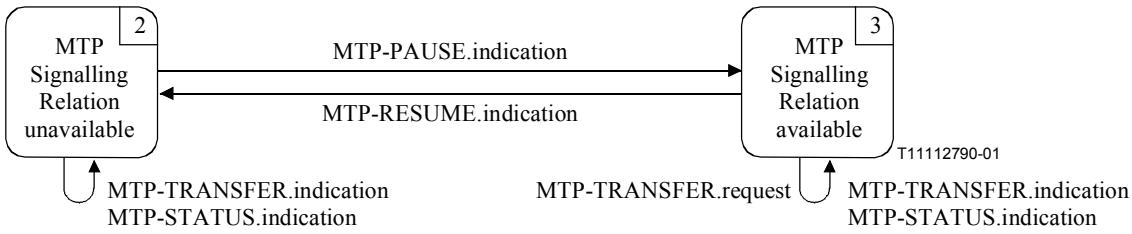


Figure 6-2/Q.2150.1 – State transition diagram for sequences of primitives between MTP and STC

7 Protocol elements for peer-to-peer communication

The peer-to-peer STC protocol utilizes the mechanisms provided by the underlying sublayer (MTP3 or MTP3b, ITU-T Q.704 [4] or ITU-T Q.2210 [6]). In particular:

- In order to provide service availability information it uses the information received in MTP-PAUSE.indication and MTP-RESUME.indication primitives.
- In order to provide congestion indication, it relies on the information received in MTP-STATUS.indication primitives.
- STC PDU transfer utilizes the MTP-TRANSFER.request and MTP-TRANSFER.indication primitives. MTP-TRANSFER.request is used for sending PDUs while MTP-TRANSFER.indication is used for receiving PDUs.

7.1 STC PDUs

7.1.1 STC PDU formats

The following STC messages (PDUs) are used for exchanging information between peer STC entities:

STC signalling message

This PDU is used for carrying STC signalling messages to a peer STC entity via the MTP network. The length of such a signalling message may not exceed the maximum length indicated in the Max_Length parameter. The STC is not adding any Protocol Control Information to the message. Figure 7-1 illustrates the format of the STC PDU.

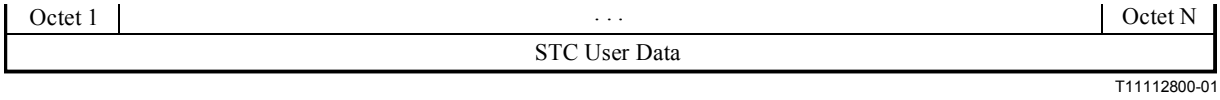


Figure 7-1/Q.2150.1 – STC Signalling Message PDU

7.1.2 STC Signalling Message PDU fields

An STC Signalling Message PDU contains the following field:

- **STC User Data field**:

  This field in the STC Signalling Message PDU contains a complete STC-SDU.

7.2 STC state variable

The STC maintains the following state variable:

- **Congestion Level (CL)**:

  This variable can hold the values from a level indicating "no congestion" through to a level indicating "maximum congestion" in increments.

  NOTE – The number of steps of congestion level and/or amount of increase/decrease is considered to be network implementation dependent.

7.3 STC timers

The STC entity requires the following timers:

a) **Timer_Long**:

This timer corresponds to timer T30, see 2.10.2/Q.764 [5].

NOTE 1 – This timer is used by the congestion indication procedure. Receipt of a repeated congestion indication from MTP before the expiry of this timer is interpreted as the congestion situation having worsened in the meantime. On the other hand, if no congestion indication is received from MTP before expiry of this timer, the congestion situation is considered to have improved.

b) **Timer_Short**:

This timer corresponds to timer T29, see 2.10.2/Q.764 [5].

NOTE 2 – This timer is used by the congestion indication procedure. The role of this timer is to avoid overreacting if multiple congestion indications are received from MTP in quick succession.

7.4 Provisioned STC parameters

STC parameters are specified at the creation of a new STC entity and are unchanged during the lifetime of the STC entity. The following parameters are defined:

a) **STC_DPC**:

Point Code corresponding to the destination point served by the STC entity.

b) **STC_OPC**:

Point Code corresponding to the originating point served by the STC entity.

c) **STC_SIO**:

The service information octet contains the service indicator (SI) and the subservice field. The subservice field carries the network indicator bits and spare bits; the spare bits are for national use to indicate message priority. The network indicator (NI) must indicate to which network the signalling relation belongs. The service indicator must indicate the STC user, e.g. "AAL type 2 signalling", "BICC signalling", etc.

NOTE 1 – The value of the Service Indicator for the Bearer Independent Call Control is "13" (see ITU-T Q.704 [4] and Q.2210 [6] and their respective Implementors' Guides).

NOTE 2 – The value of the Service Indicator for the AAL type 2 signalling is "12" (see ITU-T Q.704 [4] and Q.2210 [6] and their respective Implementors' Guides).

d) **Value of Timer_Long (vTimer_Long)**:

The value of Timer_Long is defined in 2.10.2/Q.764 [5] as the value for timer T30.

NOTE 3 – Timer_Long is typically in the range of 5 to 10 seconds.

e) **Value of Timer_Short (vTimer_Short)**:

The value of Timer_Short is defined in 2.10.2/Q.764 [5] as the value for timer T29.

NOTE 4 – Timer_Short is typically in the range of 0.3 to 0.6 seconds.

f) **Value of Max_Length**:

The value of Max_Length can be set to either "272" or "4096".

NOTE 5 – The value of the Max_Length parameter is chosen by network operators.

NOTE 6 – The Max_Length parameter is a characterization of the underlying MTP length limitation; this value includes the MTP header. For precise information see ITU-T Q.704 [4] and Q.2210 [6].

NOTE 7 – The Max_Length parameter is set as follows:

- If the STC is deployed in an MTP3 signalling relation, the Max_Length parameter is set to "272".
- If the STC is deployed in an MTP3b signalling relation, the Max_Length parameter is set to "272" or "4096". The value to be provisioned is chosen by network operators.

g) **Value of Congestion Level "no congestion" (CLnc)**:

This value is used in the CONGESTION.indication and IN-SERVICE.indication primitives to indicate "no congestion".

h) **Value of Congestion Level "maximum congestion" (CLmc)**:

This value is used in the CONGESTION.indication and IN-SERVICE.indication primitives to indicate "maximum congestion".

i) **Value "step" for Congestion Levels (CLst)**:

This value indicates the amount of increase or decrease of congestion levels.

NOTE 8 – Variable sizes of the value "step" are not shown in this Recommendation; nevertheless, they are explicitly allowed.

NOTE 9 – The values for indication "no congestion" and "maximum congestion" as well as the number of steps of congestion level and/or amount of increase/decrease are considered to be network implementation dependent.

NOTE 10 – In BICC CS 1 (see ITU-T Q.1901 [12]), the value for "no congestion" is set to "0", the value for "maximum congestion" is set to "10", and the value for "step" is set to "1".

NOTE 11 – The value of the CIC_Control parameter of the START-INFO primitive is computed at power-up from the values of the STC parameters STC_DPC and STC_OPC, i.e. it need not be provisioned.

8 Specification of the STC

This clause provides a set of SDL diagrams defining the procedures of the Signalling Transport Converter (STC). These SDL diagrams are the definitive description of the procedures and in case of conflict with the text, the SDL diagrams take precedence.

8.1 Overview

Figure 8-1 gives an overview about the states of STC and the major state transitions between them. The full specification of the STC state transitions can be found in 8.4.

These states are used in the specification of the peer-to-peer protocol. The states are conceptual and reflect the general condition of the STC entity in the sequences of primitives and PDU exchanges with its user, peer, underlying sublayer.

8.1.1 State 1: Service Unavailable

In this state, STC is not able to transfer signalling messages.

8.1.2 State 2: STC Service Available

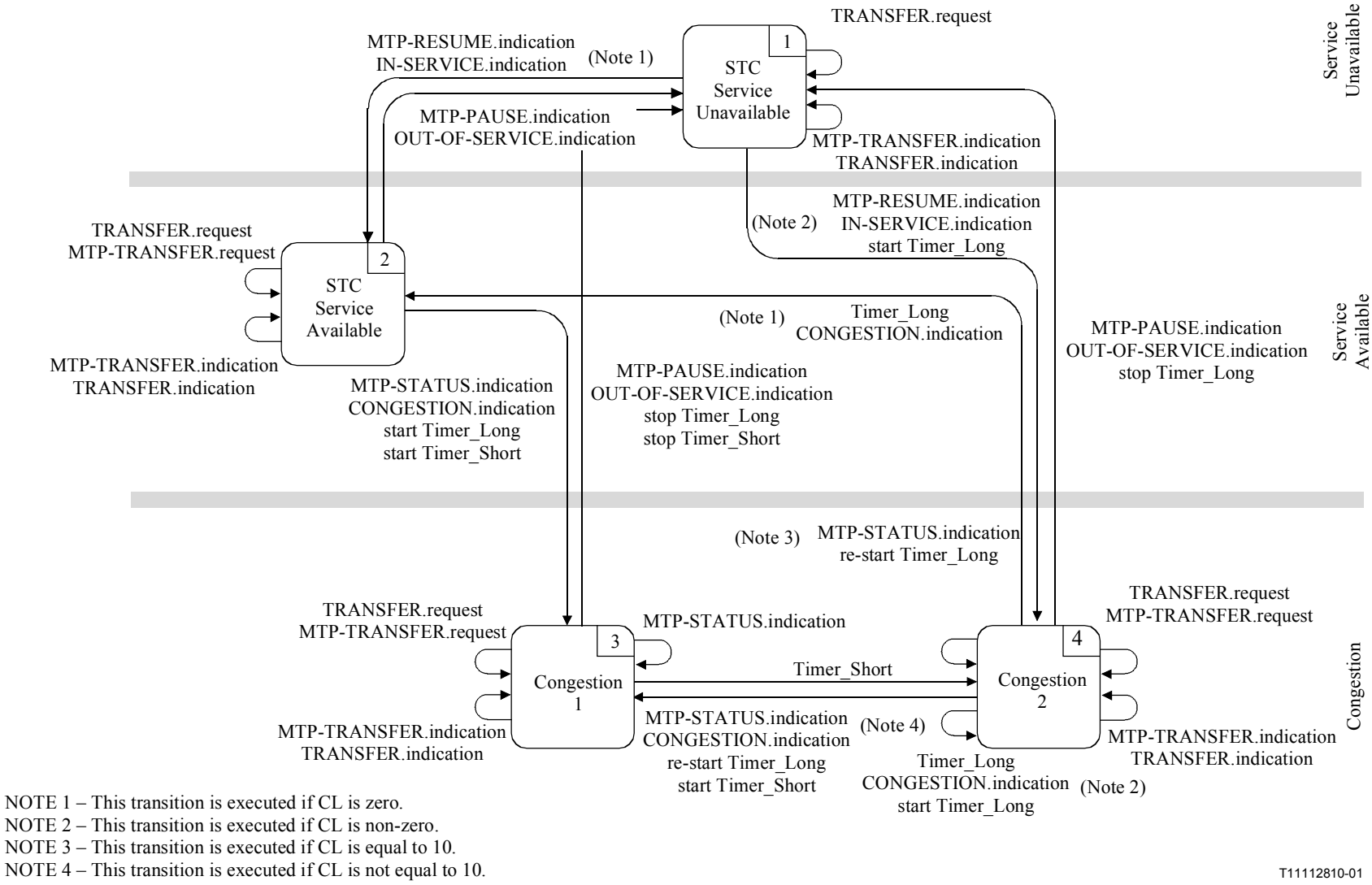
In this state, STC is able to provide unrestricted transfer of signalling messages.

8.1.3 State 3: Congestion 1

In this state, STC is able to provide a restricted service because of congestion in the signalling network. Both Timer_Short and Timer_Long are running in this state.

8.1.4 State 4: Congestion 2

In this state, STC is able to provide a restricted service because of congestion in the signalling network. Timer_Long is running in this state.



NOTE 1 – This transition is executed if CL is zero.
NOTE 2 – This transition is executed if CL is non-zero.
NOTE 3 – This transition is executed if CL is equal to 10.
NOTE 4 – This transition is executed if CL is not equal to 10.

Figure 8-1/Q.2150.1 – Overview of STC states and major transitions between them

8.2 Procedures of the STC

8.2.1 Initial Conditions

This clause specifies how the STC operates at power up.

When the STC is initialized, it determines the CIC_Control parameter and indicates it, together with the parameter Max_Length, to the STC user in the START-INFO.indication primitive.

The CIC_Control parameter is computed the following way:

- If the value of the STC_OPC parameter is greater than the value of the STC_DPC parameter, then the CIC_Control shall be set to **EVEN**.
- If the value of the STC_DPC parameter is greater than the value of the STC_OPC parameter, then the CIC_Control shall be set to **ODD**.

NOTE – If BICC receives a CIC_Control parameter set to **EVEN** then it is controlling node for **EVEN** CIC values of the call association; if it receives a CIC_Control parameter set to **ODD** then it is controlling node for **ODD** CIC values of the call association.

If an MTP-RESUME.indication primitive is received by the STC, the MTP service is successfully initialized towards its peer MTP. STC then sends an IN-SERVICE.indication primitive to the STC user signalling entity. The IN-SERVICE.indication primitive carries a Level parameter; the value of the parameter is network dependent. If the Level indicates congestion, then congestion indication procedure (specified in 8.2.4.) is started.

8.2.2 STC signalling message transfer procedure

8.2.2.1 Sending a signalling message

Upon receipt of a TRANSFER.request primitive from the STC user, the STC shall place the signalling message unaltered into an STC Signalling Message PDU and derive the Signalling Link Selection Value (SLS) from the received Sequence Control parameter. It shall then transfer the PDU to the MTP using the MTP-TRANSFER.request primitive. The primitive carries the parameters shown in Table 8-1.

Table 8-1/Q.2150.1 – Parameters in the MTP-TRANSFER.request primitive

Parameter	Content
MTP User Data	unaltered STC Signalling Message as received in the STC user Data parameter
Point code of the originating exchange	value of STC_OPC provisioned parameter
Point code of the destination exchange	value of STC_DPC provisioned parameter
Service Information Octet	value of STC_SIO provisioned parameter (Note)
Signalling Link Selection Value (SLS)	derived from received Sequence Control parameter
NOTE – The SIO may be augmented, as a national option, with priority indication with the value received in the Priority parameter.	

8.2.2.2 Receiving a signalling message

Upon receipt of an MTP-TRANSFER.indication primitive containing an STC Signalling Message PDU, the STC shall pass the MTP User Data unaltered to the STC user in a TRANSFER.indication primitive. As a national option, the TRANSFER.indication primitive may indicate priority as extracted from the Service Information Octet.

All the other parameters (OPC, DPC, SIO and SLS) are ignored.

8.2.3 Destination availability procedure

On the reception of an MTP-PAUSE.indication primitive by the STC, an OUT-OF-SERVICE.indication primitive is transmitted to the STC user. Layer Management is informed.

On the reception of an MTP-RESUME.indication primitive by the STC, an IN-SERVICE.indication primitive is transmitted to the STC user. IN-SERVICE.indication carries a Level parameter; the value of the parameter is network dependent. If the Level indicates congestion then the congestion indication procedure (specified in 8.2.4) is started.

NOTE 1 – The Level value used here can be different from the value used at start up.

NOTE 2 – With the concept of one STC entity per "DPC OPC SI NI" quadruplet, the primitives MTP-PAUSE.indication and MTP-RESUME.indication are always routed to the STC entity whose provisioned parameter "STC_DPC" is identical to the parameter "Affected DPC" in the primitives.

8.2.4 Congestion Indication procedure

On receipt of a MTP-STATUS.indication primitive with the cause set to "signalling network congestion", the STC acts as follows:

1) When the first congestion indication is received by the STC, a CONGESTION.indication primitive with the parameter Level indicating onset of congestion shall be issued towards the STC user. At the same time, timers Timer_Short and Timer_Long shall be started.
2) While Timer_Short is running, all received congestion indications for the same destination point code shall be ignored in order not to reduce traffic too rapidly.
3) Reception of a congestion indication after the expiry of timer Timer_Short, but still while Timer_Long is running, shall result in the transfer of a CONGESTION.indication primitive being sent to the STC user. It contains a Level parameter that is stepped up from the previous level. At the same time, Timer_Short and Timer_Long shall be restarted.
4) This stepwise increase of the congestion level shall continue until a maximum level is reached by arriving at the last step.
5) If Timer_Long expires (i.e. no congestion indications have been received while Timer_Long was running), a CONGESTION.indication containing the Level parameter that is stepped down from the previous level shall be sent to the STC user. Timer_Long shall be restarted unless full traffic load has been resumed.

NOTE 1 – The number of steps of congestion level and/or amount of increase/decrease is considered to be network implementation dependent.

NOTE 2 – With the concept of one STC entity per "DPC OPC SI NI" quadruplet, the primitive MTP-STATUS.indication is always routed to the STC entity whose provisioned parameter "STC_DPC" is identical to the parameter "Affected DPC" in the primitive.

8.2.5 User Part availability

On receipt of an MTP-STATUS.indication primitive with the cause parameter set to "user part unavailability-unknown", "user part unavailability-inaccessible remote user" or "user part unavailability-unequipped remote user", the STC user shall be informed via an OUT-OF-SERVICE.indication primitive, and an MSTC-ERROR.indication primitive with the cause parameter set to the value indicated in Table 8-2 shall be issued. If the STC receives an MTP-TRANSFER.indication primitive, it will issue an IN-SERVICE.indication primitive prior to performing the procedure specified in 8.2.2.2. The IN-SERVICE.indication primitive carries a Level parameter; the value of the parameter is network dependent. If the Level indicates congestion then the congestion indication procedure (specified in 8.2.4.) is started.

Table 8-2/Q.2150.1 – Cause parameter mapping

Cause parameter in MTP-STATUS.indication	Cause parameter in MSTC-ERROR.indication
user part unavailability-unknown	user part unavailable (unknown)
user part unavailability-inaccessible remote user	user part unavailable (inaccessible)
user part unavailability-unequipped remote user	user part unequipped

NOTE – With the concept of one STC entity per "DPC OPC SI NI" quadruplet, the primitive MTP-STATUS.indication is always routed to the STC entity whose provisioned parameter "STC_DPC" is identical to the parameter "Affected DPC" in the primitive.

8.3 State Transition Table

The State Transition Table for STC (Table 8-3) describes the primitives and primitives that lead to state transitions. The table only shows the major transition paths; the SDL diagrams in 8.4 show the full transitions.

Table 8-3/Q.2150.1 – State transition table *(part 1 of 2)*

Event	State			
	1 STC Service Unavailable	**2 STC Service Available**	**3 Congestion I**	**4 Congestion II**
TRANSFER.request	→ 1	MTP-TRANSFER. request → 2	MTP-TRANSFER. request → 3	MTP-TRANSFER. request → 4
MTP-RESUME.indication	Set CL (Note 2) IN-SERVICE. indication (CL) If CL > CLnc then set Timer_Long → 4 else → 2	–	–	–
MTP-PAUSE.indication	–	OUT-OF-SERVICE. indication → 1	OUT-OF-SERVICE. indication reset Timer_Long reset Timer_Short → 1	OUT-OF-SERVICE. indication reset Timer_Long → 1
MTP-TRANSFER.indication	TRANSFER. indication → 1	TRANSFER. indication → 2	TRANSFER. indication → 3	TRANSFER. indication → 4

Table 8-3/Q.2150.1 – State transition table *(part 1 of 2)*

Event	State			
	1 **STC Service Unavailable**	**2** **STC Service Available**	**3** **Congestion I**	**4** **Congestion II**

MTP-STATUS.indication (Note 3)	–	CL := 1
		CONGESTION. indication (CL)
		set Timer_Long
		set Timer_Short
		→ 3
			3	set Timer_Long
				if CL < CLmc then
				CL := CL + CLst
				CONGESTION. indication (CL)
				set Timer_Short
				→ 3
				else
				→ 4

Expiry of Timer_Long	–	–	–	CL := CL – CLst
				CONGESTION. indication (CL)
				if CL > CLnc then
				set Timer_Long
				→ 4
				else
				→ 2

Expiry of Timer_Short	–	–	→ 4	–
MTP-STATUS.indication (Note 4)	→ 1	OUT-OF-SERVICE. indication MSTC-ERROR. indication → 1	OUT-OF-SERVICE. indication reset Timer_Long reset Timer_Short MSTC-ERROR. indication → 1	OUT-OF-SERVICE. indication reset Timer_Long MSTC-ERROR. indication → 1

Table 8-3/Q.2150.1 – State transition table *(part 2 of 2)*

Event	State		
	start		

Power-up		START-
		INFO.indication
		Set CL (Note 2)
		IN-SERVICE.
		indication (CL)
		If CL > CLnc then
		set Timer_Long
		→ 4
		else
		→ 2	

NOTE 1 – In this state transition table, the values for CL are used as follows: "CFnc" indicates "no congestion" and "CFmc" indicates maximum congestion; the amount of step up or down is "CFst". These values are provisioned (see 7.4) and used to illustrate the algorithm and are in no way binding for implementations; the number of steps of congestion level and/or amount of increase/decrease are considered to be network implementation dependent.

NOTE 2 – The value of CL when an MTP-RESUME.indication is received or at start-up is a network option.

NOTE 3 – Congestion indication without level.

NOTE 4 – Peer MTP user unavailable.

NOTE 5 – Congestion indication with congestion level is a national option; no state transitions are shown in this table.

8.4 SDL diagrams

The SDL diagrams are represented in Figures 8-2 to 8.4.

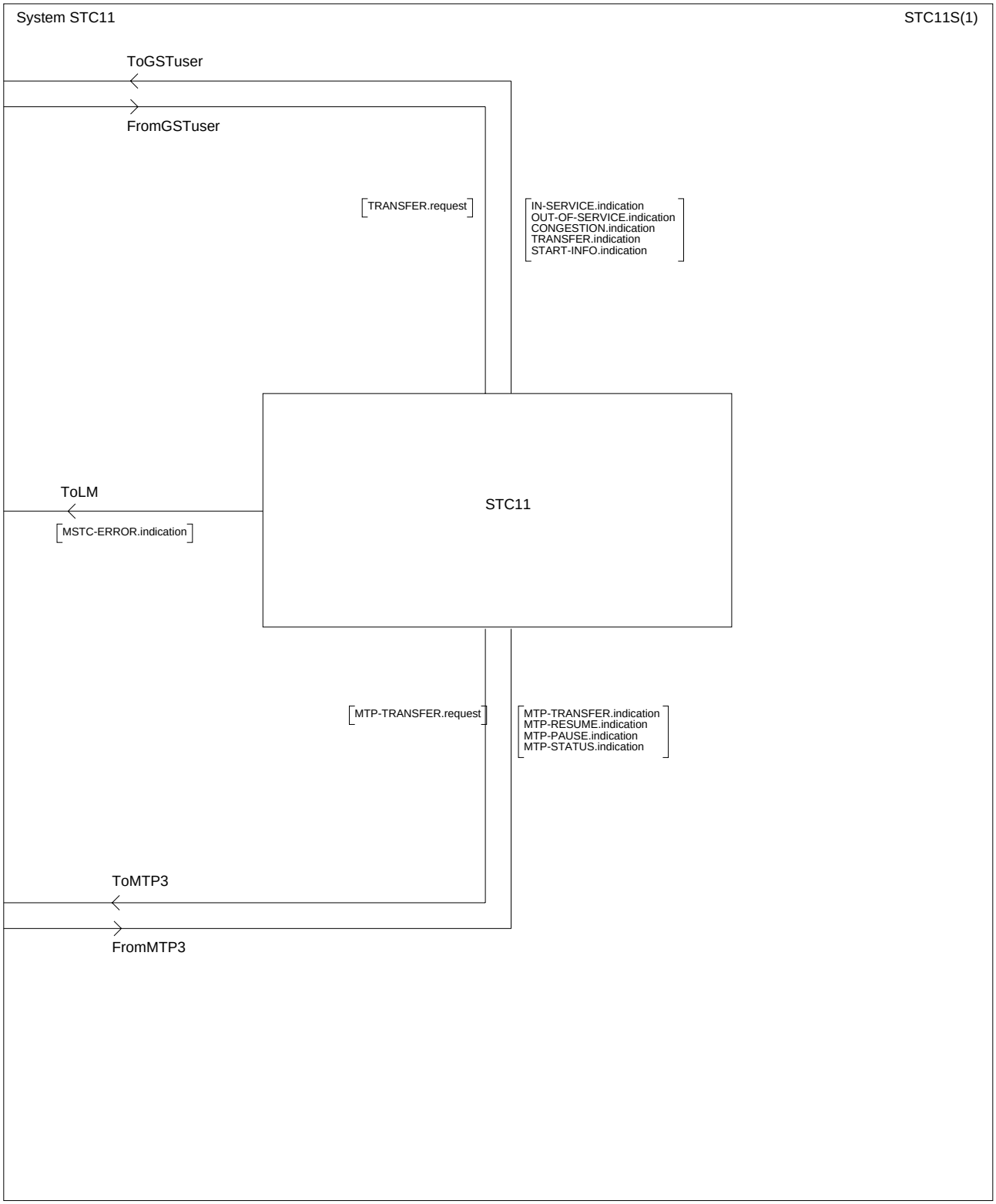


Figure 8-2/Q.2150.1 – SDL system of the Signalling Transport Converter

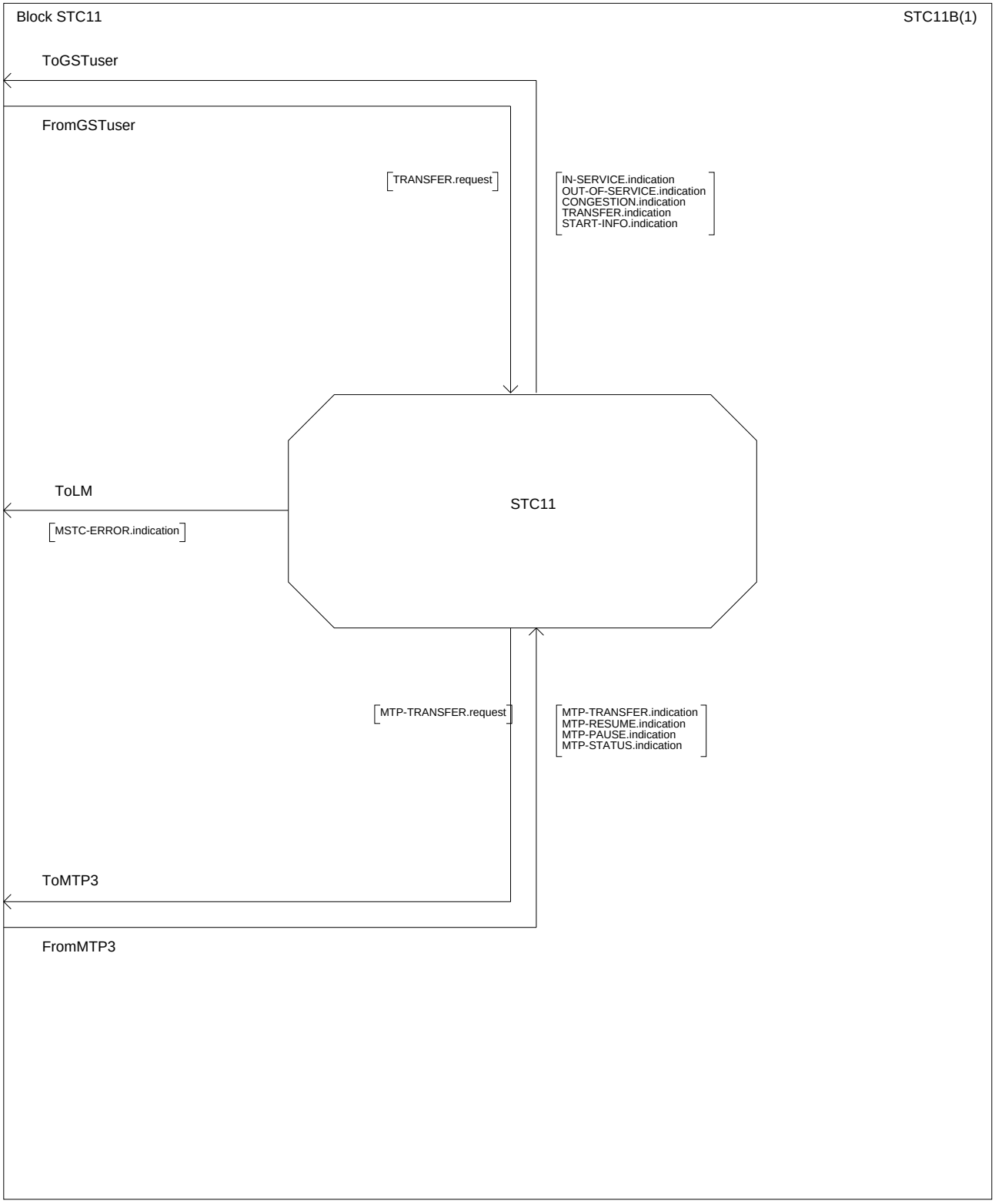


Figure 8-3/Q.2150.1 – SDL block structure of the Signalling Transport Converter

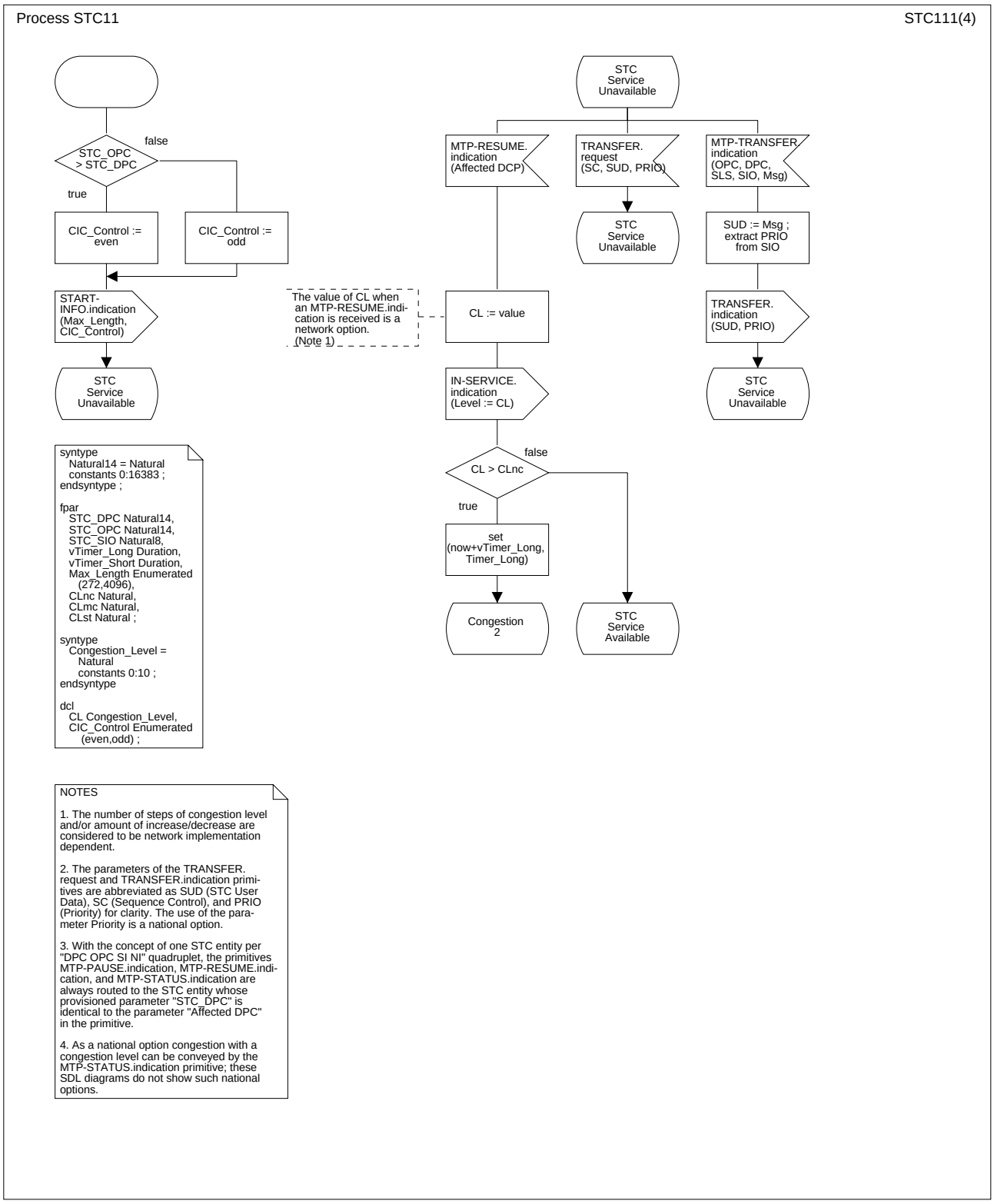


Figure 8-4/Q.2150.1 – SDL diagram for the Signalling Transport Converter *(part 1 of 4)*

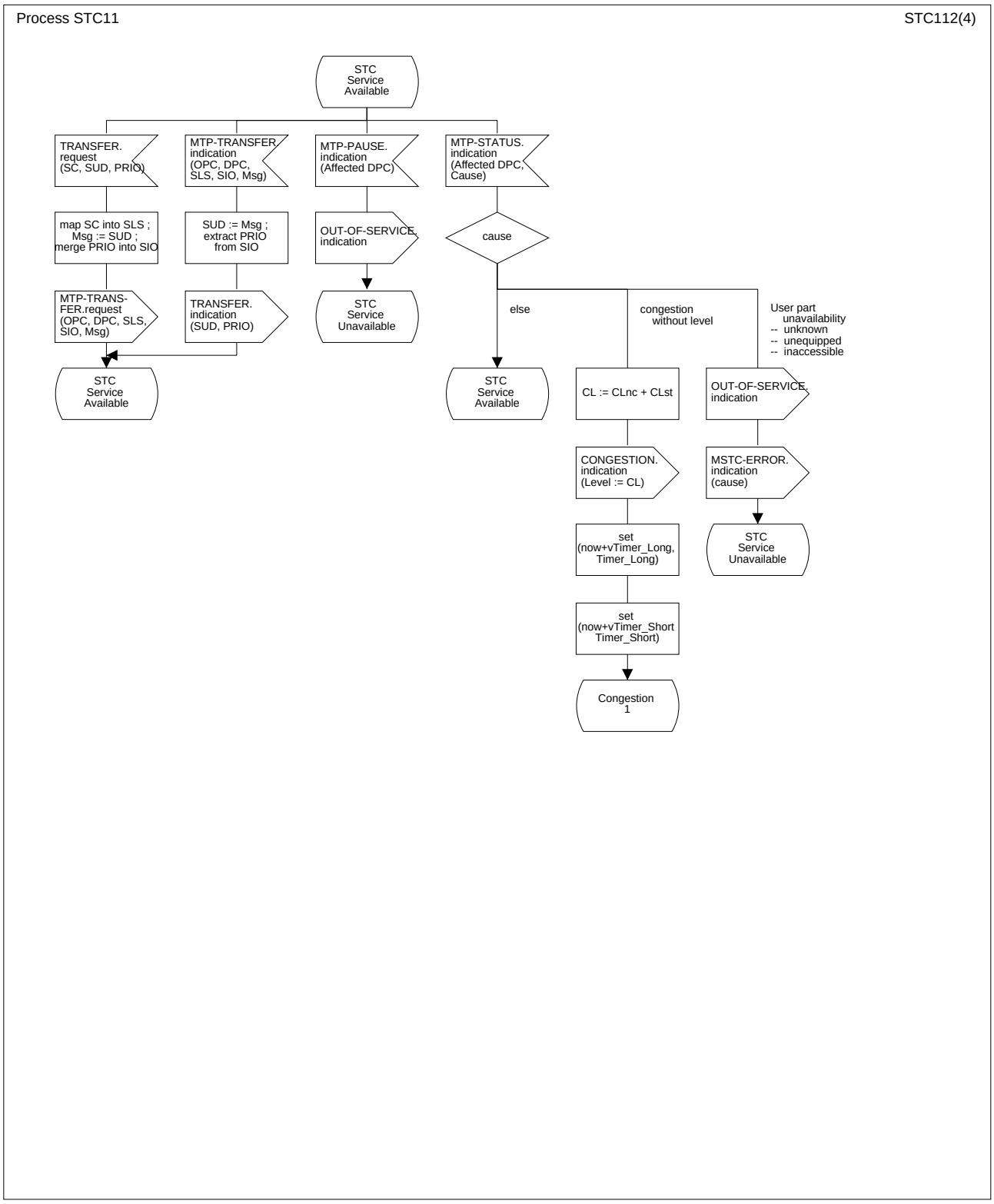


Figure 8-4/Q.2150.1 – SDL diagram for the Signalling Transport Converter *(part 2 of 4)*

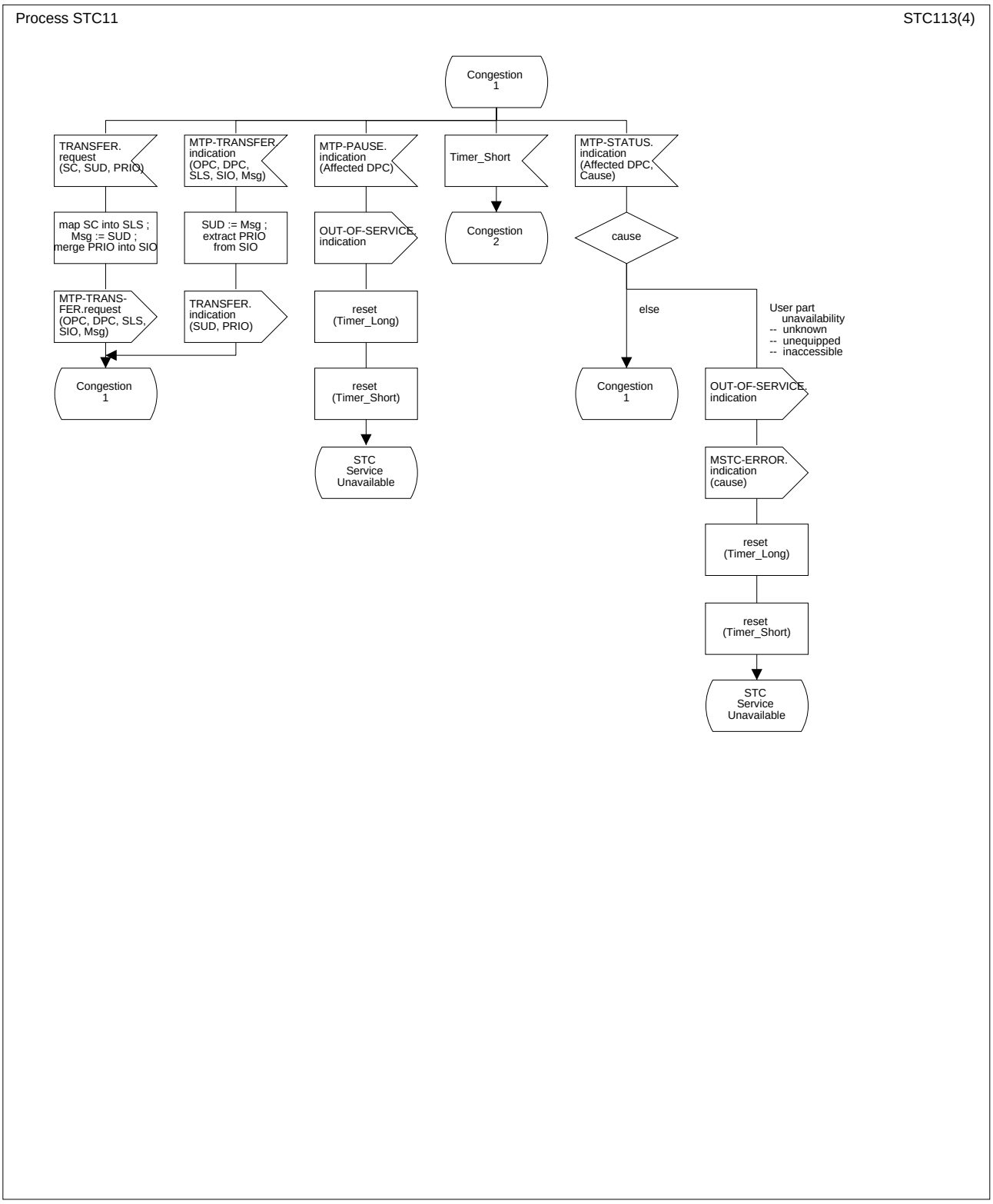


Figure 8-4/Q.2150.1 – SDL diagram for the Signalling Transport Converter *(part 3 of 4)*

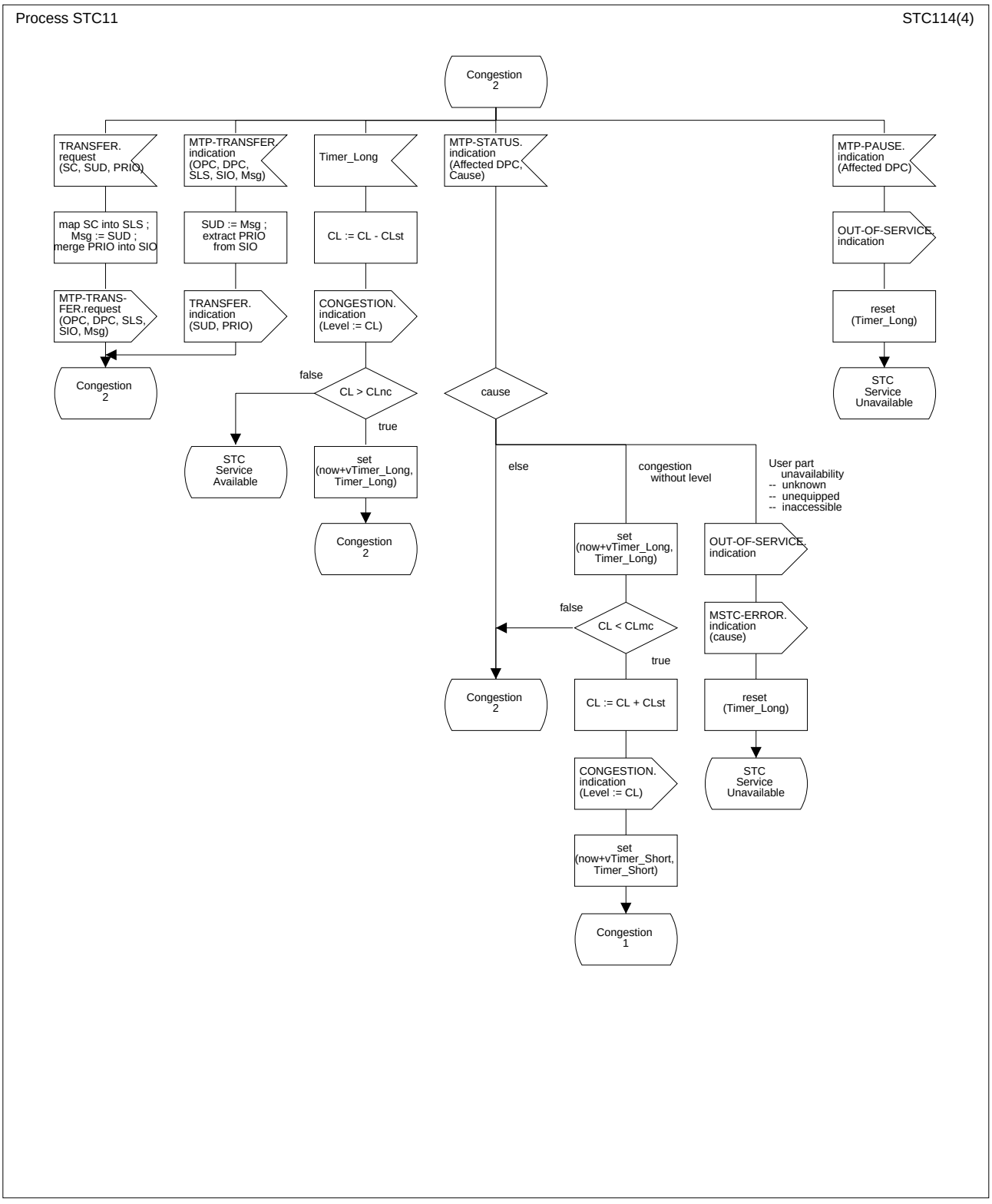


Figure 8-4/Q.2150.1 – SDL diagram for the Signalling Transport Converter *(part 4 of 4)*

APPENDIX I

Protocol Implementation Conformance Statement (PICS) Proforma

There exists no actions of the Signalling Transport Converter that are visible from outside a system, therefore a Protocol Implementation Conformance Statement is not possible. If the Generic Signalling Transport Service is based on MTP3 or MTP3b, all of clauses 7 and 8 of this Recommendation apply.

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