ETSI TECHNICAL REPORT

ETR 044

July 1992

Source: ETSI TC-NA

Reference: DTR/NA-42111

ICS: 33.080

Key words: ISDN, performance

Network Aspects (NA); Reference events for network performance parameters in an ISDN

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Foreword

ETSI Technical Reports (ETRs) are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS), or Interim-European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use, or application of ETSs, or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS, or I-ETS.

This ETR has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunication Standard Institute (ETSI) and defines the reference events which are used for defining the network performance parameters of the pan-European Integrated Services Digital Network (ISDN).

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1 Scope

This ETR defines the reference events which are used for defining the network performance parameters of the pan-European Integrated Services Digital Network (ISDN) as provided by European public telecommunications network operators.

The ISDN performance parameters are defined in terms of reference events which can be observed at physical measurement points within an ISDN connection. This ETR defines the relevant measurement points and associated performance-significant ISDN reference events.

2 References

[1] ETR 003: "Network Aspects (NA); General aspects of quality of service and network performance in digital networks, including ISDN".

[2] ETS 300 125: "Integrated Services Digital Network (ISDN); User-network interface data link layer specification Application of CCITT Recommendations Q.920/I440 and Q.921/I.441".

[3] ETS 300 102: "Integrated Services Digital Network (ISDN); User-network interface layer 3 Specifications for basic call control".

[4] CCITT Recommendation Q.764 (1988): " Signalling procedures".

[5] CCITT Recommendation I.112 (1988): "Vocabulary of terms for ISDNs".

[6] CCITT Recommendation I.325: "Reference Configurations for ISDN Connection Types".

[7] CCITT Recommendation X.134 (1988): "Portion boundaries and packet layer reference events: Basis for defining packet-switched performance parameters".

[8] CCITT Recommendation X.25 (1988): "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".

3 Definitions

For the purpose of this ETR the following definitions apply:

Integrated Services Digital Network (ISDN): see CCITT Recommendation I.112 [5], § 2.3, definition 308.

Measurement Point: a physical interface that separates either a (set of) Customer Premises Equipment (CPE), or a Switching or Signalling Node (SSN) from an attached transmission system at which standardised protocols can be observed.

Measurement Point T: is a measurement point that separates a (set of) customer equipment from an attached transmission system. A Measurement Point T (MPT) is located at the interface at the T reference point.

Measurement Point I: is a measurement point that terminates a transmission system at an ISC. The exact location of the Measurement Point I (MPI) with reference to the ISC depends on the connection type and is specified, for each connection type, in the associated network performance ETS.

NOTE: The MPI for circuit switched connection types is generally located at the national side of an ISC. For packet switched connection types the MPI is generally located at the international side of an international packet switching gateway.

Network performance: see ETR 003 [1], subclause 1.2.1.

Quality of Service: see ETR 003 [1], subclause 1.2.2.

Reference point: see CCITT Recommendation I.325 [6], subclause 3.6.

4 Symbols and abbreviations

The following symbols and abbreviations are used in this ETR.

ATM	Asynchronous Transfer Mode
CPE	Customer Premises Equipment
DSS1	Digital subscriber Signalling System No. 1
ETR	ETSI Technical Report
ISC	International Switching Centre
ISDN	Integrated Services Digital Network
MP	Measurement Point
MPI	Measurement Point at an ISC
MPT	Measurement Point at the interface at reference point T
NT2	Network Termination 2
SSN	Switching or Signalling Node
T	Interface at Reference Point T
TE	Terminal Equipment
XID	Exchange Identification

5 Performance-significant reference events

An ISDN reference event is the transfer of a discrete unit of control, or user information, encoded in accordance with CCITT recommended protocols across a Measurement Point (MP). Specified information units and associated resulting protocol state(s) are identified by an event code used for reference in defining network performance parameters. The resulting state(s) in turn establish which reference events can subsequently occur. Two classes of reference events are distinguished: exit events and entry events.

An entry event is a reference event that corresponds to an information unit entering an SSN, or CPE.

An exit event is a reference event that corresponds to an information unit exiting an SSN, or CPE.

Figure 1 conceptually illustrates the two classes of reference events and indicates the measurement points at which entry and exit events are intended to be observed.

Table 1 provides references to following subclauses, or related ETSs and CCITT Recommendations that collectively define a comprehensive set of performance-significant reference events for ISDN performance description.

If the state resulting from transfer of the control, or user information, across the MP is not the one listed in tables 2 to 5, or remains unchanged, the reference event does not occur. Aspects of the state other than those listed in tables 2 to 5 may change during entry, or exit events, but those events are not viewed as performance-significant reference events.

When tables 2 to 6 list more than one aspect of the state that might be changed as a result of a particular exit or entry event, each of those changes represents a distinct reference event that can be used in defining different network performance parameters.

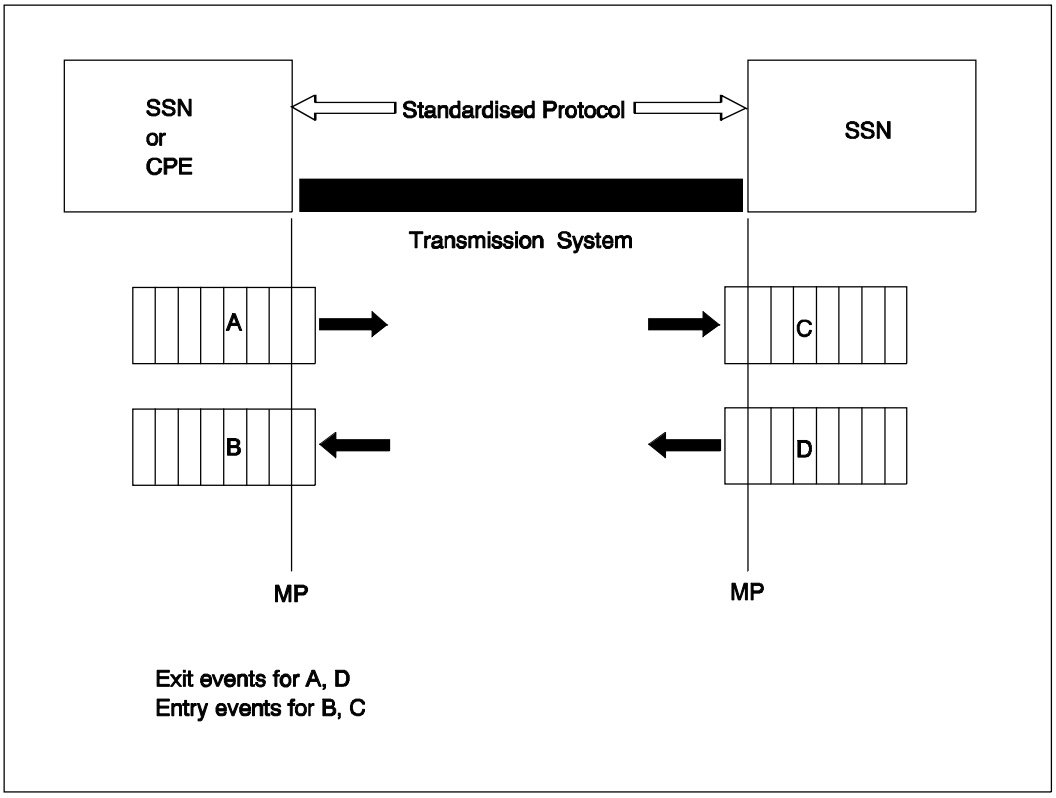

Figure 1: Example entry and exit reference events

Table 1: References to information specifying performance-significant reference events

Category	Relevant Measurement Point	
	MPT	**MPI**
ETS 300 102	subclause 5.1	not applicable
ETS 300 125	subclause 5.2	not applicable
X.25, layer 3	CCITT Rec. X.134 [7]	not applicable
X.25, layer 2 (LAP B)	subclause 5.4	not applicable
X.75	not applicable	CCITT Rec. X.134 [7]
Q.764 [4]	not applicable	subclause 5.3
B-ISDN, ATM-layer	subclause 5.5	subclause 5.5

5.1 Performance-significant reference event for E-DSS1 layer 3 messages

Table 2 lists performance significant E-DSS1 layer 3 message transfer reference events associated with the interface at the T reference point. The table entries are event identification code, type of E-DSS1 layer 3 message transferred, and the resulting state of the E-DSS1 layer 3 interface.

The time of occurrence of a E-DSS1 layer 3 message entry event is defined to coincide with the time at which the last bit of the unit of control, or user information, crosses the MP into the SSN, or CPE. The time of occurrence of a E-DSS1 layer 3 message exit event is defined to coincide with the time at which the first bit of the unit of control, or user information crosses the MP into the SSN, or CPE. If retransmission occurs, the exit event occurs with the first transmission, and the entry event occurs with the last transmission.

Table 2: Performance-significant reference events based on E-DSS1 layer 3 message transfer at the T reference point

Code	Layer 3 Message	Resulting State
P1a	SETUP	N1 (Call Initiated)
P1b	SETUP	N6 (Call Present)
P2a	SETUP ACKnowledge	N25 (Overlap Receiving)
P2b	SETUP ACKnowledge	N2 (Overlap Sending)
P3	INFOrmation	N2 (Overlap Sending)
P4a	CALL PROCeeding	N9 (Incoming Call Proceeding)
P4b	CALL PROCeeding	N3 (Outgoing Call Proceeding)
P5a	ALERTing	N7 (Call Received)
P5b	ALERTing	N4 (Call Delivered)
P6a	CONNect	N8 (Connect Request)
P6b	CONNect	N10 (Active)
P7	CONNect ACKnowledge	N10 (Active)
P8a	DISConnect	N11 (Disconnect Request)
P8b	DISConnect	N12 (Disconnect Indication)
P9	RELease	N19 (Release Request)
P10	RELease COMplete	N0 (Null)

5.2 Performance-significant reference events for E-DSS1 layer 2 messages

Table 3 lists performance-significant E-DSS1 layer 2 frame transfer reference events associated with the interface at the T reference point. The table entries are, event identification code, type of E-DSS1 layer 2 frame transferred, and the resulting state of the E-DSS1 layer 2 interface.

The time of occurrence of a E-DSS1 layer 2 frame entry event is defined to coincide with the time at which the last bit of the unit of control, or user information, crosses the MP into the SSN, or CPE. The time of occurrence of a E-DSS1 layer 2 frame exit event is defined to coincide with the time at which the first bit of the unit of control, or user information crosses the MP into the SSN, or CPE. If frame retransmission occurs, the exit event occurs with the first transmission, and the entry event occurs with the last transmission.

Table 3: Performance-significant reference events based on E-DSS1 layer 2 frame transfer at the T reference point

Code	Layer 2 Frame	Resulting State (NOTE 1)
Q1a	I	V(R) becomes N(S) + 1
Q1b	I	V(A) becomes N(R)
Q2	RR	V(A) becomes N(R); PRB cleared
Q3	RNR	V(A) becomes N(R); PRB set
Q4	REJ	V(A) becomes N(R); PRB cleared
Q5	SABME	Awaiting Establishment
Q6	DM	TEI Assigned
Q7	UI	(NOTE 2)
Q8	DISC	Awaiting Release
Q9a	UA	Multiple Frame Established (NOTE 3)
Q9b	UA	TEI Assigned (NOTE 3)
Q10	FRMR	Awaiting Establishment

(NOTE 4)

Notation: I = information;
RR = Receive Ready;
RNR = Receive Not Ready;
REJ = Reject;
SABME = Set Asynchronous Balanced Mode Extended;
DM = Disconnect Mode;
UI = Unnumbered Information;
DISC = Disconnect;
UA = Unnumbered Acknowledgement;
FRMR = Frame Reject;
V(R) = Receive State Variable;
N(S) = Send Sequence Number;
V(A) = Acknowledge State Variable;
N(R) = Receive Sequence Number;
PRB = Peer Receiver Busy;
TEI = Terminal Endpoint Identifier.

NOTE 1: Figure 2 defines the state variables used in frame flow control.

NOTE 2: UI frames have no effect on the data link layer state variables defined in ETS 300 125 [2].
Their transmission and reception could be recorded by incrementing ancillary state variables if required for performance assessment purposes.

NOTE 3: Q9a occurs in response to a SABME command. Q9b occurs in response to a DISC command.

NOTE 4: Exchange Identification (XID) frames have no effect on the operational mode, or state variables, associated with data link layer entities.

5.3 Performance-significant reference events for Q.764 messages

Table 4 lists performance-significant CCITT Recommendation Q.764 [4] message transfer reference events associated with the interface at the IB reference point. The table entries are; event identification code, type of CCITT Recommendation Q.764 [4] message transferred, and the resulting state of the CCITT Recommendation Q.764 [4] interface.

The time of occurrence of a CCITT Recommendation Q.764 [4] message entry event is defined to coincide with the time at which the last bit of the CCITT Recommendation Q.764 [4] message crosses the MP into the SSN. The time of occurrence of a CCITT Recommendation Q.764 [4] message exit event is defined to coincide with the time at which the first bit of the CCITT Recommendation Q.764 [4] message crosses the MP into the SSN. If message retransmission occurs, the exit event occurs with the first transmission and the entry event occurs with the last transmission.

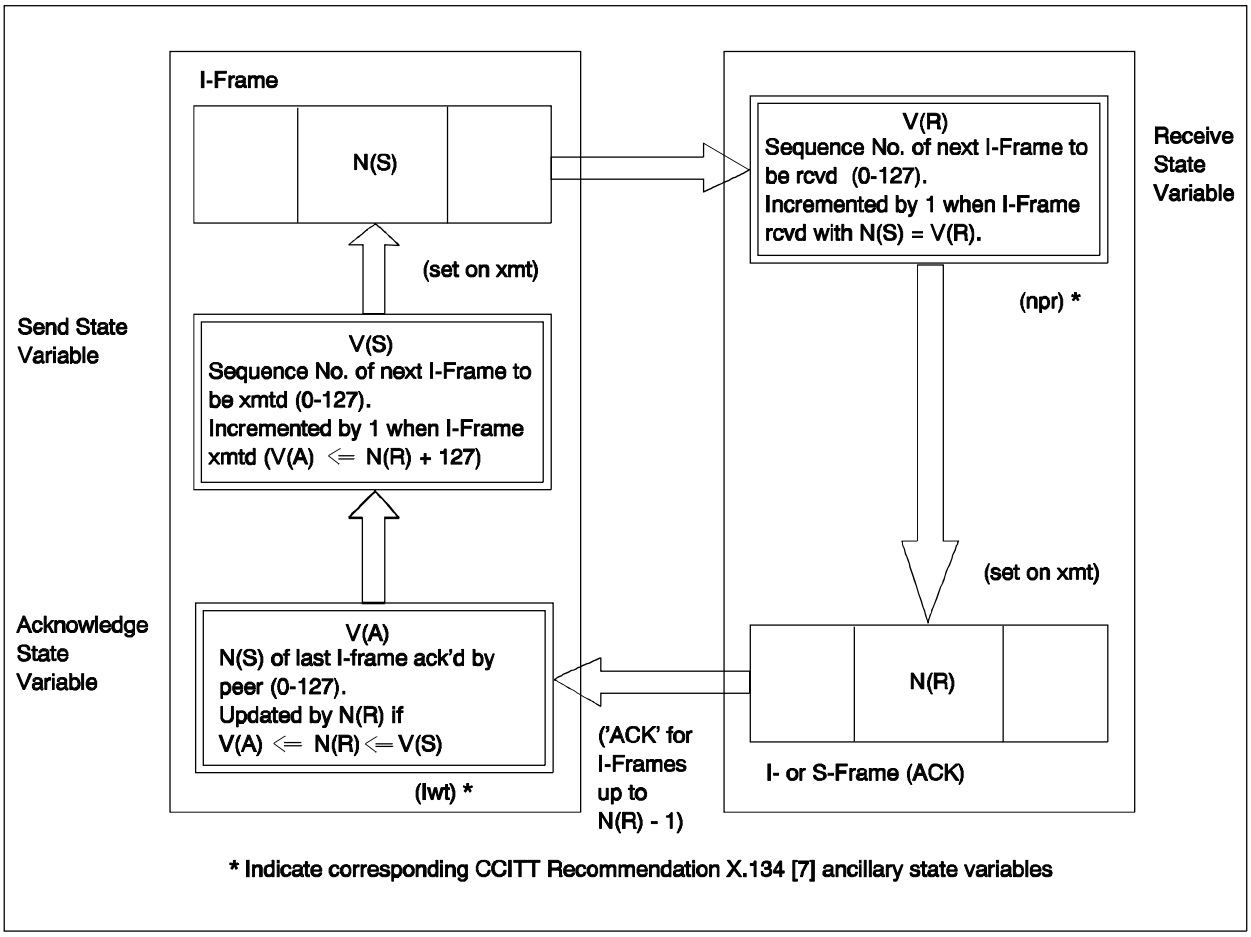

Figure 2: E-DSS1 layer 2 state variables used in frame flow control

Table 4: Performance-significant reference events based on Q.764 [4] message transfer at the IB reference point

Code	Q.764 Message	Resulting State
S1a	Initial Address (IAM)	2 Wait for ACM
S1b	Initial Address (IAM)	2 Wait for OGC Select
S2a	Address Complete (ACM)	3 Wait for Answer
S2b	Address Complete (ACM)	5 Wait for Answer
S3a	Answer (ANS)	4 OGC Answered
S3b	Answer (AND)	4 ICC Answered
S4a	Release (REL)	7 Wait for RLC
S4b	Release (REL)	9 Wait for RLC
5	Release Complete (RLC)	0 Idle

Notation: OGC = Outgoing Trunk Circuit;
ICC = Incoming Trunk Circuit;
Nat = National Portion;
Int = International Portion.

NOTE: The connection processing control states have been divided into those used in incoming and outgoing circuit handling. The usage of the term direction in this context refers to the direction of the connection.

5.4 Performance-significant reference event for X.25 layer 2(LAPB) frames

Table 5 lists performance-significant CCITT Recommendation X.25 [8] layer 2 (LAPB) frame transfer reference events associated with the interface at the T reference point. The table entries are: event identification code; type of CCITT Recommendation X.25 [8] layer 2 (LAPB) frame transferred; and the resulting state of the CCITT Recommendation X.25 [8] layer 2 interface.

The time of occurrence of a CCITT Recommendation X.25 [8] layer 2 (LAPB) frame entry event is defined to coincide with the time at which the last bit of the CCITT Recommendation X.25 [8] layer 2 frame crosses the MP into the SSN, or CPE. The time of occurrence of a CCITT Recommendation X.25 [8] layer 2 (LAPB) frame exit event is defined to coincide with the time at which the first bit of the CCITT Recommendation X.25 [8] layer 2 frame crosses the MP into the SSN, or CPE. If frame retransmission occurs, the exit event occurs with the first transmission, and the entry event occurs with the last transmission.

Table 5: Performance-significant reference events based on CCITT Recommendation X.25 [8] layer 2 (LAPB) frame transfer at the T reference point

Code	X.25 [8] Layer 2 Frame	Resulting State
B1a	I	V(R) becomes N(S) + 1
B1b	I	V(A) becomes N(R) (NOTE 1)
B2	RR	V(A) becomes N(R); PRB cleared (NOTE 1)
B3	RNR	V(A) becomes N(R); PRB set (NOTE 1)
B4	REJ	V(A) becomes N(R); PRB cleared (NOTE 1)
B5	SABM	Awaiting Establishment
B6	SABME	Awaiting Establishment
B7	DM	TEI Assigned
B8	DISC	Awaiting Release
B9a	UA	Multiple Frame Established (NOTE 2)
B9b	UA	TEI Assigned (NOTE 2)
B10	FRMR	Awaiting Establishment

Notation: I = Information;
RR = Receive Ready;
RNR = Receive Not Ready;
REJ = Reject;
SABM = Set Asynchronous Balanced Mode;
SABME = Set Asynchronous Balanced Mode Extended;
DM = Disconnect Mode;
DISC = Disconnect;
UA = Unnumbered Acknowledgement;
FRMR = Frame Reject;
V(R) = Receive State Variable;
N(S) = Send Sequence Number;
V(A) = Acknowledgement State Variable;
N(R) = Receive Sequence Number;
PRB = Peer Receiver Busy;
TEI = Terminal Endpoint Identifier.

NOTE 1: V(A) and PRB are ancillary state variables not explicitly defined in CCITT Recommendation X.25 [8]. With the appropriate notational changes figure 2 generally applies to the interpretation of table 5.

NOTE 2: B9a occurs in response to a SABM, or SABME command. B9b occurs in response to a DISC command.

History

Document history	
July 1992	First Edition
March 1996	Converted into Adobe Acrobat Portable Document Format (PDF)