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SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – B-ISDN application protocols for the network signalling

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B-ISDN User Part – Look-ahead without state change for the Network Node Interface (NNI)

ITU-T Recommendation Q.2724.1

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.2724.1

B-ISDN USER PART – LOOK-AHEAD WITHOUT STATE CHANGE FOR THE NETWORK NODE INTERFACE (NNI)

Summary

This Recommendation specifies the extensions to the Broadband ISDN User Part for the support of look-ahead without state change.

Source

ITU-T Recommendation Q.2724.1 was prepared by ITU-T Study Group 11 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 9th of July 1996.

FOREWORD

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NOTE

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

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As of the date of approval of this Recommendation, the ITU had/had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Recommendation Q.2724.1

B-ISDN USER PART – LOOK-AHEAD WITHOUT STATE CHANGE FOR THE NETWORK NODE INTERFACE (NNI)

(Geneva, 1996)

1 Overview

1.1 Scope

This Recommendation specifies the procedures for Look-Ahead without state change at the B-ISDN Network Node Interface. This Recommendation specifies the essential features, procedures and operations required for Look-Ahead. The Look-Ahead facility allows a network to perform called-terminal availability and compatibility checking without any commitment of network resources.

The points-in-call at which this procedure may be invoked will be identified in the appropriate Basic Call, Additional Capability, or Supplementary Service Recommendations, i.e. in their Application Process procedures. However, guidelines for the selection of such points and how the procedure may be used are contained in Appendix II.

Procedures and additional parameters for Look-Ahead on non-basic call will be identified in the appropriate service Recommendations.

The action to be taken at six exchange types are described as:

– initiating exchange;
– intermediate national exchange;
– outgoing screening point and/or gateway exchange;
– intermediate international exchange;
– incoming screening point and/or gateway exchange;
– destination local exchange.

Actions common for all exchange types are described only once. Different, or additional actions required in specific types are described in separate subclauses applicable to this type of exchange.

Note that the incoming and outgoing screening points may be coincident with gateway exchanges, transit exchanges, local exchanges, or as free-standing functions according to the specific national network architecture.

1.2 References

The following ITU-T Recommendations, and other references contain provisions which, through reference in this text, constitute provision of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all 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 Recommendation Q.2763 (1995*), Signalling System No. 7 B-ISDN User Part (B-ISUP) – Formats and codes.*

[2] ITU-T Recommendation Q.2764 (1995), *Signalling System No. 7 B-ISDN User Part (B-ISUP) – Basic call procedures.*

[3] ITU-T Recommendation Q.2610 (1995), *Usage of cause and location in B-ISDN User Part and DSS 2*.

[4] ITU-T Recommendation Q.2964.1 (1996), *Digital Subscriber Signalling System No. 2 – Basic Look-Ahead*.

[5] ITU-T Recommendation Q.2725.1 (1996), *B-ISDN user part – Support of negotiation during connection setup*.

[6] ITU-T Recommendation Q.771 (1993), *Functional description of transaction capabilities*.

[7] ITU-T Recommendation Q.772 (1993*), Transaction capabilities information element definitions*.

[8] ITU-T Recommendation Q.711 (1996), *Functional description of the signalling connection control part*.

[9] ITU-T Recommendation Q.712 (1996), *Definition and function of signalling connection control part messages.*

[10] ITU-T Recommendation Q.713 (1996), *Signalling connection control part formats and codes*.

[11] ITU-T Recommendation Q.714 (1996), *Signalling connection control part procedures.*

[12] ITU-T Recommendation Q.715 (1996), *Signalling connection control part user guide*.

[13] ITU-T Recommendation Q.2931 (1995), *Digital Subscriber Signalling System No. 2 – User-Network Interface (UNI) layer 3 specification for basic call connection control.*

[14] ITU-T Recommendation Q.931 (1993), *ISDN user-network interface layer 3 specification for basic call control*.

[15] CCITT Recommendation X.209 (1988), *Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1).*

[16] ITU-T Recommendation Q.773 (1993), *Transaction capabilities formats and encoding*.

[17] ITU-T Recommendation Q.774 (1993), *Transaction capabilities procedures*.

[18] ITU-T Recommendation Q.775 (1993), *Guidelines for using transaction capabilities*.

1.3 Definitions

This Recommendation defines the following terms.

1.3.1 screening function: This function is optionally provided within a network to support network-specific screening of Look-Ahead operations and parameters within the LA application. This screening may, for example, include checking of specific parameter values and field contents against bilateral agreements between originating and terminating network operators.

1.3.2 screening point: The location at which the screening function is deployed within a given network. This may be an exchange of any type, or it may be a free-standing node.

1.4 Abbreviations

This Recommendation uses the following abbreviations.

AEI Application Entity Invocation

ASE	Application Service Element
ASN.1	Abstract Syntax Notation No. 1
B-ISDN	Broadband Integrated Services Digital Network
B-ISUP	Broadband ISDN User Part
ISDN	Integrated Services Digital Network
LA	Look-Ahead
MTP-3	Message Transfer Part 3
SACF	Single Association Control Function
SAO	Single Association Object
SCCP	Signalling Connection Control Part
TCAP	Transaction Capabilities Application Part

2 Specification model

The description of the Look-Ahead procedures are structured according to the model described in Figure 1.

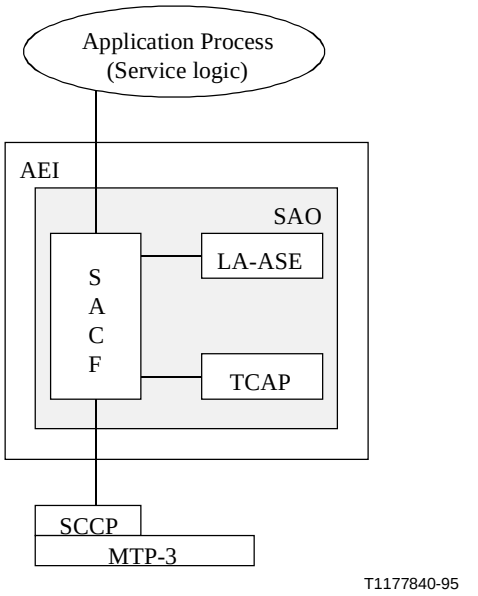


Figure 1/Q.2724.1 – Look-Ahead protocol architecture

3 Look-Ahead, application process functions

3.1 Primitive interface AP/SACF

The Look-Ahead functions in the application process use the services provided by the SACF primitive interface. These are listed in Table 1.

Table 1/Q.2724.1 – LA primitives between AP and SACF

Primitive name	Types
LA_Invoke	Req./Ind./Resp./Conf.
LA_Error	Ind.

Table 2 contains the list of parameters in the LA_Invoke Req./Ind./Resp./Conf. primitives that may be used for the Look-Ahead.

Table 2/Q.2724.1 – Contents of the LA_Invoke Req./Ind./Resp./Conf. primitive

LA_Invoke Req./Ind./Resp./Conf.	
Parameter	**Mandatory/Optional**
AAL_Parameters	O
AdditionalATMCellRate	O
ATM_CellRate	O
BroadbandBearerCapability	O
BroadbandHighLayerInformation	O
BroadbandLowLayerInformation (Note 1)	O
AESAforCalledParty	O
CalledPartyNumber	(Note 2)
CalledPartySubaddress	O
CauseIndicators	O
LookResult	O
NarrowbandBearerCapability (Note 1)	O
NarrowbandHighLayerCompatibility (Note 1)	O
NarrowbandLowLayerCompatibility (Note 1)	O
OAMTrafficDescriptor	O
NOTE 1 – The information elements contained into this parameter may be repeated in accordance with Recommendation Q.2931. NOTE 2 – This parameter will be mandatory in the forward direction (i.e. in the req. and ind. primitives), whilst it is not required in the backward direction (i.e. in the resp. and conf. primitives).	

Table 3 contains the list of parameters, used for the Look-Ahead, in the LA_Error Indication primitive.

Table 3/Q.2724.1 – Contents of the LA_Error Indication primitive

LA_Error Ind.	
Parameter	**Mandatory/Optional**
Error_Type	O

3.2 Procedures at initiating exchange

Initiating exchange is the exchange initiating the LA procedure and it could be any of the types, originating, transit, gateway or destination (not a free-standing screening point). Actions where the initiating exchange is also the destination exchange are specified by DSS 2 protocol [4].

3.2.1 Normal procedures

The LA-initiating exchange shall perform Look-Ahead based on service requirements, as indicated in Basic Call (Recommendation Q.2764) or other procedures (e.g. Point-to-multipoint, multiconnection, modification etc.). The criteria for this decision are outside the scope of this Recommendation, but some guidelines and suggestions are included in Appendix II.

The LA procedure is requested by the AP creating an instance of Look-Ahead AEI and sending an LA_Invoke.req primitive to the SACF.

If the LA-initiating exchange receives an LA_Invoke.conf primitive:

– which includes a satisfactory LookResult parameter, it shall start the normal setup procedure towards the addressed user, using the received alternatives;

– which includes an unsatisfactory LookResult parameter, or a Cause Indicators parameter, based on the received parameter values and possibly on the diagnostics field, it shall decide whether to clear the connection towards the calling party or to proceed with normal call setup. If the connection is to be cleared, the clearing message shall include the received cause value.

3.2.2 Exceptional procedures

If timer T-la expires, an LA_Invoke.resp primitive will be received by the AP. The LA-initiating exchange shall decide, based on service requirements, whether to continue the call setup or to clear the call towards the calling party.

An LA_Error.ind primitive will be received by the AP also when an error occurs at LA-ASE level.

3.3 Procedure at an intermediate national exchange

The AP of an intermediate national exchange takes part in the LA operation only when it is the LA initiating exchange (see 3.2).

3.4 Procedure at the outgoing screening point

The Look-Ahead AEI has to be instantiated to allow bridging of Look-Ahead requests from the incoming to outgoing network with any required screening.

When a Look-Ahead AEI is instantiated on the incoming side, an LA_Invoke.ind is received from the AEI. The exchange examines the called party number and determines the appropriate destination.

If the destination network is known not to support Look-Ahead, and the screening point is not the originating local exchange, an LA_Invoke.resp primitive shall be generated with the cause value #79 "Service or option not implemented" to inform the originating local exchange. If this occurs in the originating local exchange, the LA procedures will not be initiated.

Otherwise, the received parameters are screened in accordance with network agreements. An outgoing LA-AEI is instantiated, and the agreed parameters are sent to it in an LA_Invoke.req primitive.

On receipt of an LA_Invoke.conf primitive from an outgoing AEI by the application, the AEI from which the primitive was received is terminated, and the parameters received are screened and passed to the corresponding incoming AEI in an LA_Invoke.resp primitive.

If the T-la timer expires, an LA_Invoke.resp primitive is received by the AP from the SACF. An LA_Invoke.resp primitive will then be sent to the corresponding incoming AEI with an appropriate cause value.

3.5 Procedure at an intermediate international exchange

The AP of an intermediate international exchange takes part in the LA operation only where it is the LA initiating exchange (see 3.2).

3.6 Procedure at the incoming screening point

Procedures described in 3.4 for the outgoing screening point apply also for the incoming screening point.

3.7 Procedure at the destination local exchange

3.7.1 Normal procedures

At the destination local exchange, the LA procedure consists of the following actions.

When a Look-Ahead AEI is instantiated on the incoming side, an LA_Invoke.ind is received from the AEI. If a request is received, the destination local exchange shall perform one or both of the following actions:

– Start the appropriate procedure towards the user passing all the received parameters.

  If an answer is received from the access, the destination local exchange shall map the received information into parameters of LA_Invoke.resp primitive sent to the SACF.

– Check the user profile, subscription options, user availability.

  The result of this check may be used to populate the appropriate information (e.g. Cause indicators) in the LA_Invoke.resp primitive sent to the SACF.

If the LA procedure is not supported/implemented at the UNI, the procedure described in 3.7.2 applies.

3.7.2 Exceptional procedures

If no answer is received from the access, the destination local exchange shall:

– Check the user profile, subscription options, user availability.

  The result of this check may be used to populate the appropriate information (e.g. Cause indicators) in the LA_Invoke.resp primitive sent to the SACF.

Whenever the access does not support LA or does not respond, the destination local exchange shall include a Cause indicators parameter with the value #79 "Service or option not implemented".

If the destination local exchange cannot send a request for Look-Ahead to the destination access (e.g. if the called number does not exist or if the destination is out of order), the AP shall send an LA_Invoke.resp primitive to the SACF containing an appropriate cause value (e.g. either #1 "unallocated number" or #27 "destination out of order"). When possible it shall also check the user profile, subscription options, user availability. The result of this check shall also be used to populate the appropriate information in the LA_Invoke.resp primitive sent to the SACF.

4 SACF

The main objective of SACF is to receive/deliver primitives from/to the appropriate entity. To this purpose four interfaces (shown in Appendix IV) are defined by this Recommendation:

– AP/SACF (see 3.1);

– SCCP/SACF (see 4.1);

– LA-ASE/SACF (see 5.1);

– TCAP/SACF (see 6.1).

Table 4 shows the correspondence among the primitives between AP and SACF and those between SACF and LA-ASE. The direction to correlate the primitives at the SACF is also indicated.

Table 4/Q.2724.1 – Correspondence among the primitives between AP and SACF and those between SACF and LA-ASE

AP Interface	SACF	LA-ASE Interface
LA_Invoke Req./Ind./Resp./Conf.	<-------->	LA_ASE_Information Req./Ind./Resp./Conf.
LA_Error Ind.	<--------- (Note)	LA_ASE_Information Ind.
NOTE – It has to be noted that as consequence of "System Failure" or "Task Refused" error the SACF will issue the LA_Error ind. (instead of LA_Invoke) primitive towards AP.		

With regard to the interface between SACF and TCAP, all the TC primitives exchanged between the LA-ASE and the TCAP pass through the SACF unchanged.

4.1 Interface SCCP/SACF

4.1.1 Primitives

The SACF uses the services provided by the SCCP primitive interface. For details refer to SCCP Recommendations Q.711 [8] and Q.712 [9].

4.1.2 Use of SCCP

The Look-Ahead application uses SCCP Class 0 (Basic connectionless service). For details refer to SCCP Recommendation Q.714 [11].

The SCCP Return Option is not used for the Look-Ahead mechanism.

For the SCCP formats and codes refer to SCCP Annex B/Q.713 [10].

5 LA-ASE

5.1 Interface LA-ASE/SACF

Table 5 contains the primitive exchanged between SACF and LA-ASE.

Table 5/Q.2724.1 – LA primitive between SACF and LA-ASE

Primitive name	Type
LA_ASE_Information	Req./Ind./Resp./Conf.

Table 6 contains the full list of parameters in the LA_ASE_Information Req./Ind./Resp./Conf. that may be used for the Look-Ahead.

Table 6/Q.2724.1 – Contents of the LA_ASE_Information Req./Ind./Resp./Conf. primitive

Parameter	Mandatory/Optional
AAL_Parameters	O
AdditionalATMCellRate	O
ATM_CellRate	O
BroadbandBearerCapability	O
BroadbandHighLayerInformation	O
BroadbandLowLayerInformation (Note 1)	O
AESAforCalledParty	O
CalledPartyNumber	(Note 2)
CalledPartySubaddress	O
CauseIndicators	O
LookResult	O
NarrowbandBearerCapability (Note 1)	O
NarrowbandHighLayerCompatibility (Note 1)	O
NarrowbandLowLayerCompatibility (Note 1)	O
OAMTrafficDescriptor	O
NOTE 1 – The information elements contained into this parameter may be repeated in accordance with Recommendation Q.2931. NOTE 2 – This parameter will be mandatory in the forward direction (i.e. in the req. and ind. Primitives), whilst it is not required in the backward direction (i.e. in the resp. and conf. Primitives).	

The invocation of LA is left as a network option to perform called-terminal availability and compatibility checking. If the compatibility checking is performed, the involved parameters can be used as specified by Recommendations Q.2764 and Q.2931. The Called Party Subaddress is used to reach the appropriate called terminal as for the Supplementary Service.

5.2 Supported operation

A single operation is supported by the ASE:

- lookahead.

Invocation of the above mentioned operation can generate the following components:

– *LookAhead invoke*;

– *LookAhead return result*;

– *LookAhead return error*.

5.3 ASE procedures

5.3.1 Dialogue beginning

5.3.1.1 Initiating exchange

When a LA_ASE_Information.req primitive is received, the LookAhead operation is invoked. The request to transfer *LookAhead invoke* component is passed to TCAP by means of TC-INVOKE.req primitive through the SACF.

The TC-BEGIN.req primitive is then issued to TCAP to request to open the dialogue (and to send to the remote peer entity the component previously received).

5.3.1.2 Responding exchange

The request to open the dialogue is passed from TCAP to the LA-ASE via SACF by means of a TC-BEGIN.ind primitive.

The reception of a *LookAhead invoke* component will be indicated by means of a TC-INVOKE ind. primitive from TCAP, via SACF. This is passed back to SACF in a LA_ASE_Information ind.

5.3.2 Normal dialogue end

5.3.2.1 Responding exchange

When a LA_ASE_Information.resp primitive is received from SACF it is mapped to the TC-RESULT-L.req primitive issued to TCAP, via SACF. Two types of components can be generated. They are:

– *LookAhead return result* component if the LA procedure was fully performed (either positive or negative);

– *LookAhead return error* component if the LA procedure could not be performed (Abnormal dialogue end).

The TC-END.req primitive will be issued to TCAP, via SACF, to send to the remote peer entity the appropriate component previously received.

5.3.2.2 Initiating exchange

If the initiating LA-ASE receives a TC-END.ind primitive, the contained component is mapped to a LA_ASE_Information.conf primitive.

5.3.3 Abnormal dialogue end

At either the initiating or responding exchange the dialogue can also be terminated if a "System Failure" or "Task Refused" error occurs. At the exchange where the error occurs a TC-END.ind will be sent to TCAP and, additionally, the LA-ASE generates a LA_ASE_Information.ind primitive which will be used by SACF to generate an LA_Error.ind primitive towards the AP. At the other exchange a TC-END.ind will be received and a LA_ASE_Information.req primitive is generated, containing the Operation Error defined in the LA-ASE ASN.1 module (see 5.6). This primitive will be used by SACF to generate an LA_Error.ind primitive towards the AP.

5.4 Parameters

In the following the B-ISUP parameters which could be involved in the LA procedure are listed (see also Table 6). In Appendix I the applicability of each parameter for availability and/or compatibility checking is indicated.

Addressing and identification parameters:

- called party number;
- called party subaddress;
- AESA for called party.

Resource parameters:

- AAL parameters;
- Additional ATM cell rate;
- ATM cell rate;
- broadband bearer capability;
- broadband high layer information;
- broadband low layer information;
- narrow-band bearer capability.
- narrow-band high layer compatibility;
- narrow-band low layer compatibility;
- OAM traffic descriptor.

Cause parameter:

- Cause indicators.

Note that the LookResult parameter is unique to the Look-Ahead, and is therefore not imported from B-ISUP, but is specified within this ASE.

5.5 Abstract syntax, general

Subclause 5.6 specifies the operations and errors which form the Look-Ahead ASE using the Abstract Syntax Notation One (ASN.1), as defined in Recommendation X.208 and the OPERATION and ERROR MACROs defined in Recommendations Q.771 to Q.775.

The set of values each of which is a value of the ASN.1 type TCAP Messages, Message Type as defined in Recommendations Q.771 to Q.775 with the ANY DEFINED BY clauses resolved by the operations and errors definitions included in 5.6 form the abstract syntax for the Look-Ahead ASE protocol.

The ASN.1 data type which follows the keywords "ARGUMENT" or "RESULT" (for OPERATION and ERROR) is always optional from a syntactic point of view. However, except when stated otherwise, it has to be considered as mandatory from a semantic point of view.

The LA-ASE is responsible for encoding and decoding the parameters. The Basic Encoding Rules as defined in Recommendation X.209 are used for encoding the LA-ASE operation and identifying the individual parameters.

5.6 ASN.1 module

The following table shows the definition of the operations, errors and types required for the Look-Ahead operation using ASN.1 as defined in Recommendation X.208 and using the

OPERATION and ERROR macro as defined in Recommendations Q.771 to Q.775. Parameters useful for the LA-ASE are imported from ASN.1 module attached in Annex A.

```
LookAheadProtocol {itu recommendation q 2724 1 modules(0) operations-and-errors(1) version1(0)}

DEFINITIONS IMPLICIT TAGS::=

BEGIN

IMPORTS
        OPERATION, ERROR

        FROM TCAPMessages {itu recommendation q 773 modules(0) messages (1) version2(2)}
                                                -- white book TCAP
        AALParameters,
        AdditionalATMCellRateparameterfield,
        ATMCellRate,
        BroadbandBearerCapability,
        BroadbandHighLayerInfo,
        BroadbandLowLayerInfo,
        AESAForCalledParty,
        CalledPartyNumber,
        CalledPartySubaddress,
        CauseIndicators,
        NarrowbandBearerCapability,
        NarrowbandHighLayerCompa,
        NarrowbandLowLayerCompa,
        OAMTrafficDescriptor

        FROM LookAheadParameters {itu recommendation q 2724 1 modules (0) parameters(2) version1(0)}

        SystemFailure,
        TaskRefused

        FROM IN-CS-1-Errors {itu recommendation q 1218 modules (0) cs-1-errors(1) version1(0)};
Lookahead ::=           OPERATION

ARGUMENT                SET {
    aALParameters                           [71]    AALParameters                           OPTIONAL,
    additionalATMCellRateparameterfield     [90]    AdditionalATMCellRateparameterfield     OPTIONAL,
    aTMCellRate                             [8]     ATMCellRate                             OPTIONAL,
    broadbandBearerCapability               [80]    BroadbandBearerCapability               OPTIONAL,
    broadbandHighLayerInfo                  [70]    BroadbandHighLayerInfo                  OPTIONAL,
    broadbandLowLayerInfo                   [79]    BroadbandLowLayerInfo                   OPTIONAL,
    AESAForCalledParty                      [88]    AESAForCalledParty                      OPTIONAL,
    calledPartyNumber                       [4]     CalledPartyNumber,
    calledPartySubaddress                   [21]    CalledPartySubaddress                   OPTIONAL,
    narrowbandBearerCapability              [29]    NarrowbandBearerCapability              OPTIONAL,
    narrowbandHighLayerCompa                [52]    NarrowbandHighLayerCompa                OPTIONAL,
    narrowbandLowLayerCompa                 [37]    NarrowbandLowLayerCompa                 OPTIONAL,
    oAMTrafficDescriptor                    [72]    OAMTrafficDescriptor                    OPTIONAL
    }
```

```
RESULT                  SET{
        causeIndicators                 [18]    CauseIndicators                 OPTIONAL,
        lookResult                      [94]    LookResult                      OPTIONAL
        }
ERRORS                  {
        SystemFailure,                          -- The operation could not be completed due to a system
                                                -- failure at the serving physical entity.
        TaskRefused                             -- An entity normally capable of the task requested cannot or
                                                -- chooses not to perform the task at this time.
                                                -- This include errors situations like congestion.
                        }

LookResult ::= ENUMERATED {
                        compatibleAndFree       (0),
                        compatibleAndBusy       (1),
                        incompatible            (2)
                        }
--      object identifier path
        lookAheadOID    OBJECT IDENTIFIER       ::= {itu recommendation q 2724 1 operations-and-
        errors(1)}

--      operation values
        lookAhead       LookAhead               ::= globalValue {lookAheadOID lookahead(1)}

--      ERROR codes
        systemFailure   SystemFailure           ::= globalValue {lookAheadOID systemfailure(2)}
        taskRefused     TaskRefused             ::= globalValue {lookAheadOID taskrefused(3)}
--      timer T-la = 10 sec                     It is used to protect application against excessive delay in
--                                              response from the next exchange or terminating user.
END
```

6 TCAP

6.1 Interface TCAP/SACF

6.1.1 Primitives

The SACF uses the services provided by the TCAP primitive interface. For details refer to *White Book* TC Recommendations Q.771 [6] and Q.772 [7].

6.1.2 Use of TCAP

The dialogue defined for the LA operation between the peer-to-peer entities (TC-Users) is a structured dialogue. The dialogue ID parameter is used in both operation handling and transmission (dialogue) handling primitives to determine which component(s) pertain(s) to which dialogue.

Each TC-User has its own reference for a given dialogue. These references are local references and mapping of these local references into protocol references transaction ID, included in the messages, is done by TCAP.

It has to be noted that the AP at the Screening Point has to correlate the two TCAP Transaction IDs used within the two networks to allow the LA response to pass through the same Screening Point chosen for the LA invoke.

NOTE – The SCCP calling address will be held by the TCAP-ASE for routing of return messages until the TC dialogue is terminated.

Class 1 operation (both success and failure reported) is used.

There is a Timer (T-la), handled by TC, which is started when the LA procedure is requested by the AP by sending an LA_Invoke.req primitive to the SACF. The value of LA Timer will then be passed to TCAP by means of TC-INVOKE.req primitive. This Timer is stopped when the response to the LA request is received (i.e. when a TC-END.ind primitive is sent by TCAP towards LA-ASE via SACF). On expiry of Timer T-la, the TC will generate a TC-L-CANCEL.ind primitive (which has only local effect) towards LA-ASE via SACF. The LA-ASE will issue an LA_ASE_Information.ind with the cause value #102 "Recovery on Timer expiry" towards SACF which will generate an LA_Invoke.resp primitive towards the AP.

If the destination local exchange does not support the LA-ASE but the SSN for B-ISDN edge-to-edge is supported, the destination local exchange shall end the TCAP dialogue by sending a TC-U-ABORT message to the originating TCAP which will issue a TC-U-ABORT.ind primitive towards LA-ASE via SACF containing the cause for which it was decided to abort the dialogue. The LA-ASE will then send back to the SACF an LA_ASE_Information.ind primitive with the appropriate cause value (#79 "Service or option not implemented") that will be used by the SACF to generate an LA_Invoke.resp primitive towards the AP.

If the destination local exchange does not support the SSN for B-ISDN edge-to-edge, refer to 3.2.2 (Exceptional Procedures).

7 Timers

This clause specifies timers relevant for the LA procedure.

T-la Supervision Timer. Used to protect application against excessive delay in response from the next exchange or terminating user. The duration of this timer shall be 10 seconds.

ANNEX A

ASN.1 module defining B-ISUP parameters applicable for LA-ASE

```
LookAheadParameters {itu recommendation q 2724  1 modules(0) parameters(2) version1(0)}

DEFINITIONS IMPLICIT TAGS::=

BEGIN

AALParameters     ::= SEQUENCE
            {
                  codingStandard                        CodingStandard,
                  aALParametersField                    AALParametersField
            }

AdditionalATMCellRateparameterfield ::=  SET OF                 ATMCellRateField

ATMCellRate  ::=  SET OF        ATMCellRateField

BroadbandBearerCapability ::=  SEQUENCE
            {
                  codingStandard                        CodingStandard,
                  broadbandBearerCapabilityField        BroadbandBearerCapabilityField
            }
```

```
BroadbandHighLayerInfo ::=  SEQUENCE
        {
                codingStandard                          CodingStandard,
                broadbandHighLayerInformationField      BroadbandHighLayerInformationField
        }

BroadbandLowLayerInfo ::=  SEQUENCE
        {
                priority                                Priority,
                repeatIndicator                         RepeatIndicator,
                broadbandLowLayerInformationField       SEQUENCE OF
                                                                BroadbandLowLayerInformationField
        }

AESAForCalledParty ::= SEQUENCE
      {
                codingStandard                          CodingStandard,
                AESAForCalledPartyField                 AESAForCalledPartyField
      }

CalledPartyNumber ::=  SEQUENCE
        {
                natureOfAddressIndicator                NatureOfAddressIndicator,
                numberingPlanIndicator                  NumberingPlanIndicator,
                internalNetworkNumberIndicator          InternalNetworkNumberIndicator,
                calledPartyAddress                      CalledPartyAddress
        }

CalledPartySubaddress ::=  SEQUENCE
        {
                codingStandard                          CodingStandard,
                calledPartySubaddressField              CalledPartySubaddressField
        }

CauseIndicators ::=  OCTET STRING (SIZE (7..N))
                -- coding as Recommendation Q.2610

NarrowbandBearerCapability ::=  SEQUENCE
        {
                priority                                Priority,
                repeatIndicator                         RepeatIndicator,
                narrowbandBearerCapabilityField         SEQUENCE OF
                                                                NarrowbandBearerCapabilityField
        }

NarrowbandHighLayerCompa ::=  SEQUENCE
        {
                priority                                Priority,
                repeatIndicator                         RepeatIndicator,
                narrowbandHighLayerCompaField           SEQUENCE OF
                                                                NarrowbandHighLayerCompaField
        }

NarrowbandLowLayerCompa ::=  SEQUENCE
        {
                priority                                Priority,
                repeatIndicator                         RepeatIndicator,
                narrowbandLowLayerCompaField            SEQUENCE OF
                                                                NarrowbandLowLayerCompaField
        }
```

```
OAMTrafficDescriptor ::= SEQUENCE
        {
                codingStandard                  CodingStandard,
                oAMTrafficDescriptorField       OAMTrafficDescriptorField
        }

                                        -- Parameters content

AALParametersField  :: OCTET STRING (SIZE (1..17))
                --      coding as AAL parameters info element Recommendation Q.2931 starting with octet 5

ATMCellRateField ::= SEQUENCE
        {
                cellRateIdentifier              CellRateIdentifier,
                cellRateID                      CellRateID
        }

CalledATMEndSystemAddressField ::= OCTET STRING (SIZE (2..21))
                --      coding as called party number info element in Recommendation Q.2931 starting with octet 5

CellRateIdentifier ::= ENUMERATED
        {
                forwardPeakCellRateForCellLossPriority0(2),
                backwardPeakCellRateForCellLossPriority0(3),
                forwardPeakCellRateForCellLossPriority0and1(4),
                backwardPeakCellRateForCellLossPriority0and1(5)
        }

CellRateID ::= INTEGER (0..16777215)            --      maximum value 2^24 - 1

BroadbandBearerCapabilityField ::= OCTET STRING (SIZE (2..3))
                --      coding as Broadband BC info element in Recommendation Q.2931 starting with octet 5

BroadbandHighLayerInformationField ::= OCTET STRING (SIZE (1..9))
                --      coding as Broadband HLC info element in Recommendation Q.2931 starting with octet 5

BroadbandLowLayerInformationField ::= OCTET STRING (SIZE (4..17))
                --      coding as Broadband LLC info element in Recommendation Q.2931 including the header

CalledPartyAddress ::= SEQUENCE SIZE (0..16) OF CalledAddressSignal

CalledAddressSignal ::= ENUMERATED
        {
                digit0(0),
                digit1(1),
                digit2(2),
                digit3(3),
                digit4(4),
                digit5(5),
                digit6(6),
                digit7(7),
                digit8(8),
                digit9(9),
                code11(11),
                code12(12),
                sTsignal(15)
        }

CalledPartySubaddressField ::= OCTET STRING (SIZE (2..21))
                --      coding as SUB info element in Recommendation Q.2931 starting with octet 5
```

```
NatureOfAddressIndicator ::= ENUMERATED
        {
                subscriberNumber(1),                    -- for national use
                unknown(2),                             -- for national use
                nationalSignificantNumber(3),
                internationalNumber(4)                  -- values 112..126 are reserved
        }

NumberingPlanIndicator ::= ENUMERATED
        {
                iSDNTelephonyNumberingPlanE.164(1)  -- values 3, 4, 5 and 6 are reserved
                                                    --    for national use
        }

InternalNetworkNumberIndicator ::= ENUMERATED
        {
                routingToInternalNetworkNumberAllowed(0),
                routingToInternalNetworkNumberNotAllowed(1)
        }

Priority ::= ENUMERATED
        {
                noPrioritisedOrder(0),
                prioritisedListInAscendingOrder(1),
                prioritisedListInDecendingOrder(2)
                        --      values 3..15 are reserved
        }

RepeatIndicator ::= ENUMERATED
        {
                informationElementNotRepeated(0),
                informationElementRepeated(1)
        }

NarrowbandBearerCapabilityField ::= OCTET STRING (SIZE (4..13))
                --      coding as Narrow-band BC info element in Recommendation Q.2931 including the header

NarrowbandHighLayerCompaField ::= OCTET STRING (SIZE (4..7))
                --      coding as Narrow-band HLC info element in Recommendation Q.2931 including the header

NarrowbandLowLayerCompaField ::= OCTET STRING (SIZE (4..20))
                --      coding as Narrow-band LLC info element in Recommendation Q.2931 including the header

OAMTrafficDescriptorField  :: OCTET STRING (SIZE (2))
                --      coding as OAM traffic descriptor IE in Recommendation Q.2931 starting with octet 5

END
```

ANNEX B

Network Look Ahead Indicator parameter

B.1 Network Look Ahead Indicator parameter

In order to indicate that a network Look-Ahead without call state change was invoked (successfully or unsuccessfully), the Network Look Ahead Indicator parameter shall be included in the IAM message if Look-Ahead has been performed and shall be transferred to the destination network.

However, any exchange receiving an IAM message including this indicator shall decide according to its logic whether to perform Look-Ahead.

B.2 Formats

The parameter name code assigned to the Network Look Ahead Indicator parameter is 0101 1111.

The format of the parameter is shown in Figure B.1.

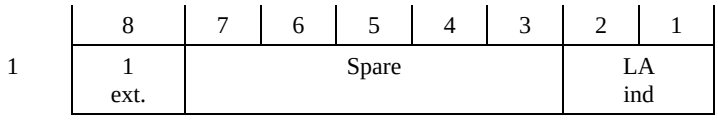


Figure B.1/Q.2724.1 – Network Look Ahead Indicator parameter field

The following codes are used in the Network Look Ahead Indicator parameter field:

a) *Extension indicator*

0 octet continues through the next octet;

1 last octet;

b) *Look Ahead indicator*

00 no indication;

01 Network Look Ahead invoked – no indication;

10 reserved;

11 Network Look Ahead invoked – an answer received from the terminating exchange or private network.

The coding of the instruction indicators for the Network Look Ahead Indicator parameter is shown in Appendix VI.

B.3 Procedures

The indicator shall be set to "Network look-ahead invoked – an answer received from the terminating exchange or private network" if look-ahead was invoked and an answer was received from the terminating exchange or private network.

The indicator shall be set to "Network look-ahead invoked – no indication" if look-ahead was invoked and an answer was not received from the terminating exchange or private network. In this case, an answer might have been received from an intermediate exchange or private network or no answer might have been received.

APPENDIX I

B-ISUP Parameters used in the Look-Ahead Procedure

In the following table, it is indicated which action can be taken for each parameter that could be included in the LA procedure.

Parameter	Action
AAL Parameters	Compatibility checking
Additional ATM Cell Rate	Compatibility checking
ATM Cell Rate	Compatibility checking
Broadband Bearer Capability	Compatibility checking
Broadband High Layer Information	Compatibility checking
Broadband Low Layer Information	Compatibility checking
AESA for Called Party	Routing to destination end system
Called Party Number	Routing to destination UNI
Called Party Subaddress	Routing to destination terminal
Cause Indicators	
Narrow-band Bearer Capability	Compatibility checking
Narrow-band High Layer Compatibility	Compatibility checking
Narrow-band Low Layer Compatibility	Compatibility checking
OAMTrafficDescriptor	Compatibility checking
NOTE – The Called Party Subaddress is used to reach the appropriate called terminal as for the Supplementary Service.	

APPENDIX II

Guidelines on the use of Look-Ahead without state change

The B-ISDN NNI Look-Ahead without state change capability is intended to minimize the commitment of resources to calls that eventually fail to be delivered or accepted. The procedure is optional and can be invoked by any exchange on encountering a suitable trigger condition.

These trigger conditions are not subject to standardization, but the following guidelines give suggested criteria for invoking Look-Ahead and may be used to define such trigger conditions.

The Look-Ahead procedure is defined to operate prior to the establishment of a single connection, so these guidelines refer to connection establishment rather than call establishment. Also, the guidelines are written as if an IAM for the new connection had already been assembled, but not yet sent.

II.1 Criteria for invocation

The following suggested criteria are illustrations only, and the lists given are neither inclusive nor exclusive of other possibilities.

II.1.1 High-resource connections

The network may consider using the Look-Ahead procedure when:

- ATM Cell Rate indicates a connection at a bandwidth greater than a specific threshold, the value of which would be determined by current local circumstances.

- ATM Cell Rate indicates a connection at a bandwidth greater than a specific threshold, with different threshold values depending on networks to be traversed, the value of each of which would be determined by current local circumstances.
- Network management indicates that the user-plane of the network is under heavy load, with increasing competition for scarce user-plane resources.

The threshold values selected by the network operator may change according to the time of day, day of week, or similar scheduling reasons, so as to ensure maximum resource saving at times when resources are most scarce.

II.1.2 Number analysis

The network may consider using the Look-Ahead procedure when:

- Connection is directed to a country code with a known low penetration of B-ISDN subscribers (e.g. developing countries).
- Connection is directed to an own-network or national area code known to have limited or no penetration of B-ISDN subscribers.

II.1.3 Service indications

The network may consider using the Look-Ahead procedure when:

- B-LLI, H-LLI and/or BC parameters indicate a request for a service that is not recognized as standard, or that is known to be unavailable on a high percentage of terminal equipments.
- Parameters indicate a service that is not known to be standardized for use in the called Country.

II.1.4 Calling party indications

The network may consider using the Look-Ahead procedure when:

- The calling party is known to make a high proportion of unsuccessful calls.

II.2 Criteria for precluding use of Look-Ahead

Where one or more of the above criteria indicate that Look-Ahead may be usefully employed, the network operator might choose to modify the decision based on other criteria that make the procedure inappropriate. One of the most important criteria for precluding use of LA could be dependent from subscription or service information which indicates that Call Setup delay must be minimized. It is the responsibility of the service logic not to invoke the LA procedure when the resulting overall setup delay could be unacceptably high.

In the following, a list containing some cases that could be used by the network to decide whether the use of Look-ahead is not appropriate is provided:

- Subscription or service information indicates that Call Setup delay must be minimized.
- Number analysis identifies a called country or network that is known to not support the Look-Ahead mechanism.
- Network management indicates that the signalling network is heavily loaded, while the user-plane of the network is not.

II.3 Management of Look-Ahead criteria

All the above criteria require the management of threshold values, data tables, or historical information. These are all subject to change over time, and require to be managed. Therefore the

choice of criteria for the invocation of Look-Ahead will be related to local regulations and the operators policy on storing and managing such information.

II.4 Relationship between Look-Ahead and Multiparty service

For the Multiparty service where only sequential setup and addition of parties is used, the LA procedure can be repeated towards all the parties involved in the multiparty call.

There is no need to include the Leaf Party Type parameter for Look-Ahead, as any such consideration will be handled by the service logic of the LA-initiating node.

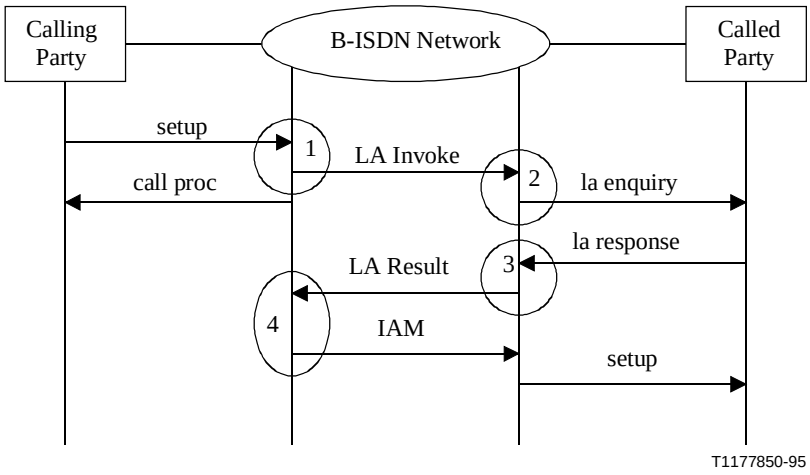
APPENDIX III

Look-Ahead message flow for the UNI/NNI interworking

In this Appendix, some examples are presented in order to show the UNI/NNI interworking aspects related to the Look-Ahead procedures. It has to be noted that for the UNI side the flow does not refer to any specific messages.

III.1 First scenario

In this scenario, the OLEX determines, based on service requirements, that LA has to be performed. The LA procedure can be performed at the destination address, resulting in compatibility and availability of the terminal.



1 The OLEX determines that LA has to be performed. The parameters used for availability/compatibility check are included in the *LookAhead invoke* component which is sent to the DLEX. Timer T-la is started.

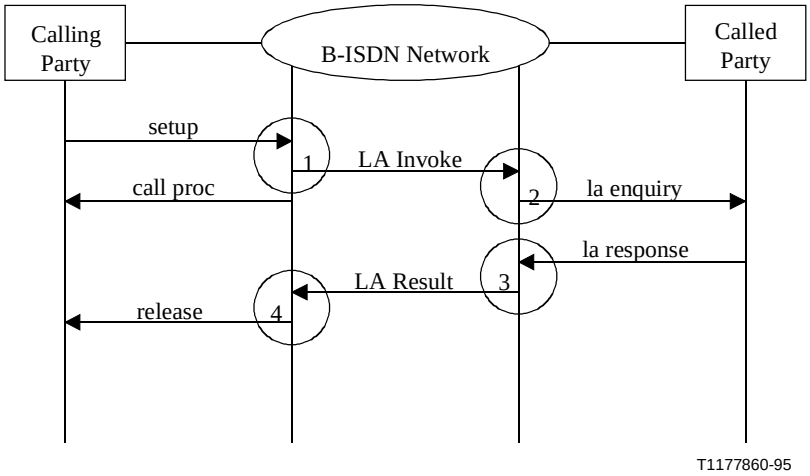
2 On receipt of the *LookAhead invoke* component, the DLEX shall map the received information into the LA_Enquiry message sent through the UNI to the addressed user. A supervision timer is started both at the UNI and at the NNI to ensure that an answer is received from the access within a prescribed interval of time.

3 An LA Response message is received from the access, which contains the result of the availability/compatibility check and does not contain any cause value. The supervision timer is stopped both at the UNI and at the NNI. The received information is mapped in the parameters included in the *LookAhead return result* component. No interpretation is required at the NNI of the information received from the access.

4 The OLEX receives the *LookAhead return result* component and stops timer T-la. Since it does not contain any cause value indicating that the call cannot be completed, normal call setup is performed, using the appropriate values for the parameters.

III.2 Second scenario

In this scenario, the OLEX determines, based on service requirements, that LA has to be performed. The LA procedure can be performed at the destination address, resulting in an indication that the call cannot be completed (e.g. user busy or incompatible destination).



1 The OLEX determines that LA has to be performed. The parameters used for availability/compatibility check are included in the *LookAhead invoke* component which is sent to the DLEX. Timer T-la is started.

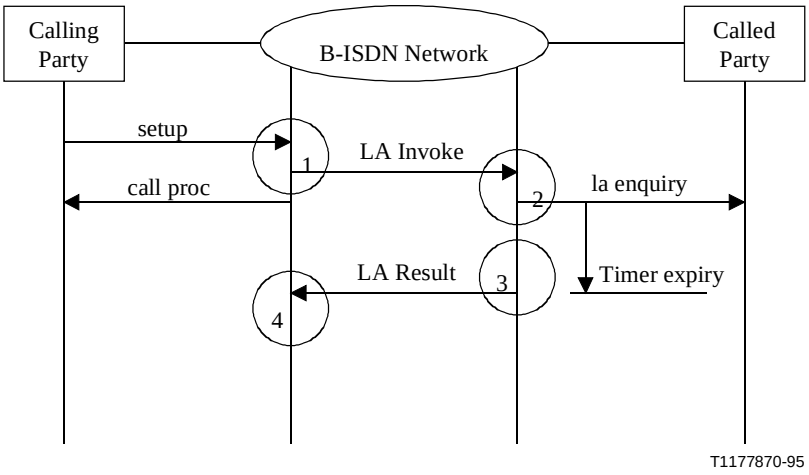
2 On receipt of the *LookAhead invoke* component, the DLEX shall map the received information into the LA_Enquiry message sent through the UNI to the addressed user. A supervision timer is started both at the UNI and at the NNI to ensure that an answer is received from the access within a prescribed interval of time.

3 An LA Response message is received from the access, which contains a cause value indicating the reason that should prevent the successful establishment of the call towards that addressed user. The supervision timer is stopped both at the UNI and at the NNI. The received information is mapped in the parameters included in the *LookAhead return result* component. No interpretation is required at the NNI of the information received from the access.

4 The OLEX receives the *LookAhead return result* component and stops timer T-la. Since it contains a cause value indicating that the call cannot be completed, based on service requirements the OLEX shall decide whether to proceed with normal call setup or to release the call (as in the scenario depicted above). In case of release, the clearing message sent to the calling party shall contain the received cause value.

III.3 Third scenario

In this scenario, the OLEX determines, based on service requirements, that LA has to be performed. At the DLEX, the supervision timer expires prior to the receipt of the LA response from the destination access. The DLEX shall therefore check the user profile, subscription options and, if possible, user availability, and use the result of this check to populate the *LookAhead return result* component sent to the OLEX.



1 The OLEX determines that LA has to be performed. The parameters used for availability/compatibility check are included in the *LookAhead invoke* component which is sent to the DLEX. Timer T-la is started.

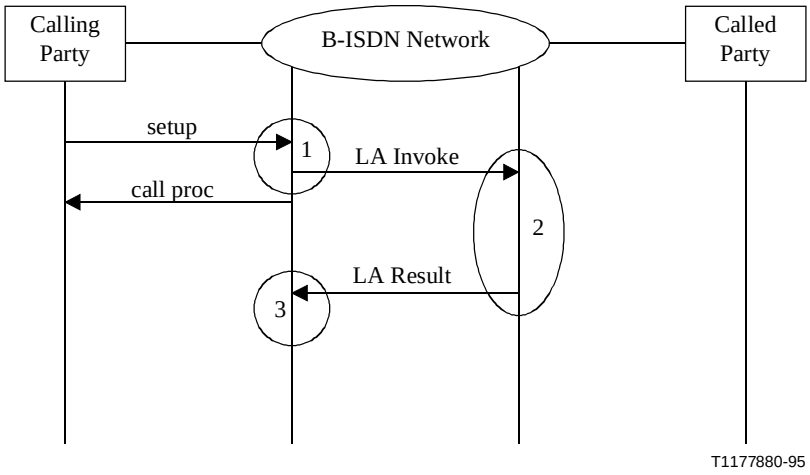
2 On receipt of the *LookAhead invoke* component, the DLEX shall map the received information into the LA_Enquiry message sent through the UNI to the addressed user. A supervision timer is started at the UNI to ensure that an answer is received from the access within a prescribed interval of time.

3 At the expiry of the supervision timer at the NNI, the DLEX shall check the user profile, subscription options and, if possible, user availability. The result of this check is used to populate the LookAhead return result component sent to the OLEX. The *LookAhead return result* component shall also contain the appropriate cause value to indicate that the LookAhead is not supported at the destination access.

4 The OLEX receives the *LookAhead return result* component and stops timer T-la. Since it contains a cause value indicating that the procedure is not supported, based on service requirements and on the other information received in the *LookAhead return result* component, the OLEX shall decide whether to proceed with normal call setup or to release the call.

III.4 Fourth scenario

In this scenario, the OLEX determines, based on service requirements, that LA has to be performed. At the DLEX it is not possible to perform the Look-Ahead procedure towards a user (e.g. the LA procedure is not supported/implemented at the UNI, the called number does not exist or the destination is out of order). In this case the *LookAhead return result* component shall contain a cause value indicating why the addressed user cannot be reached.



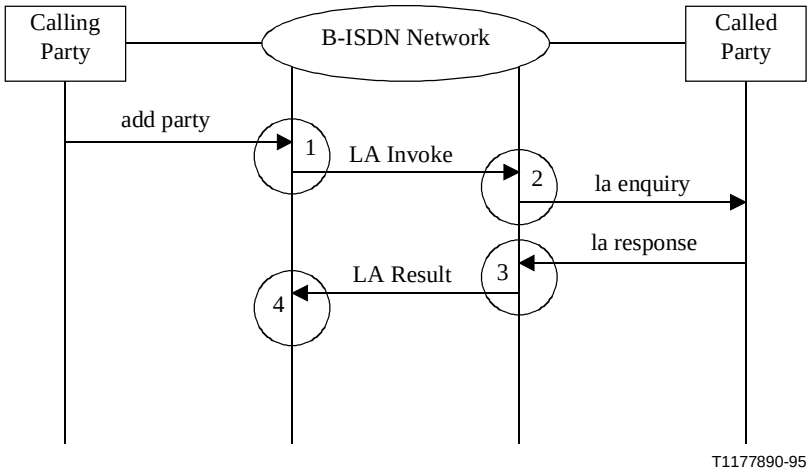
1 The OLEX determines that LA has to be performed. The parameters used for availability/compatibility check are included in the *LookAhead invoke* component which is sent to the DLEX. Timer T-la is started.

2 The DLEX cannot send an LA_Enquiry message to the user (e.g. number not allocated). In this case it shall send back a *LookAhead return result* component containing the appropriate cause value. If possible, the DLEX can also check the user profile, subscription options and user availability. The result of this check shall also be used to populate the *LookAhead return result* component sent to the OLEX.

3 The OLEX receives the *LookAhead return result* component and stops timer T-la. Since it contains a cause value indicating that the addressed user is not reachable, based on service requirements and on the other information possibly received in the *LookAhead return result* component, the OLEX shall decide whether to proceed with normal call setup or to release the call.

III.5 Fifth scenario

This scenario is similar to the previous ones, but now the Look-Ahead procedure is performed for a multiparty call. The OLEX shall therefore decide whether to perform the LA procedure or not when it receives an Add Party message from the access. Procedures at the network side and at the destination access are the same as described above.



APPENDIX IV

Primitive relationships

The following picture shows an example primitive flow between different entities specified by the model depicted in Figure IV.1.

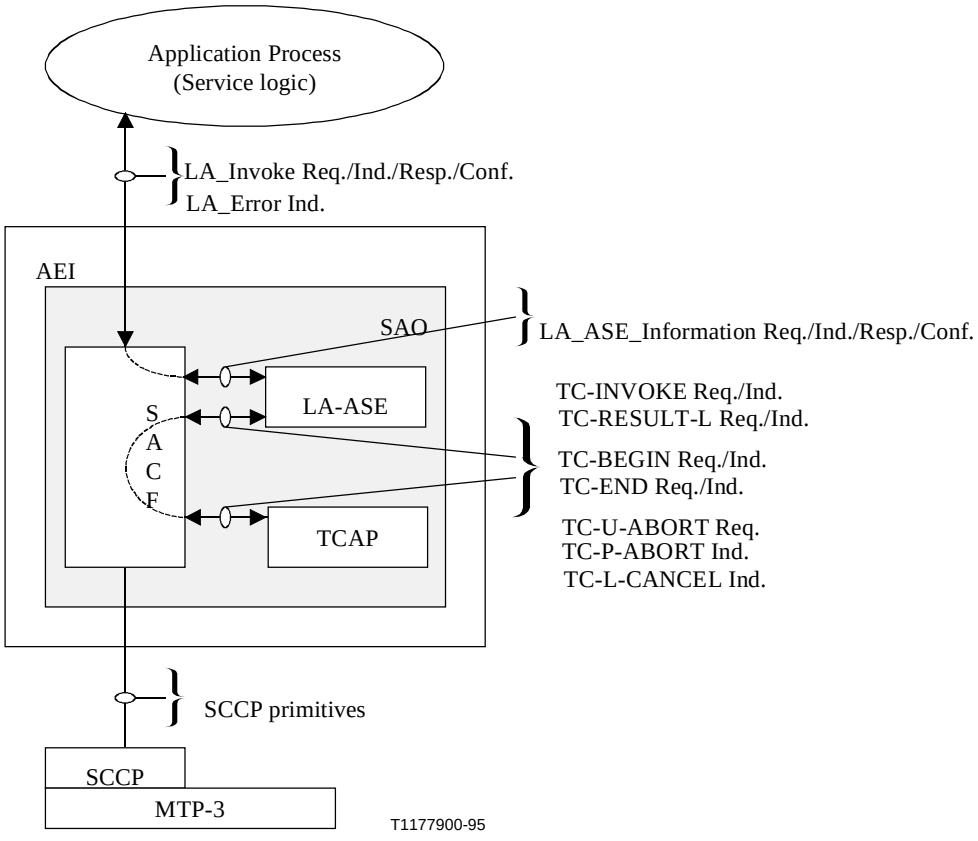


Figure IV.1/Q.2724.1

APPENDIX V

Look-Ahead relationships involving Multiple Networks

The following picture shows a possible scenario of Look-Ahead relationships involving International Gateways. See Figure V.1.

The general case of edge-to-edge operation is shown with the solid arrow lines.

The dashed arrow lines indicate possible alternative realizations of the Look-Ahead capability, where the screening function is not required in one or other network, or where screening is provided as an integral function of the called and/or calling local exchange. An extreme example of this would be where all screening (if any) is carried out by the local exchanges, giving a true "end-to-end" association. "End-to-End" can thus be seen as a special case of the general "Edge-to-Edge" protocol architecture.

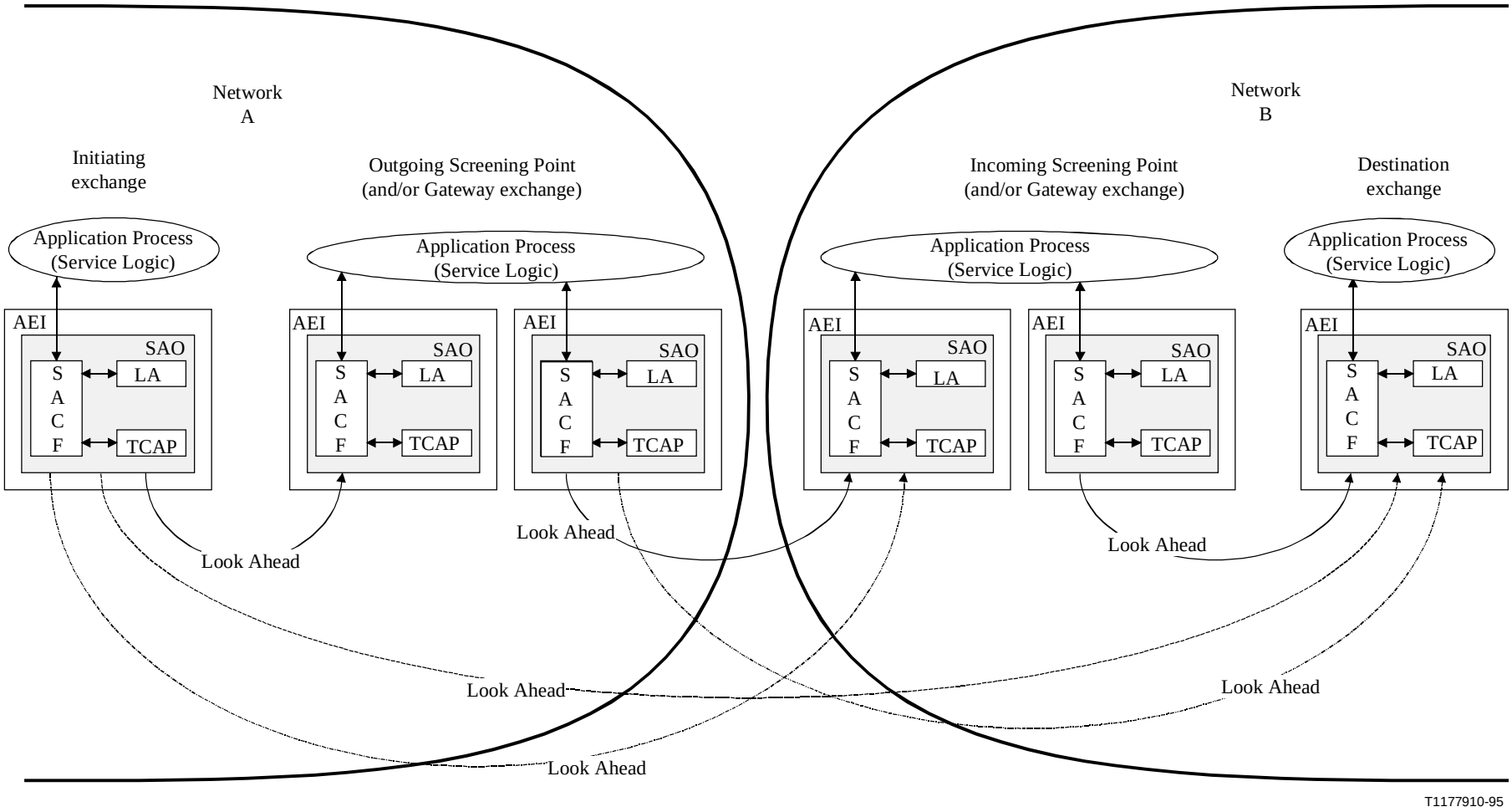


Figure V.1/Q.2724.1

APPENDIX VI

Coding of instruction indicators for the Network Look Ahead Indicator

Setting of instruction indicators

The setting of the instruction indicators for the Network Look Ahead Indicator parameter is as follows:

Parameter	Network look ahead indicator
Pass on not possible indicator	Default
Discard parameter indicator	Discard parameter
Discard message indicator	Do not discard message
Send notification indicator	Do not send notification
Release call indicator	Do not release call
Transit at intermediate exchange indicator	Transit interpretat.
Broadband/narrow-band interwork indicator	Discard parameter

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