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ETSI Secretariat

Postal address
F-06921 Sophia Antipolis Cedex - FRANCE

Office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16
Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

X.400
c= fr; a=atlas; p=etsi; s=secretariat

Internet
secretariat@etsi.fr
http://www.etsi.fr

Contents

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Signalling Protocols and Switching (SPS), and is now submitted for the Voting phase of the ETSI standards Two-step Approval Procedure (TAP).

The present document details exceptions and clarifications to ITU-T Recommendations Q.750 [1], Q.751.1 [11], Q.752 to Q.754 [2] to [4], defining the management of international ITU-T Signalling System No.7 networks, for example those used to provide the pan-European cellular digital radio system and the Integrated Services Digital Network (ISDN).

The present document also lists considerata for the interconnection of ITU-T Signalling System No.7 (SS7) networks, using ITU-T Recommendation M.4110 [18] as an aid, as well as ITU-T Recommendations Q.750 , Q.752 to Q.755 [2] to [5] and Q.780 [16].

The present document is part 1 of a multi-part EN covering Integrated Services Digital Network (ISDN) Signalling System No.7 Operations, Maintenance and Administration Part (OMAP), as identified below:

Part 1: "Protocol specification";

Part 2: "Protocol Implementation Conformance Statement (PICS) proforma specification".

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

1 Scope

This first part of EN 301 007 defines the requirements for monitoring and measuring in Signalling System No.7 networks (including measurements for message traffic accounting), the requirements for the Message Transfer Part (MTP) and the Signalling Connection Control Part (SCCP) managed objects, and the requirements for the MTP Routing Verification Test (MRVT) of Signalling System No.7 management. It also lists the considerations applicable when inter-connecting Signalling System No.7 networks.

The requirements in the present document are based upon ITU-T Recommendations Q.750 [1], Q.751.1 [11], Q.752 to Q.754 [2] to [4], and ETS 300 356-1 [12].

The present document draws upon ITU-T Recommendations Q.750 [1], Q.752 to Q.754 [2] to [4], Q.755 [5] and M.4110 [18] as informative references, for considerations applicable to the inter-connection of Signalling System No.7 networks.

NOTE: The requirements of M.4110 are used to derive the considerations in the present document, but the present document does not make any statement as to the applicability or otherwise of M.4110.

2 References

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or

b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

2.1 Normative references

[1] ITU-T Recommendation Q.750 (1993): "Overview of Signalling System No. 7 management".

[2] ITU-T Recommendation Q.752 (1993): "Monitoring and measurements for Signalling System No. 7 networks".

[3] ITU-T Recommendation Q.753 (1993): "Signalling System No. 7 management functions MRVT, SRVT and CVT and definition of the OMASE-user".

[4] ITU-T Recommendation Q.754 (1993): "Signalling System No. 7 management application service element (ASE) definitions".

[5] ITU-T Recommendation Q.755 (): "".

[6] ITU-T Recommendation Q.704 : "Signalling network functions and messages".

[7] ETS 300 008-1 (1997): "Integrated Services Digital Network (ISDN); Signalling System No.7; Message Transfer Part (MTP) to support international interconnection; Part 1: Protocol specification [ITU-T Recommendations Q.701 (1993), Q.702 (1988), Q.703 to Q.706 (1993), Q.707 (1988) and Q.708 (1993), modified]".

[8] ETS 300 009-1 (1996), Third Edition: "Integrated Services Digital Network (ISDN); Signalling System No.7; Signalling Connection Control Part (SCCP) (connectionless and connection-oriented class 2) to support international interconnection; Part 1: Protocol specification [ITU-T Recommendations Q.711 to Q.714 and Q.716 (1993), modified]".

[9] ETS 300 287-1 edition 2 (1996): "Integrated Services Digital Network (ISDN); Signalling System No.7; Transaction Capabilities (TC) version 2; Part 1: Protocol specification [ITU-T Recommendations Q.771 to Q.775 (1993), modified]".

[10] CCITT Recommendation X.209 (1988): "Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1)".

[11] ITU-T Recommendation Q.751.1: "Network element management information model for the Message Transfer Part".

[12] ETS 300 356-1 (1995): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1993), modified]".

[13] ITU-T Recommendation Q.751.3 (1997): "Network Information Model for MTP Accounting and Accounting Verification".

[14] ITU-T Recommendation X.690 (1994) | ISO/IEC 8825-1: "Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)".

[15] CCITT Recommendation X.208 (1988): "Specification of Abstract Syntax Notation One (ASN.1)".

[16] ITU-T Recommendation Q.780: "Signalling System No.7 test specification general description".

[17] ITU-T Recommendation M.3100 (1992): "".

2.2 Informative references

[18] ITU-T Recommendation M.4110: "Inter-Administration agreements on Common Channel Signalling System No. 7".

[19] ITU-T Recommendation Q.822: "".

[20] ITU-T Recommendation Q.2210: "".

[21] ITU-T Recommendation Q.756: "".

[22] ITU-T Recommendation Q.705 (1993): "Signalling Network Structure".

3 Abbreviations

ASN.1	Abstract Syntax Notation 1
BEC	Basic Error Correction
BER	Basic Encoding Rules
CDPA	CalleD Party Address
CGPA	CallinG Party Address
CIC	Circuit Identification Code
GT	Global Title
GTAI	GT Address Information
GTI	GT Indicator
ILS	Incoming LinkSet
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
MRVT	MTP Routing Verification Test

MTP	Message Transfer Part
NAI	Nature of Address Indicator
NP	Numbering Plan
OLS	Outgoing LinkSet
OMAP	Operations, Maintenance and Administration Part
PC	Point Code
PCR	Preventive Cyclic Retransmission
PICS	Protocol Implementation Conformance Statement
SAP	Service Access Point
SEP	Signalling End Point
SCCP	Signalling Connection Control Part
SI	Service Indicator
SLC	Signalling Link Code
SP	Signalling Point (general)
SSN	Sub System Number
STP	Signalling Transfer Point
TMN	Telecommunications Management Network
TT	Translation type
UDT	UniDatTa message
XUDT	Extended UniDatTa message
XUDTS	Extended UniDatTa Service message

4 General exceptions and clarifications to ITU-T Recommendations Q.750 to Q.751

4.1 Q.750

ITU-T Recommendation Q.750 [1] is an overview document which is generally applicable.

4.2 Q.751.1

ITU-T Recommendation Q.751.1 [11] defines the network information model (in the form of managed objects) for the MTP of Signalling System No.7. If the network operator uses a Telecommunications Management Network (TMN) Operations System to control the Signalling System No.7 network, the management of the MTP shall be via the Managed Objects defined in ITU-T Recommendation Q.751.1 [11] with the clarifications and exceptions listed here.

The requirements specified in the present document referring to subclause 6 of ITU-T Recommendation Q.751.1 [11] shall also constrain the conditional packages and optional parameters in subclause 7 of ITU-T Recommendation Q.751.1 [11].

4.2.1 Subclause 1 to 6.1 inclusive of Q.751.1

Subclause 1 to 6.1 inclusive shall apply.

4.2.2 Subclause 6.2 of Q.751.1

The Signalling Link Set Timer Profile (subclause 6.2.1) may be used, Managed Switching Element (subclause 6.2.2) may apply, MTP Access Point (instance) (subclause 6.2.3) shall apply.

The MTP Level 2 Protocol Profile (subclause 6.2.4) may be used, but the bufferMechanismPackage, multipleTransmissionCongestionLevelsPackage and multipleTransmissionCongestionStatesPackage shall not apply.

The MTP Signalling Point (subclause 6.2.6) shall apply. The conditional package spTimersPackage may be used, but attributes 14, 17, 21, 22 and 30 (ITU-T Recommendation Q.704 [6] timers T7, T11, T15, T16 and T24 respectively) shall not apply; (note that if this package is used then the Signalling Point Timers Profile shall not be used at the same

signalling point - this is required in the conditional packages statement of the formal description of subclause 7 of ITU-T Recommendation Q.751.1 [11]).

The Signalling Data Link Termination Point (subclause 6.2.7) shall apply.

The Signalling Link Set Termination Point (subclause 6.2.8) shall apply. If the conditional package spTimersPackage is used in the superior MTP Signalling Point instance, the lsTimersProfilePointerPackage shall not be used. If the spTimersProfilePointerPackage is used in the superior MTP Signalling Point instance, the lsTimersProfilePointerPackage shall not be used.

The Signalling Link Termination Point (subclause 6.2.9) shall apply, but attribute 11 (linkCongestionLevel) shall not apply. Attributes 13 and 15 (signDataLinkTpList and signTermList) may be used, but only to support the basic signalling link management procedures of ITU-T Recommendation Q.704 [6] subclause 12.2 (see ETS 300 008-1 [7]). In addition, create and set rejection reasons vii) and viii) referring to ITU-T Recommendation Q.704 [6] timer T17 shall not apply. If the conditional package spTimersPackage is used in the superior MTP Signalling Point instance, the slTimersProfilePointerPackage shall not be used. If the spTimersProfilePointerPackage is used in the superior MTP Signalling Point instance, the slTimersProfilePointerPackage shall not be used.

The Signalling Link Timer Profile (subclause 6.2.10) may be used, but attribute 5 (ITU-T Recommendation Q.704 [6] timer T24) shall not apply.

The Signalling Point Timers Profile (subclause 6.2.11) shall apply if the spTimersPackage of the MTP Signalling Point is not used, but ITU-T Recommendation Q.704 [6] timers T7, T11, T15 and T16 shall not apply.

The Signalling Route Network Element Part shall apply (subclause 6.2.12).

The Signalling Route Set Network Element Part (subclause 6.2.13) shall apply, with the congestedStatePackage. The congestionLevelPackage shall not apply.

The Signalling Terminal may be used, but only to support the basic signalling link management procedures of ITU-T Recommendation Q.704 [6] subclause 12.2 (see ETS 300 008-1 [7]).

The Signalling Transfer Point (STP) Screening Table may be used.

For all object classes additionally applies:

> "Creation of new object class instances may be rejected due to lack of system resources, e.g. the system specific maximal number of instances of this object class per superior object instance have been exceeded."

Object class mtpAccessPoint:

> Additionally applies:

The MTP status is mapped to the operationalState and availabilityStatus attributes as follows:

MTP Status	operationalState	availabilityStatus
allowed	enabled	{ }
congested	enabled	{degraded}
prohibited	disabled	{off line}

Object class signDataLinkTp:

> Additionally applies:
>
> "If an attempt is made to delete a signDataLinkTp instance which is still referenced by a signLinkTp, the delete request is rejected".

Object class signLinkTp:

> Attribute "mtpL2ProtocolProfilePointer" (and all references to it) is renamed to "protocolProfilePointer".

Object class signLinkSetTp:

> For the congestionControlMethod only the values "unknown" or "ccmQ704International" apply.

4.2.3 Subclause 7 of Q.751.1

Subclause 7 of ITU-T Recommendation Q.751.1 [11] is the formalization of the informal specification of subclause 6.2. Subclause 7 shall apply, but shall be constrained by the exceptions and clarifications to subclause 6.2 given previously, and by the corrections and additions listed below.

4.2.4 Subclause 7.1 of Q.751.1

4.2.4.1 Subclause 7.1.8 of Q.751.1

Object class signLinkSetTp:

For attribute inLsLoadShareAlgorithm also the operation SET BY CREATE applies.

4.2.4.2 Subclause 7.1.9 of Q.751.1

Object class signLinkTp:

For attribute maxCapacitySl also the operation SET BY CREATE applies. For attributes signDataLinkTpList and signTermList also the operations SET BY CREATE and ADD-REMOVE apply.

4.2.5 Subclause 7.4 of Q.751.1

Attribute template signLinkTpPointer does not apply.

4.2.6 Subclause 7.5 of Q.751.1

Action replaceSignTerm does not apply.

4.2.7 Subclause 7.7 of Q.751.1

The following name bindings are mandatory, if the object class is used:

```
mtpSignPoint-signRouteSetNePart;
signRouteSetNePart-signRouteNePart;
signLinkSetTp-signLinkTp;
mtpSignPoint-mtpAccessPoint;
mtpSignPoint-mtpLevel3;
mtpSignPoint-signDataLinkTp;
mtpSignPoint-signLinkSetTp;
mtpSignPoint-stpScreeningTable;
stpScreeningTable-stpScreeningTableLine.
```

The following name bindings are optional:

```
managedSwitchingElement-mtpSignPoint;
managedSwitchingElement-signTerm;
managedSwitchingElement-lsTimersProfile;
managedSwitchingElement-mtpL2ProtocolProfile;
managedSwitchingElement-slTimersProfile;
managedSwitchingElement-spTimersProfile.
```

In the signLinkSetTp-signLinkTp name binding the AND SUBCLASSES does not apply.

If it is not desired to use managedSwitchingElement from M.3100 [17], in order to avoid defining a separate naming tree, the following name bindings may be used:

```
managedElementR1-mtpSignPoint NAME BINDING
    SUBORDINATE OBJECT CLASS mtpSignPoint;
    NAMED BY;
    SUPERIOR OBJECT CLASS "ITU-T Rec. M.3100 (1995)":managedElementR1;
    WITH ATTRIBUTE mtpSignPointId;
    BEHAVIOUR managedElementR1-mtpSignPointBehaviour BEHAVIOUR DEFINED AS.
        "An mtpSignPoint can be created by an operator or automatically.
        In case the spTimersProfilePackage is used, a create or set request is rejected, if
        i)  the spTimersProfilePointer does not reference a spTimersProfile;
        OR
```

```
        ii) the spTimersProfilePointer would reference an instance which does not exist.
        If the name package is supported: a create request with a value for the name attribute that
        is already used by another instance of the same object class will be rejected.
        An mtpSignPoint can be deleted if and only if it does not contain any other managed object
        class instances, except     for contained measurements.";;
    CREATE;
    DELETE ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS {itu-t(0) identified-organization(4) etsi(0) 1007 informationModel(0) nameBinding(6)
    managedElementR1-mtpSignPoint(1)};

managedElementR1-signTerm NAME BINDING;
    SUBORDINATE OBJECT CLASS signTerm;
    NAMED BY;
    SUPERIOR OBJECT CLASS "ITU-T Rec. M.3100 (1995)":managedElementR1;
    WITH ATTRIBUTE signTermId;
    BEHAVIOUR managedElementR1-signTermBehaviour BEHAVIOUR DEFINED AS
        "A create request is rejected if the equipmentPointer would reference equipment that does
        not exist. If the name package is supported: a create request with a value for the name
        attribute that is already used by another instance of the same object class will be
        rejected.";;
    CREATE;
    DELETE;
REGISTERED AS {itu-t(0) identified-organization(4) etsi(0) 1007 informationModel(0) nameBinding(6)
    managedElementR1-signTerm(2)};

managedElementR1-lsTimersProfile NAME BINDING
    SUBORDINATE OBJECT CLASS lsTimersProfile ;
    NAMED BY
    SUPERIOR OBJECT CLASS "ITU-T Rec. M.3100 (1995)":managedElementR1;
    WITH ATTRIBUTE lsTimersProfileId;
    BEHAVIOUR managedElementR1-lsTimersProfileBehaviour BEHAVIOUR DEFINED AS
        "If the name package is supported: a create request with a value for the name attribute that
        is already used by another instance of the same object class will be rejected.
        If an attempt is made to delete an lsTimersProfile which is still referenced by a
        signLinkSetTp the delete request will be rejected.";;
    CREATE;
    DELETE;
REGISTERED AS {itu-t(0) identified-organization(4) etsi(0) 1007 informationModel(0) nameBinding(6)
    managedElementR1-lsTimersProfile(3)};

managedElementR1-mtpL2ProtocolProfile NAME BINDING
    SUBORDINATE OBJECT CLASS mtpL2ProtocolProfile;
    NAMED BY
    SUPERIOR OBJECT CLASS "ITU-T Rec. M.3100 (1995)":managedElementR1;
    WITH ATTRIBUTE mtpL2ProtocolProfileId;
    BEHAVIOUR managedElementR1-mtpL2ProtocolProfileBehaviour BEHAVIOUR DEFINED AS
        "If the name package is supported: a create request with a value for the name attribute that
        is already used by another instance of the same object class will be rejected.
        If an attempt is made to delete an mtpL2ProtocolProfile which is still referenced by a
        signLinkTp the delete request will be rejected.";;
    CREATE;
    DELETE;
REGISTERED AS {itu-t(0) identified-organization(4) etsi(0) 1007 informationModel(0) nameBinding(6)
    managedElementR1-mtpL2ProtocolProfile(4)};

managedElementR1-slTimersProfile NAME BINDING
    SUBORDINATE OBJECT CLASS slTimersProfile ;
    NAMED BY
    SUPERIOR OBJECT CLASS "ITU-T Rec. M.3100 (1995)":managedElementR1;
    WITH ATTRIBUTE slTimersProfileId;
    BEHAVIOUR managedElementR1-slTimersProfileBehaviour BEHAVIOUR DEFINED AS
        "If the name package is supported: a create request with a value for the name attribute that
        is already used by another instance of the same object class will be rejected.
        If an attempt is made to delete an slTimersProfile which is still referenced by a signLinkTp
        the delete request will be rejected.";;
    CREATE;
    DELETE;
REGISTERED AS {itu-t(0) identified-organization(4) etsi(0) 1007 informationModel(0) nameBinding(6)
    managedElementR1-slTimersProfile(5)};

managedElementR1-spTimersProfile NAME BINDING
    SUBORDINATE OBJECT CLASS spTimersProfile;
    NAMED BY
    SUPERIOR OBJECT CLASS "ITU-T Rec. M.3100 (1995)":managedElementR1;
    WITH ATTRIBUTE spTimersProfileId;
    BEHAVIOUR managedElementR1-spTimersProfileBehaviour BEHAVIOUR DEFINED AS
        "If the name package is supported: a create request with a value for the name attribute that
        is already used by another instance of the same object class will be rejected.
        If an attempt is made to delete an spTimersProfile which is still referenced by a
        mtpSignPoint the delete request will be rejected.";;
    CREATE;
    DELETE;
REGISTERED AS {itu-t(0) identified-organization(4) etsi(0) 1007 informationModel(0) nameBinding(6)
```

```
    managedElementR1-spTimersProfile(6)};
```

4.2.8 Subclause 7.8 of Q.751.1

The ASN.1 type Point Code is extended to: (unrestricted) INTEGER.

For the CHOICE components of StpScreeningTableLineId the typing is replaced by "designatedLinkSet" and "designatedOpc".

The ASN.1 type TimerValue is extended to: INTEGER (0..360000).

4.2.9 Annex A of Q.751.1

This annex is informative.

4.2.10 Annex B of Q.751.1

This annex is informative.

It is an informal definition of the Signalling System No.7 MTP resources and their management, as seen from the MTP. It is written from a network management perspective, and does not apply directly, although it may be useful for an explanation of the MTP and its management.

4.2.11 Annex E and annex F of Q.751.1

Annex E is the formal description of MTP measurements. The MTP measurements used for message traffic accounting are for further study in ITU-T Recommendation Q.751.1 [11], the requirements of the present document are defined in subclause 3.2.12.

Only those portions of annex E apply which correspond to required measurements defined in ITU-T Recommendation Q.752 [2] (see clause 4 of the present document).

Annex F is the definition of the MRVT managed object class, and shall apply.

4.2.12 Object model for MTP accounting and verification

ITU-T Recommendation Q.751.3 [13] shall apply, with the exception that MTP accounting verification is not required.

5 Exceptions and clarifications to ITU-T Recommendation Q.752

If a Protocol Implementation Conformance Statement (PICS) associated with an ETSI deliverable contains a reference to an optional Signalling System No.7 function, and that function has an associated measurement which is obligatory if the function is used, then the measurement shall be supplied if the function is supplied.

The references to Recommendation Q.751 in ITU-T Recommendation Q.752 [2] should be replaced throughout by "the series of Recommendations Q.751".

5.1 Subclause 1 of Q.752

Subclause 1 shall apply with the following exceptions:

Subclause 1.1.1: add to the hyphenated list at the end:

> "ITU-T Recommendation Q.752 [2] does not describe any filtering techniques to be applied after measurements are taken (apart from the "first and interval" method to reduce the number of output reports). The Q.820 series of

> Recommendations define filtering techniques useful for control of the Signalling System No.7 network. In particular, ITU-T Recommendation Q.822 [19] defines packages of counters, grouped into one data object. So, for instance, if the operator wishes to monitor error performance, all counters in a group could be activated at the same time. The distinction made in the ITU-T Recommendation Q.752 [2] Recommendation between "permanent" and "activated" measurements also disappears - all measurements are inherently "activated", permanency can be achieved by keeping a measurement activated all the time."

Subclause 1.1.2 should refer to the operations, maintenance and administration part and not the operations and maintenance application part.

Subclause 1.4.2: delete the words "according to the managed object being measured" in the first sentence.

Subclause 1.6: refer to ITU-T Recommendation X.701 and not paragraph 2.2 in ITU-T Recommendation Q.750 [1].

Subclause 1.6.4: delete the last sentence "However, certain measurements … for STP accounting purposes".

Subclause 1.7.1.2: delete the clause apart from its first sentence.

Subclause 1.7.1.7: add a paragraph at the end "The "1st & interval" measurements "Units" column contains two items if the units for the first event report are different from those applied in the interval, and in that case the ones applied in the interval are the second in the column."

Add a subclause 1.8:

"1.8 Techniques for filtering measurements

1.8.1 Single faults giving rise to multiple error reports

Where a single fault could cause recurring event reports (e.g. a single MTP routing data corruption could result in many MSUs being discarded), the first and interval measurement technique can be used. The initial report should contain enough information to establish the location of the fault, the interval count will then indicate its severity. The interval should be short enough to allow real time control. This technique presents information essential to the maintenance staff, and filters out that which is redundant."

5.2 Subclause 2 through 5 of Q.752

The provisions of these clauses shall apply where the measurements referred-to apply (see the references to the tables of ITU-T Recommendation Q.752 [2] in the present document).

Subclause 2.1: add a paragraph at the beginning: "The measurements for MTPs according to Q.2210 [20] have yet to be defined in detail, however the ones included here for level 3 are likely to be appropriate also in the broad band environment."

Subclause 2.3.1: change to "Item 2.1 could be derived from measurements 1.2, 1.12, 2.5 and 2.6."

Subclause 3.2.1: replace the subclause with:

"Subclause **3.2.1** Routing failure measurements (items 7.1 through 7.7 and 7.9) refer to all possible failures (both local and remote) detected by SCCP Routing Control, and count all SCCP messages which encounter transport problems, regardless of whether or not a (X)Unitdata Service message or N-NOTICE primitive is returned to the originator. Receipt of a (X)Unitdata Service message is not included in this count. The measurements refer to both primary and secondary entities, or just the primary if no secondary entity is prescribed.

All of these measurements are marked as "1st & interval". They enable SCCP routing failures to be identified.

The reassembly error measurements (items 7.10 through 7.12) are prescribed for the SCCP connectionless reassembly service. item 7.12 (no reassembly space) indicates a resource limitation when the first segment of a sequence is received.

Item 7.13 (Hop counter violation) indicates a routing failure, possibly an SCCP circular route. All hop counter violations are reported with this item, including those from Connection Request messages.

The report associated with the first event of items 7.10 and 7.11 should contain at least the calling party address and the segmentation local reference as diagnostic information.

The report associated with the first event of item 7.13 should contain as diagnostic information at least the called party address, and the OPC of the MTP routing label. If present, the calling party address should also be included.

The report associated with the first event of item 7.14 should contain as diagnostic information the subsystem number and called party address.

The reports associated with the first event of items 7.15, 7.16 and 7.18 should contain as diagnostic information at least the MTP Service Access Point (SAP) identity (implementation dependent), the connection references (local and remote) and the DPC.

Item 7.18 should also contain the cause."

Subclause 3.4.4 and 3.4.5 should be replaced by:

"Subclause **3.4.4** Measurements 9.6 and 9.7 are taken per protocol class (as present in the protocol class parameter of (X)UDT messages) and per SSN. 9.6 is counted at the origin per source SSN and refers to messages delivered to an MTP Service Access Point, 9.7 is counted at the destination per sink SSN and refers to messages received from an MTP Service Access Point.

"Subclause **3.4.5** Measurement 9.8 refers only to those messages which would normally have been routed to a local subsystem but because of a change in the translation process (e.g. due to a routing failure towards that subsystem), are directed to a backup subsystem. The measurement is only applicable at replicated nodes with translation capabilities."

Subclause 3.4: delete the last sentence.

5.3 Subclause 6 of Q.752

This subclause is informative.

5.4 Subclause 7 of Q.752

Add a clause 7 to ITU-T Recommendation Q.752 [2], and note that the network operator shall be able to determine to what date and time the start of each accounting interval belongs. It should be noted that implementations might respond with different delays in starting accounting when requested, and the network operator should take this into consideration when determining when to start the first accounting interval. In addition, depending upon implementation, it might or might not be sufficient to associate a date and time only with the first accounting interval, and then to determine the date and time of the start of each successive interval from its position and the length of preceding intervals.

The text of the new clause 7 is:

"Subclause **7 Accounting of MTP and SCCP message traffic**

Subclause 7.1 General

Subclause 7.1.1

This section covers all registration items appropriate to support cascade remuneration. This accounting method is based on the principle that the originator pays the operator (if different) of the next node in the message's path for delivering the message; the next node's operator pays the operator of its next node, and so on. The measurements here, because they differentiate on the basis of the destination of the messages, would allow all the network operators involved to be remunerated.

Subclause **7.1.2**

Two functions are defined for Signalling System No.7 message accounting:

1) verification of the number of messages sent for which the receiving operator should be paid (this function is optional);

2) registration by the receiving operator of the number of messages for which payment is to be received.

Subclause **7.1.3**

Two types of traffic registration are distinguished. The registration of the MTP signalling traffic refers to the usage of the "transfer" resources. The registration of the SCCP signalling traffic refers to the usage of the "relay" resources. Traffic registration will not only be needed for remuneration but also for remuneration verification. Correlation between both kinds of traffic registration within one node is not required. The role of Signalling End Points (SEPs) and SCCP endpoints in accounting and accounting verification is for further study.

NOTE: The use of Service Indicator (SI), SSN and SCCP class as registration items for accounting purposes should be considered in the light of the need for data protection, information security and fair competition (see Q.756 [21]).

Subclause **7.2 MTP traffic registration**

MTP traffic registration is applicable within one Operator's MTP network or a group of Operators of one MTP network (e.g. different countries owning parts of the overall international signalling network). If required, these networks can also be subdivided into different parts (in order to apply different tariffs).

Subclause 7.2.1 Basic registration principles

Subclause 7.2.1.1For remuneration purposes, the incoming MTP signalling traffic should be registered against the following items:

- The identity of the adjacent network operator sending the MTP message. If discrimination between several operators is not required the identity of a group of these operators should be used.
- Destination information, as far as relevant for the accounting agreements. This information may identify one or more networks. If also required, network parts could be identified.
- Optionally, the identity of the requested service or group of services.

For each relevant combination the number of messages transferred as well as the number of octets should be registered per specific time interval (e.g. every 30 minutes).

Subclause **7.2.1.2**For remuneration verification, the outgoing MTP signalling traffic should be registered against the following items:

- The identity of the adjacent network operator receiving the MTP message. If discrimination between several operators is not required the identity of a group of these operators should be used.
- Destination information, as far as relevant for the accounting agreements. This information may identify one or more networks. If also required, network parts could be identified.
- Optionally, the identity of the requested service or group of services.

For each relevant combination the number of messages sent out as well as the number of octets should be registered per specific time interval (e.g. every 30 minutes).

Subclause **7.2.1.3**The results of both periodic measurements should be provided with the date (year, month, day) and time (hours, minutes) of the start of each time interval.

Subclause **7.2.1.4**The following MTP related information is used to identify the items involved in remuneration and remuneration verification.

- The Incoming LinkSet (ILS) or set of ILSs should be used to identify the adjacent network operator or group of operators from which the MTP message was received.
- The Outgoing LinkSet (OLS) or set of OLSs should be used to identify the adjacent network operator or group of operators to which the message is sent.
- The DPC or set of DPCs should be used to identify the relevant destination information.
- If the option is selected, the SI value or set of values should be used to identify the requested service or group of services.

Subclause **7.2.2. Limitations**

Subclause 7.2.2.1 Although each network operator is responsible for defining the relevant combinations, limits should be placed on the number of registration items mentioned in subclauses 7.2.1.1 and 7.2.1.2. A limit should also be placed on the number of combinations.

Subclause 7.2.2.2 The effect of re-transmissions due to e.g. changeover can be ignored. Tariffs could always be adjusted to compensate for the predicted traffic volume from this effect.

Subclause 7.2.2.3 No particular attempt will be made to account separately for, or exclude from accounting, MTP-own messages with SI = 0000 or 0001 (the number of messages should anyway be small).

Subclause 7.3 SCCP traffic registration

SCCP traffic registration is applicable in all cases where a G.T.T. (global title translation) is done, e.g. at relay nodes or at gateways between MTP networks.

Subclause 7.3.1 Basic registration principles.

Subclause 7.3.1.1 For remuneration purposes, the incoming SCCP signalling traffic should be registered against the following items:

- The identity of the operator of the previous network adjacent to the gateway (where accounting is done) sending the SCCP message (identity of the previous SCCP node). If discrimination between several operators is not required the identity of a group of these operators should be used.

- Destination information, as far as relevant for the accounting agreements. This information may identify one or more destination or intermediate networks. If also required, network parts could be identified.

- Optionally, the identity of the requested service application type (HLR, VLR, ISUP, ISDN supplementary services, etc.) or group of service application types. The required number of such groups and their constituents is for further study.

- Optionally, the identity of the SCCP class requested (0, 1, 2 or 3).

For each relevant combination the number of transferred messages as well as the number of SIF + SIO octets should be registered per specific time interval (e.g. every 30 minutes).

It is for further study for which network arrangements the last two registration items might be required.

Subclause **7.3.1.2**For remuneration verification, the outgoing SCCP signalling traffic should be registered against the following items:

- The identity of the operator of the following network adjacent to the gateway (where accounting is done) which received the SCCP message (identity of the next SCCP node). If discrimination between several operators is not required the identity of a group of these operators should be used.

- Destination information, as far as relevant for the accounting agreements. This information may identify one or more destination or intermediate networks. If also required, network parts could be identified.

- Optionally, the identity of the requested service application type (HLR, VLR, ISUP, ISDN supplementary services, etc.) or group of service application types. The required number of such groups and their constituents is for further study.

- Optionally, the identity of the SCCP class used (0, 1, 2 or 3).

For each relevant combination the number of messages sent out as well as the number of SIF + SIO octets should be registered per specific time interval (e.g. every 30 minutes).

It is for further study for which network arrangements the last two registration items might be required.

Subclause **7.3.1.3** The results of both periodic measurements should be provided with the date (year, month, day) and time (hours, minutes) of the start of each time interval.

Subclause **7.3.1.4** The following SCCP related information should be used to identify the items involved in remuneration and remuneration verification. For remuneration, the information of the received message should be used.

For remuneration verification, the information resulting from the global title translation in the sending node should be used.

- The OPC (+MTP service access point instance (which is implementation dependent and indicates the MTP network)), as provided by the MTP to the SCCP, should be used to identify the operator of the previous node/network from which the SCCP message was received.

- The DPC (+MTP service access point instance (which is implementation dependent and indicates the MTP network)), resulting from a global title translation, should be used to identify the operator of the following node/network to which the SCCP message is sent.

- The following called party address global title items should be used to deduce the relevant destination information:

  - Global Title Indicator (GTI);

  - The relevant parts of the address information;

  - Nature of address indicator (NAI) (optional);

  - Numbering plan (NP) (optional);

  - Translation type (TT) (optional).

Whether or not the GTI, NAI, NP and TT are used, their values, and which parts of the address information are used, depend upon the particular network arrangements, and are for further study.

NOTE 1: Although a DPC may be used instead of a global title, it is assumed that accounting will only be needed between MTP network boundaries (in which case the GT Address Information (GTAI) is mandatory) and therefore the DPC is not included here.

- If the option is selected, the SSN or set of SSNs should be used to identify the requested service application type (HLR, VLR, ISUP, ISDN supplementary services, etc.).

NOTE 2: The network operator will decide how to handle (to group) a called party address with a SSN value 0 or SSN that is not recognized and/or standardized.

- If the option is selected, the "protocol class" parameter field should be used to identify the requested SCCP class (0, 1, 2 or 3).

Subclause **7.3.2 Limitations**

Subclause 7.3.2.1 Although the network operator is responsible for defining the relevant combinations, limits should be placed on the number of registration items mentioned in subclauses 7.3.1.1 and 7.3.1.2. A limit should also be placed on the number of combinations.

Subclause 7.3.2.2 No particular attempt will be made to account separately for, or exclude from accounting, SCCP-own messages with SSN = H01 (the number of messages should anyway be small).".

5.5 The tables of Q.752

In these tables, delete the "Activated/Permanent" column, and delete notes of managed objects.

Table 1 items 1.1 and 1.2 and 1.8 (30 minute duration) shall apply.

Table 2 item 2.1 shall apply.

Table 3 item 3.1 (30 minute duration), item 3.4 (30 minute duration) and item 3.10 (30 minute duration) shall apply.

Table 4 items 4.9 and 4.10 shall apply.

Table 5 item 5.1 (on occurrence), item 5.2 (5 and 30 minute duration), item 5.5 (30 minute duration) shall apply.

Table 6 is not required.

Table 7 items 7.1 through 7.16, 7.18 and 7.20 (all with 1st & Δ duration) shall apply, subject to the provisions of the Notes to table 7, and to the provisions of ETS 300 009-1 [8].

The items 7.9 onwards of this set should be replaced by:

"7.9 is Routing Failure - unqualified; units are Events; usage F, R, P, C, N; interval 1st & Δ; reference Q.714/2.4.

"7.10 is Reassembly error - Timer T_{reass} expiry; units are Event/CGPA/seg.LR, Events; usage F,R,P; interval 1st&Δ; note (d) applies; reference Q.714/4.1.1.2.3.2.

"7.11 is Reassembly error - segment received out of sequence (inc. duplicates, recpt. of non-first segment for which no reassembly process); units are Event/CGPA/seg.LR, Events; usage is F,R,P; interval 1st&Δ; note (d) applies; reference Q.714/4.1.1.3.2.

"7.12 is Reassembly error - no reassembly space; units are Events; usage is R,P,N; interval 1st&Δ; note (d) applies; reference Q.714/4.1.1.2.3.4.

"7.13 is Hop counter violation (XUDT, XUDTS and CR); units are Event/[CGPA]/CDPA, Events; usage F,R,P; interval 1st&Δ; note (e) applies; reference Q.714/2.3.1 3.

"7.14 is Message too large for segmentation; units Event/SSN, Events; usage F,R,P; interval 1st&Δ ; note (d) applies; reference Q.714/4.1.1.1.1.

"7.15 is Failure of release complete supervision; units Event/DPC/Protocol class, Events; usage F,R,P; interval 1st&Δ ; note (f) applies; reference Q.714/3.3.4.2.

"7.16 is Timer T(iar) expiry; units Event/DPC/Protocol class, Events; usage F,R,P; interval 1st&Δ; note (f) applies; reference Q.714/3.4.

"7.18 is Provider initiated release of a connection; units Event/DPC/Protocol class, Events; usage F,R,P; interval 1st&Δ ; note (f) applies; reference Q.714/3.3, Q.713/ Table A-2.

"7.20 is segmentation error - segmentation failed; units Event; usage F,R,P; interval 1st&Δ ; reference Q.714/4.1.1.1."

Notes (d), (e) and (f) to table 7 should be replaced by:

d) This measurement is obligatory if SCCP connectionless segmentation and reassembly is supported.

e) This measurement is obligatory if the node supports 1993 SCCP Global Title Translation or later, and the network supports XUDT or XUDTS or other messages (e.g. CR) routed on GT and containing a hop counter. Note that the calling party address (CGPA) might not be present in CR messages. It is used, if present in messages, to register violations.

f) This measurement is obligatory only if the node supports connection-oriented SCCP.

Table 8 items 8.6 and 8.7 shall apply, subject to the provisions of the notes to the table, and to the provisions of ETS 300 009-1 [8]. Item 8.6 is the measurement of subsystem out-of-service grant message received. The units for 8.6 and 8.7 are Events/SSN/DPC, and they are on occurrence measurements.

Table 9 items 9.6 (30 minute duration), 9.7 (30 minute duration) and 9.8 (30 minute duration) shall apply, subject to the provisions of ETS 300 009-1 [8]. item 9.8 is also subject to the provisions of note b) to the table. Item 9.6 and 9.7 descriptions should be replaced by:

"9.6 Total (X)UDT messages originated per class and source SSN

"9.7 Total (X)UDT messages terminated per class and sink SSN"

Tables 9*bis* and 10 are not required.

Table 11 items 11.1 and 11.2, both for 30 minute durations and summed over all message types, shall apply.

Table 12 items 12.5, 12.6, 12.8 through 12.19 shall apply, subject to the provisions of ETS 300 356 -1[12]. Item 12.23 shall apply, subject to the provisions of ETS 300 356-1[12] and note a) to the table.

Table 13 items 13.1*bis* and 13.2*bis* (both 30 minute durations) shall apply.

Items 13. 1*bis* and 13.2*bis* are:

"13.1*bis* is Total number of TC messages sent by the node; units Messages; usage P, R, N; interval 30 min."

"13.2*bis* is Total number of TC messages received by the node; units Messages; usage P, R, N; interval 30 min."

Table 14 items 14.1 d) and e) shall apply.

Table 15 items 15.1 and 15.2 shall apply. The identity of the service set may be used as a registration item.

Table 16 items 16.1 and 16.2 shall apply. The identity of the service set may be used as a registration item. The provisions of subclause 5.4 of the present document (referring to a new subclause 7.3.1.4 of ITU-T Recommendation Q.752) [2] shall apply with respect to the use of GTI, NAI, NP, TT and parts of the address information.

Tables 15 and 16 are as follows:

Table 15/Q.752: Signalling System No.7 MTP Message accounting

(See subclause 7.2 to be added to ITU-T Recommendation Q.752 [2], subclause 5.4 of the present document.)

Description of Measurements	Units[1,2,3]	Usage	Duration	From	Obl.	References
15.1 Messages received	Msgs./sending op./dest.info./ service set	A	30 min. (prov.)	-	No	
15.2 Octets received	Octets./sending op./dest.info./ service set	A	30 min. (prov.)	-	No	

NOTE 1: Sending op. means the identity of the operator(s) of the sending part of the network, rcvng.op. means the identity of the operator(s) of the receiving part of the network. , derived from the appropriate linkset.
NOTE 2: Dest.info. means destination information, derived from the MTP label's DPC, which identifies the accounting agreement.
NOTE 3: The service set is derived from the messages' service indicator (SI) in the SIO, several SIs may be grouped together. This registration unit is optional, and might not be used to discriminate the measurement.

Table 16/Q.752: Signalling System No.7 SCCP Message accounting

(See subclause 7.3 to be added to ITU-T Recommendation Q.752 [2], subclause 5.4 of the present document.)

Description of Measurements	Units[1,2,3,4]	Usage	Duration	From	Obl.	References
16.1 Messages received	Msgs./prev. op./dest.info./ service set	A	30 min. (prov.)	-	No	
16.2 Octets received	Octets./prev. op./dest.info./ service set	A	30 min. (prov.)	-	No	

NOTE 1: Prev.op. refers to the identity of the operator of the previous network from where the message was sent, SCCP-adjacent to this accounting gateway. It might be derived from the OPC in the MTP label (+ the MTP SAP instance of this accounting gateway).
NOTE 2: Next op. refers to the identity of the operator of the following network, which received the SCCP message, SCCP-adjacent to this gateway. It might be derived from the DPC resulting from a Global Title Translation of the called party address, plus the MTP SAP instance.
NOTE 3: Dest.info. is used to derive the identity of the accounting arrangement. It might be obtained from (parts of some of) the address information, NAI, NP, TT in the called party address.
NOTE 4: The service set is an optional registration unit, and might be identified by an SSN or set of SSNs. In addition, the requested SCCP class might optionally be included.

6 General exceptions and clarifications to ITU-T Recommendations Q.750 to Q.754 for the MRV Test

6.1 Use of SCCP addressing

There is no requirement to use global titles in the called party or calling party addresses used in the SCCP UDT or UDTS or XUDT or XUDTS messages containing OMAP MRVT, MRVA or MRVR information. (See ETS 300 009-1 [8].)

The routing indicator shall be set to "route on SSN" for both addresses in such messages, and their called and calling party addresses shall contain at least the OMAP SSN.

6.2 Definitions

MTP route: This is defined in subclause B1.2.8 of annex B of ITU-T Recommendation Q.751.1 [11].

A hop of an MTP route: The combination of signalling point and adjacent following signalling point in the route's ordered sequence of SPs.

pointcodestraversed: A parameter containing the list of the SPs encountered by successive MRVT messages along one path from the test initiator Signalling Point (SP) to the tested destination. The first entry in this list is the test initiator.

7 Specific exceptions and clarifications to ITU-T Recommendations Q.750 to Q.754 for the MRV Test

7.1 Q.750

When TMN is available the Q.750/Figure 6 [1] q3 reference point and the MIS-User will apply: until then an MRV Test can be controlled only over a local interface function.

7.2 Q.752

The obligatory measurements are required.

The obligatory measurement 5.5, MSUs discarded due to a routing data error, might indicate that an MRV Test should be run (this is network dependent, see section B.3 a) and B.3 c) of the present document).

7.3 Q.753

Section 1 is in the scope of the present document. Section 2 is replaced (see subclause 7.3.1), later sections of ITU-T Recommendation Q.753 [3] are not in the scope of the present document.

7.3.1 Subclause 2 of Q.753

Replace up to section 2.5.2 of ITU-T Recommendation Q.753 [3] by the following text:

START REPLACEMENT in Q.753:

Subclause 2 MTP management functions

Subclause 2.1 General

At present, the only function defined here for managing the MTP is the MRVT.

Subclause **2.2 Network routing management - MTP Routing Verification Test (MRVT)**

The aims of the MTP routing verification test are as follows:

a) Independence from MTP routing policy.

b) Independence from link set failures.

c) To use the existing MTP without modifications.

d) To respond to all tests (positive or negative).

e) Independence from the network structure (but note that the test has not been examined yet to see if it is suitable in Broad-band networks - this is for further study).

f) The procedure should:

- detect loops in MTP routing;
- detect excessive length routes;
- detect unknown destinations (i.e. non-existent destinations, missing routing entries and routing corruptions);
- check the bidirectionality of signalling relations (i.e. if SP A can reach SP B, can SP B reach SP A?).

NOTE: The test might need extending to cater for asymmetrical routes, and for ping pong loops if TFP messages are lost.

Subclause **2.2.1 General procedure considerations**

The object of the MTP routing verification test is to determine if the data of the MTP routing tables in the network are consistent. It is based on a decentralized test procedure using test messages. It will follow all possible routes to reach the test destination, while tracking the identities of STPs crossed.

All network operators must agree that MRV Tests may be run, before any tests are run.

The use of the MRVR trace on success would require agreement by all network operators on the circumstances of its use.

The value of the time *D* is fixed. The value is given in replaced subclause 2.4 in ITU-T Recommendation Q.753 [3].

In defining the MRV test for a particular network, the following points should be considered:

a) Inter-network operator agreements are required if the test is to traverse inter-operator boundaries in the same MTP network.

b) If there is network congestion, since the MRV Test imposes a load on the network, it should be run (if at all) with due care to avoid total overload of the network.

c) The MRVR trace on success would load the network further. See annex A item b) of the present document.

The test is started in any point (SP or STP) for any destination which is in the MTP routing tables and is stopped at the test destination or any intermediate SP at which an error is detected. The test will check the complete routing in the network only if all intermediate signalling points have routing information for the initiator and for the test destination and no errors are detected at intermediate SPs.

When an inconsistency or failure is detected the initiator of the test shall be alerted.

Subclause **2.2.1.1 Running the MRVT procedure at a signalling point**

The procedure in subclause 2.2.4.1 should be started on demand (under conditions determined by the network operator) from local maintenance staff or an operations centre when, for example:

a) New MTP routing data is introduced. Each signalling routeset should pass the MRVT procedure successfully before being opened to traffic.

b) MTP routing data is changed.

c) An unexpected MRVR (due to unknown Signalling Point, see subclause 2.3) is received.

d) Measurement 5.5 of ITU-T Recommendation Q.752 [2] indicates a significant routing problem.

In cases c) and d) above, the "trace requested" field of the MRVT message should be set to indicate no trace is expected.

Subclause **2.2.1.2 Reserved**

Subclause **2.2.1.3 Reserved**

Subclause **2.2.1.4 MRV test compatibility considerations**

The principles applied are:

1) It should not be necessary to enhance old nodes in order for the enhanced test to work, but the test should still behave in the same way as the old test at these nodes;

2) the new test should supply at least as much useful information as the old, even when some old nodes are present in the network;

3) a new node should handle old messages in the same way as old nodes;

4) a new message should be handled by an old node in the same way as an old message.

For backwards compatibility, if an MRVA, MRVR, or MRVT message received in an SP contains information as OPTIONAL parameters extra to that defined in subclause 2.2.2, the extra information shall not be acted upon, but shall be transmitted unchanged if messages are regenerated by this SP in this test.

If an unknown ErrorTag value is received in an MRVR message at the test initiator, it shall be passed up to management.

If an unknown FailureString value is received in an MRVA message at the test initiator, it shall be passed up to management.

If an unknown FailureString value is received in an MRVA message at an intermediate point, the value shall be put (logical "inclusive or") into the MRVA message to be passed back.

Subclause **2.2.2 The MRVT messages**

The MTP routing verification test procedure uses three Operations, Maintenance, and Administration Part (OMAP) messages.

Subclause **2.2.2.1 The MTP Routing Verification Test (MRVT) message**

The MRVT message shall be sent from an SP to an adjacent SP. The MRVT message may use any available signalling route to reach its destination. It shall contain:

a) information indicating an MRVT message;

b) the Point Code of the test destination;

c) the initiator Point Code;

d) the threshold N of the maximum allowed number of SPs crossed (including the initiator). This threshold is also the maximum number of point codes in the pointCodesTraversed parameter;

e) the information indicating that a trace is requested; the possible values are:

   1) for all routes which may be used to reach the test destination the MRVR messages are returned regardless of the result of the test;

   2) no detailed information requested (the MRVR messages to be sent only if a failure or inconsistency is detected);

f) a list consisting of the identities of the STPs crossed plus the initiator Point Code. This list forms the pointCodesTraversed parameter;

g) a parameter, called infoRequest, which indicates:

   1) that the test initiator is able to understand MRVR messages with optional parameters; and

   2) the information that any MRVR message may contain, if the MRVR sender understands it;

h) optionally a parameter, called returnUnknownParams, which indicates which parameters of the MRVT message, if an SP does not understand them, should be returned in any MRVR message.

Parameters g and h shall not be present in MRVT messages regenerated by intermediate nodes if they were not present in the received MRVT message (i.e. the test initiator is the only node allowed to insert them).

Parameter g shall be inserted by an initiator node, it shall contain the values pointCode(0) and pointCodeList(1).

SCCP class 0 or 1 shall be used, with the return option set to "return message on error".

Subclause **2.2.2.2 The MTP Routing Verification Acknowledgement (MRVA) message**

The MRVA message shall be sent from the SP receiving an MRVT message back to the SP that has sent the MRVT message. The MRVA message may use any available signalling routes to reach its destination. It shall contain:

a) information indicating an MRVA message;

b) information indicating whether or not an MRVR message has been sent;

c) the reason for any failure (partial or complete). If any failure has occurred, one or more of the following indications shall be present:

   i) detected loop;

   ii) detected excessive length route;

   iii) unknown Destination Point Code;

   iv) MRVT not sent due to inaccessibility (e.g. network blockage or network congestion);

   v) timer expired (MRVA not received);

   vi) unknown initiator Point Code (this result means that the test destination or an intermediate point does not know the initiator of the test);

      The MRVA message may contain information in a copyData parameter to be sent in the requested MRVR message. This shall contain information copied from the MRVT message (see subclause subclause 2.2.4.1 and 2.2.4.3) if requested by its returnUnknownParams parameter. This copyData parameter shall not be regenerated in MRVA messages, once the requested MRVR has been sent. See the Annex B.3 to be added to ITU-T Recommendation Q.753 [3] for an explanatory diagram (contained in subclause 7.3.3 of the present document).

   vii) test cannot be run due to local conditions (i.e. unavailability of processing resources, or MRVT message rejected by a remote SCCP or TC, or remote OMAP subsystem prohibited);

   viii) intermediate SP does not have the MTP transfer function, or no authorization is given at this SP to transfer messages from the test origin to the test destination (see Q.705 [22] subclause 8).

   ix) maximum number of MRV Tests are already running at the signalling point.

In the case of success, only a) shall be present; in the cases of partial success and failure, a), b), and c) shall be present. SCCP class 1 service shall be used with the sequence information the same as that for any associated MRVR message sent out.

Subclause **2.2.2.3 The MTP Routing Verification Result (MRVR) message**

There are two types of MRVR message, one with and one without optional parameters. The type containing optional parameters (routeTraceNew) shall be used if the MRVT or MRVA message triggering it contained the (optional) infoRequest parameter or copyData parameter, respectively - otherwise the type not containing optional parameters shall be used.

Nodes implemented in accordance with the present document originating an MRV Test shall include the infoRequest parameter.

The MRVR message is sent from an SP to the initiator of the MTP routing verification test, and also on receipt in the MTP of a message for an unknown destination (see ITU-T Recommendation Q.704 [6] subclause 2.3.3). It shall contain:

a) information indicating an MRVR message;

b) the Point Code of the tested destination;

c) the result of the test;

d) the information field;

The content of this information field depends on the result of the test. It shall contain:

i) if the result of the test is "success":

- the pointCodesTraversed parameter contained in the MRVT message;

ii) if the result of the test is "detected loop":

- the pointCodesTraversed parameter contained in the received MRVT message augmented in order by the point code of the SP detecting the loop and the point code of the SP completing the loop (i.e. the Point Code (PC) in list "A" mentioned in subclause 2.2.4.2.1 d) 3) i) [a]);

iii) if the result of the test is "detected excessive length route":

- the pointCodesTraversed parameter contained in the MRVT message;

iv) if the result of the test is "unknown Destination Point Code":

- either no additional information; or

- if the prompting MRVT message contained the infoRequest parameter requesting it, the pointCodesTraversed parameter of the MRVT;

v) if the result of the test is "MRVT not sent due to inaccessibility":

- the Point Code of the inaccessible SP; or

- if the prompting MRVT message requested it with the infoRequest parameter and if more than one SP were inaccessible, a list of all the inaccessible SPs;

vi) if the result of the test is "MRVA not received":

- the identity of the SP(s) from which an MRVA was not received when expected;

vii)if the result of the test is "unknown initiator Point Code":

- the Point Code of the SP returning an MRVA that caused the MRVR to be sent;

- any information from the MRVA message that it requested to be sent (in the copyData parameter);

viii) if the result of the test is "test cannot be run due to local conditions" (i.e. "processingFailure"):

- either no additional information; or

- if the prompting MRVT message requested it with the infoRequest parameter, the Point Code of the SP where the test could not be run;

ix) if the result of the test is "intermediate SP does not have the MTP transfer function":

- the pointCodesTraversed parameter;

x) if the result of the test is "maximum number of MRV Tests already running at the SP":

- either no additional information; or
- if the prompting MRVT message requested it with the infoRequest parameter, the Point Code of the SP where the test could not be run;

e) If the MRVR message was prompted by an MRVT message, and if the SP receiving the MRVT did not understand some of the parameters in it, and if the returnUnknownParams parameter was in the MRVT and indicated a selection of these unrecognized MRVT parameters, a copyData parameter containing the selection. Each such selected parameter shall be copied completely with its tag, length and value put into the copyData parameter.

The SCCP class 1 service shall be used, with the sequence information the same as that of any other associated MRVR messages and the MRVA message to be sent.

Subclause **2.2.3 Initiation of the MRVT procedure**

The conditions under which the MRV Test is started are described in subclause 2.2.1.1. An MRV Test can be initiated manually at a signalling point, or remotely from a management centre. See ITU-T Recommendation Q.750 [1], ITU-T Recommendation Q.751.1 [11], Annex A of ITU-T Recommendation Q.754 [4] and Q.756 [21] for more information.

Subclause **2.2.4 The MRVT procedure**

Subclause **2.2.4.1 At the point initiating the procedure**

Subclause **2.2.4.1.1 Initial actions**

If a Signalling point is requested to initiate an MRVT procedure, it shall check that the maximum number of MRVT procedures with different (test initiator, test destination) values allowed to run at any time at the SP, n_T, has not been exceeded. If this test fails, the MRV Test shall be refused.

An SP shall not initiate an MRVT procedure for a test destination until any MRVT procedure previously initiated there for the same tested destination has completed.

When a Signalling Point initiates an MRVT procedure, it shall send an MRVT message for each configured signalling route which is contained in the MTP routing tables to reach the test destination (if the test destination is adjacent to the test initiator on such a route, an MRVT message shall still be sent). The destination (DPC) of each of these messages shall be the adjacent signalling point within the particular route under test.

When the MRVT procedure is initiated, a timer T_1 in the OMASE-User (see subclause 2.4), and a timer T_1 in TC for each MRVT message sent, shall be started.

The signalling routes tested should be agreed, and authorized (see Q.705 [22] subclause 8).

Subclause **2.2.4.1.2 Subsequent actions**

Subclause **2.2.4.1.2.1 Reception of an MRVA message**

An MRVA message acknowledges an MRVT message previously sent. If received within its TC timer T_1, the timer shall be stopped.

The reception of the last expected MRVA message shall be used as an indication to stop the OMASE-User timer T_1. When all MRVA messages expected have been received or when a timer T_1 expires, the results shall be given to the SP management.

The possible test results at this point in the procedure are listed in subclause 2.2.2.2.

A test is positive when all expected MRVA messages have been received inside their TC timers T_1 without fault indications.

If an MRVA message is received after its TC timer T_1, it shall be ignored.

Subclause **2.2.4.1.2.2 Reception of an MRVR message**

The reception of an MRVR message shall cause the information contained in the message to be given to the SP management (see subclause 2.2.2.3), when either the MRVR message is in response to an MRV Test initiated at the SP or is caused by the receipt in the MTP of a message for an unknown destination.

Subclause **2.2.4.2 In an intermediate point X**

Subclause 2.2.4.2.1 Initial actions (on reception of an MRVT message)

a) If the intermediate point X does not have the MTP transfer function, or there is no authorization to transfer messages from test origin to test destination, it:

   1) shall send an MRVR message to the initiating point (if there is routing to it);

   2) shall acknowledge the received MRVT message by an MRVA message with indication "intermediate SP does not have the MTP transfer function", when X has routing to the initiator, or "unknown initiating SP" when X has no routing to the initiator (the MRVA shall indicate whether or not an MRVR has been sent);

   3) shall give an indication to the SP management, and stop the test.

b) If the test cannot be run due to local conditions, X:

   1) shall send an MRVR message with contents as described in subclause 2.2.2.3 to the initiating point, if there is routing to it from X;

   2) shall send an MRVA message containing the indication "test cannot be run due to local conditions" to the sender of the MRVT;

   3) shall inform the SP management and stop the test.

c) If the number of MRV Tests already running at X is the maximum value n_T, X:

   1) shall send an MRVR message with contents as described in subclause 2.2.2.3 to the initiating point, if there is routing to it from X (with the reason "processingFailure" if the routeTrace MRVR, rather than routeTraceNew, is used);

   2) shall send an MRVA message containing the indication "maximum number of MRV Tests already running at the SP" to the sender of the MRVT;

   3) shall inform the SP management and stop the test.

d) If the test can be run, X shall determine if there is routing information for the initiating SP, and if information for the tested destination exists in the MTP routing tables. Then:

   1) if there is no routing information for the initiating SP, X:

      i) shall return an MRVA message with result "unknown initiating SP", the value of the "MRVR sent" indicator shall denote that the MRVR message was not sent;

         [a] if the prompting MRVT message requested it in the infoRequest parameter, the MRVA message shall contain the pointCodesTraversed parameter, copied from the MRVT message into the copyData parameter;

         [b] if the MRVT message contained a returnUnknownParams parameter, copyData shall contain those unrecognized parameters whose tags were indicated, copied from the MRVT;

      ii) shall inform the SP management and stop the test.

   2) if there is no routing information for the destination, X:

      i) shall send an MRVR message to the initiating point;

      ii) shall acknowledge the received MRVT message by an MRVA message with indication "unknown Destination Point Code";

      iii) shall give an indication to the SP management and stop the test.

3) If there is routing information for the initiating point of the test as well as for the test destination within X's routing tables, X shall make a list "A" of the following adjacent SPs:

- STPs used to route to the destination (according to the MTP routing tables), excluding the SP from which the MRVT message was received.

- the tested destination, if this is adjacent.

NOTE 1: If list "A" is empty, but the SP from which the MRVT message was received is an STP used to route to the test destination, an MRVA shall be returned to that STP with indication "partial success", and an MRVR shall be sent to the test initiator indicating that the STP is inaccessible. The test shall then be stopped.

i) X shall then compare the pointCodesTraversed parameter contained in the MRVT message with its own list "A". One of the following conditions is possible:

[a] if the Point Code of an SP in "A" is already in pointCodesTraversed in the MRVT message, a loop is detected. X:

[1] shall send an MRVR message with the indications described in subclause 2.2.2.3 to the initiator of the test;

[2] shall send an MRVA message with the indication "detected loop" to the point which has sent the MRVT message;

[3] shall stop the test (and shall not regenerate MRVT messages), after informing the SP management.

[b] if no Point Code in "A" is in the pointCodesTraversed parameter in the MRVT message, and if the number of PCs in the latter is equal to a threshold N in the MRVT message, an excessive length route has been detected. X:

[1] shall send an MRVR message with the indications described in subclause 2.2.2.3 to the initiator of the test;

[2] shall send an MRVA message with the indication "detected excessive length route" to the point which has sent the MRVT message;

[3] shall inform the SP management and stop the test (and shall not regenerate MRVT messages).

[c] if it is impossible to route any MRVT message, X:

[1] shall send MRVR messages with the indications described in subclause 2.2.2.3 to the initiator of the test (one MRVR for each inaccessible SP in list "A" if the prompting MRVT message did not request in the infoRequest parameter a list of all inaccessible (see the note in [d][2] following) SPs, but just one MRVR listing all such inaccessible SPs otherwise);

[2] shall send an MRVA message containing the indication "MRVT not sent due to inaccessibility" to the point which has sent the MRVT message;

[3] shall inform the SP management and stop the test (no MRVT messages shall be regenerated).

[d] in other cases:

[1] the SP shall start a timer T_1 in TC for each MRVT message to be sent; and

[2] shall send MRVT messages to all the accessible SPs in list "A", after noting the inaccessible SPs.

NOTE 2: "Inaccessible" here includes also SPs whose SCCP is unavailable, or whose OMAP subsystem is prohibited. The "result" parameter in a single routeTraceNew MRVR shall be set to routeInaccessible if any SP of the set is inaccessible by the MTP. If one MRVR is returned for each unavailable SP, its result shall indicate why that SP is unavailable (processingFailure for rejects or OMAP prohibited, routeInaccessible if the MTP cannot access it).

[i] it shall add its identity into the pointCodesTraversed parameter of the MRVT message sent;

[ii] the content of the "trace requested" field shall be obtained from the received MRVT message.

[3] X shall also send MRVR messages concerning inaccessible SPs in list "A":

[i] if the prompting MRVT message did not request in the infoRequest parameter a list of all inaccessible SPs, X shall send an MRVR message with the indications described in subclause 2.2.2.3 to the test initiator for each inaccessible SP in list "A";

[ii] otherwise just one MRVR message shall be sent, listing all the inaccessible SPs in list "A".

[4] If all SPs in list "A" are accessible, no MRVR shall be sent.

Subclause **2.2.4.2.2 Subsequent actions (on reception of an MRVA message, or MRVT message rejection)**

a) The reception of an MRVA message acknowledges the corresponding MRVT message previously sent. The last TC T_1 timer shall be stopped when all the expected MRVA messages have been received.

b) An MRVA message shall be sent when all expected MRVA messages have been received. The result of the test shall contain the different results from the MRVAs received, plus any noted SP inaccessibility.

c) If any MRVA message contained the result "unknown initiating SP" and the value of the "MRVR sent" indicator denotes that the MRVR was not sent, an MRVR shall be returned to the initiator. MRVA messages sent subsequently during this test shall indicate that this MRVR has been sent. See the Annex B.3 to be added to ITU-T Recommendation Q.753 [3] for an explanatory diagram (contained in subclause 7.3.3 of the present document).

d) If one (or several) MRVA messages are not received before a timer T_1 expires:

1) the intermediate point shall send an MRVR message with the indications described in subclause 2.2.2.3 to the initiator of the test; and

2) an MRVA message to the prompter of the test.

e) If an MRVA message cannot be sent, no action shall be taken.

f) If an MRVA message is received after its TC timer T_1 expires, it shall be ignored.

g) If an MRVT message is rejected by a remote SCCP or TC, or by a newly prohibited remote OMAP, the remote node is considered unable to run the test due to local conditions (i.e. processing failure). An MRVR message shall be returned to the test initiator, and an MRVA message shall be sent to the prompter of the test.

Subclause **2.2.4.3 At the test destination receiving an MRVT message**

a) On reception of an MRVT message, the test destination shall check that there is routing information for the initiator of the test.

1) If there is no routing information for the initiator, the destination shall send an MRVA message to the point which had sent the MRVT message:

i) this MRVA message shall contain the result "unknown initiator Point Code", the "MRVR sent" indicator shall denote that the MRVR was not sent;

ii) if the MRVT message requested it in the infoRequest parameter, the MRVT message's pointCodesTraversed parameter shall be copied into the copyData parameter of the MRVA message;

iii) if the MRVT message contained a returnUnknownParams parameter, and it indicated parameters in the MRVT which the destination does not understand, these shall be copied into the copyData parameter of the MRVA.

2) If there is routing information for the initiator of the test, it is finished with success and the following actions shall be taken:

i) if the MRVT message received contains the indication that a trace is expected (see subclause 2.2.2.1) an MRVR message with the indications described in subclause 2.2.2.3 shall be sent to the initiator of the test. An MRVA message shall then be sent to the point which had sent the MRVT message;

ii) if the MRVT message received contains the indication that a trace is not expected, (see subclause 2.2.2.1), an MRVA message shall be sent to the point which had sent the MRVT message. No MRVR message shall be sent.

b) If an MRVA message cannot be sent, no action shall be taken.

Subclause **2.3 Reception of a message for an unknown destination**

When an indication is received from the MTP due to the reception of a message for an unknown destination, an MRVR message with the indications described in subclause 2.2.2.3 shall be returned to the point which has sent the message.

When an SP receives such an unexpected MRVR message, an indication shall be given to the SP management and an MRV Test shall be started at the discretion of the network operator.

Subclause 2.4 Timer definition and values

Subclause 2.4.1 MRVT timers

T_1 at a signalling point (Near End Signalling Point) initiating an MRVT is the guard time waiting for all MRVA messages in response to the MRVT messages sent from the Near End SP.

$T_{1,(Near\ End\ SP)} = D(N+1)$

where N is defined in subclause 2.2.2.1 d), and D is defined in subclause 2.4.2 below.

T_1 at an intermediate signalling point is the guard time associated with a received MRVT message, waiting for all MRVA messages in response to all MRVT messages sent.

$T_{1,(IntermediateSP)} = T_1^1 - D$

where T_1^1 is deduced from the received MRVT message,

$T_1^1 = T_{1,(NearEndSP)} - nD = D(N+1-n),$

where n is the number of SPs in the pointCodesTraversed parameter of the MRVT message.

Subclause 2.4.2 Performance time definitions and values

$D = Max(d_1) + Max(d_2) + Max(d_3) + Max(d_4)$

where

d_1 : time to transfer an MRVT message.

d_2 : time to take account of an MRVT message received.

- In an Intermediate SP, performance time d_2 is the time between the reception of an MRVT message and the sending of the MRVT messages to the concerned SPs (or the sending of the MRVA message to the point which has sent the MRVT message when a problem is detected).
- In the tested destination, performance time d_2 is the time between the reception of an MRVT message and the sending of the MRVA message to the point which has sent the MRVT message.

d_3 : time to transfer an MRVA message.

d_4 : time to take account of an MRVA received.

- In an Intermediate SP, performance time d_4 is the time between the reception of the last MRVA message and the sending of the MRVA message to the point which has sent the MRVT message.

Performance time	Estimated maximum value
d_1	2 seconds
d_2	3 seconds
d_3	2 seconds
d_4	1 second
D	8 seconds
NOTE: These performance times are network dependent, and care should be taken, in networks with many routes, to set a sufficiently high value.	

Subclause **2.4.3 Parameters for use in the European part of the international network**

The following parameters shall be identical in all nodes using MRVT, i.e. in all international gateway exchanges using MRVT. The values are provisionally set at:

a) $n_T = 2$ (the maximum number of different tests running at an SP. See subclause 7.3.1, replaced 2.2.4.2.1in ITU-T Recommendation Q.753 [3]. Here, a different MRV Test is indicated by a different combination of test initiator, test destination Point Codes).

b) $D = 8$ seconds (the time to perform the actions for a complete MRVT within one node). This time is based on restricting the network structure to allow not more than 32 different routes between the test initiator OPC and the test destination DPC.

c) N_{max} is to be determined for a maximum MTP SIF length of 272 octets, it is the maximum value of the number N of signalling transfer points allowed to be crossed plus the test initiator. N is carried in the MRVT message, and is input by network operator personnel.

Subclause **2.5 OMAP model for MRVT**

See figure A.1 for diagrams.

The OMAP model assumes that the logic defined in subclause 2.2 resides in the OMASE-User, which provides a service MRVT(Start) and MRVT(Result). The management process (MP) uses MRVT(Start) to initiate an MRV Test, and MRVT(Result) is used by the OMASE-User to give the results of the test to the MP. The actions, e.g. sending an MRVT message, described in the text of the MRV Test correspond to the sending of primitives from the OMASE-User to OMASE, and receiving primitives in the OMASE-User from OMASE. The mapping of the text-defined actions to primitives is described in subclause 2.5.1.

NOTE: The MRVT initiator's OMASE-User runs a timer T_1 in addition to the T_1 timer run in TC, which is marginally greater than the TC T_1 timer. This extra timer at the initiator guards against rare untoward happenings, e.g. ill-formed APDUs passed from TC to OMASE.

Subclause 2.5.1 Mapping of primitives

See table 1.

Table 1 in Q.753: Mapping of text-defined actions to OM service primitives

"a" interface	"b" interface
1a MRVT(Start)	1b OM-CNF-ACTION request
2a MRVT(Result)	2b OM-CNF-ACTION indication
1a -	1b OM-CNF-ACTION response
2a MRVT(Result)	2b OM-CNF-ACTION confirmation
1a -	1b OM-EVENT-REPORT request
2a MRVT(Result)	2b OM-EVENT-REPORT indication

END REPLACEMENT in Q.753

7.3.2 Subclause 2.5.2 of Q.753

Replace the SDLs with the following informative ones (see figure 1 in ITU-T Recommendation Q.753 [3] for the model):

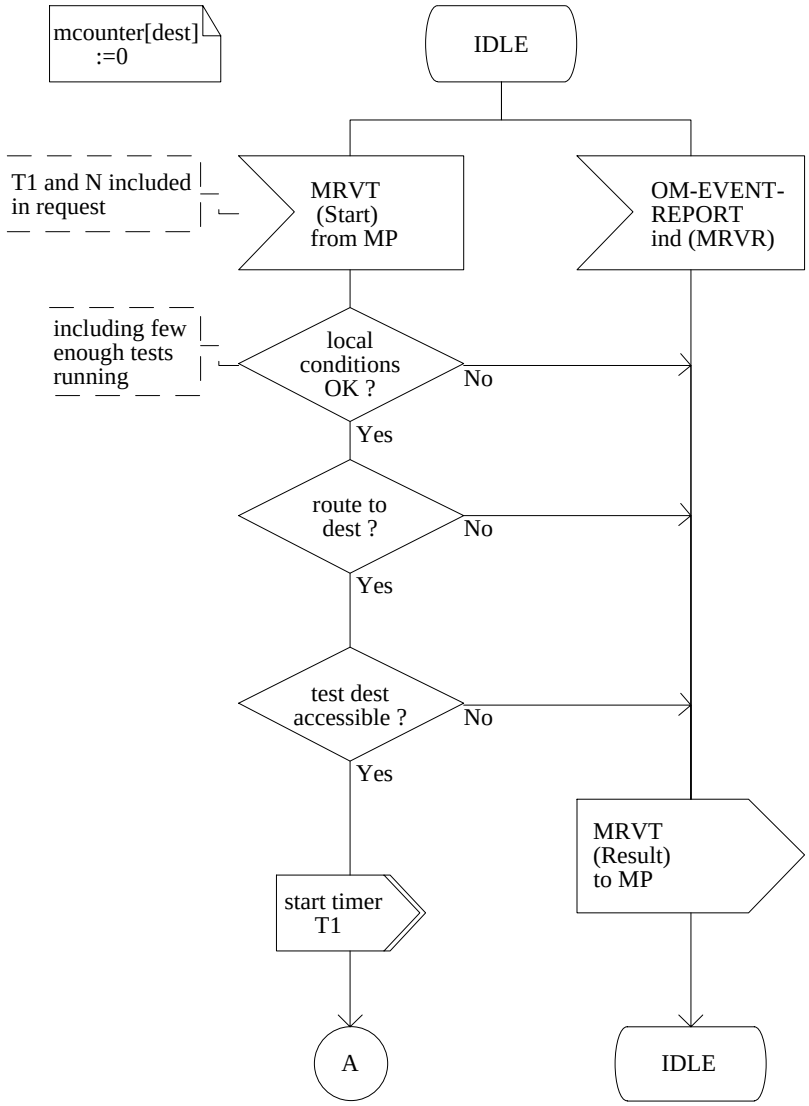


Figure 1 of 4: Procedure OMASE_User_mrvt

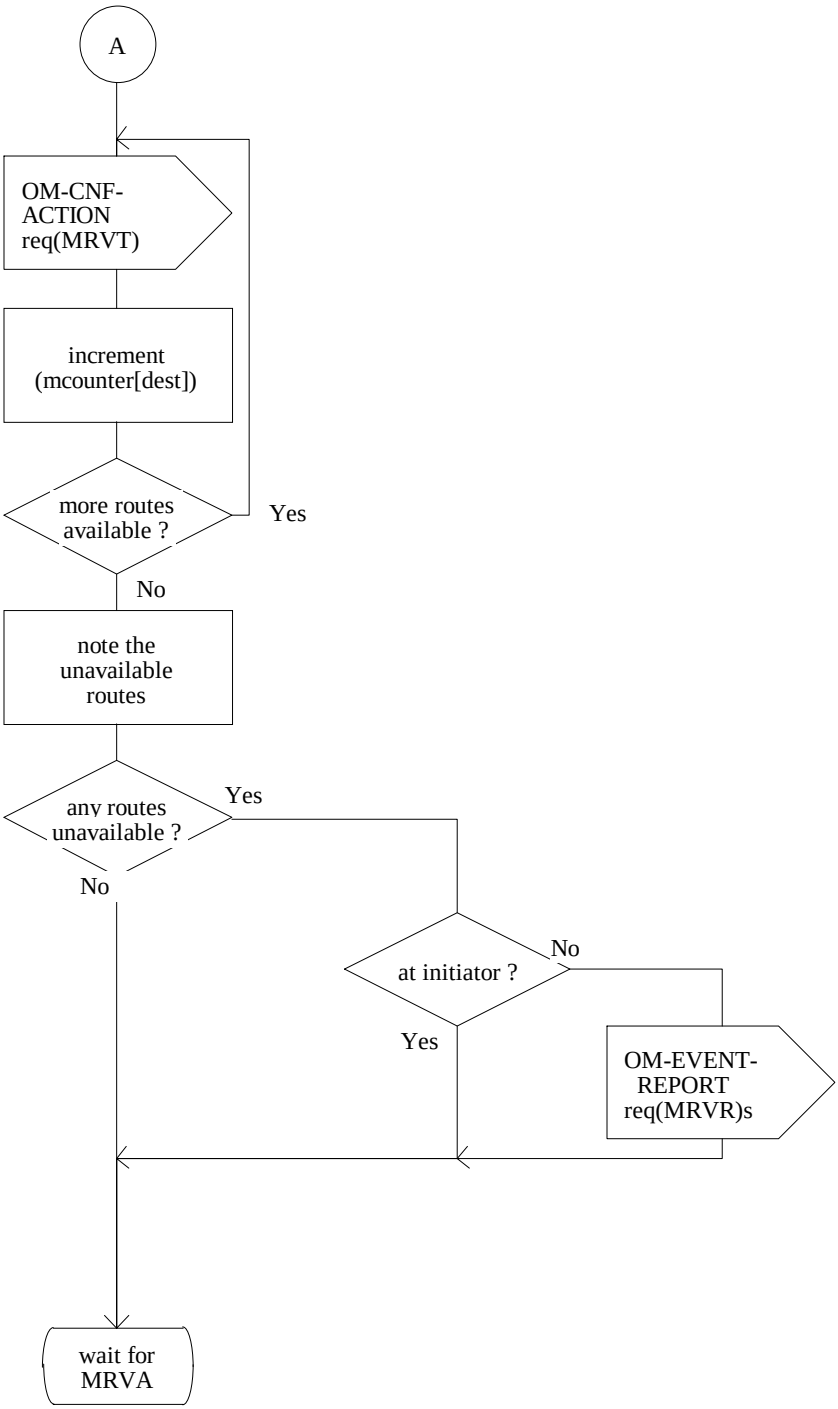


Figure 2 of 4: Procedure OMASE_User_mrvt

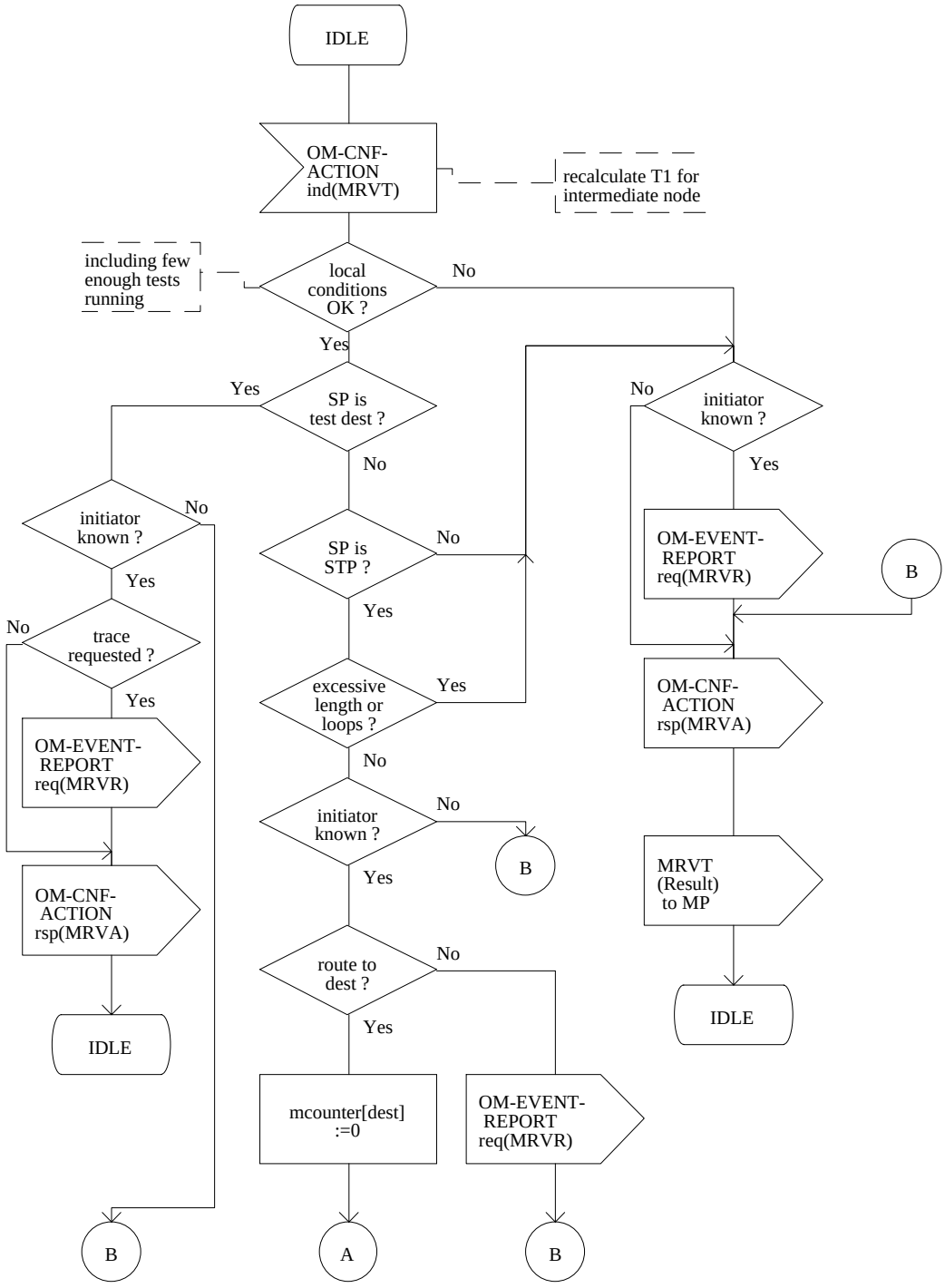


Figure 3 of 4: Procedure OMASE_User_mrvt

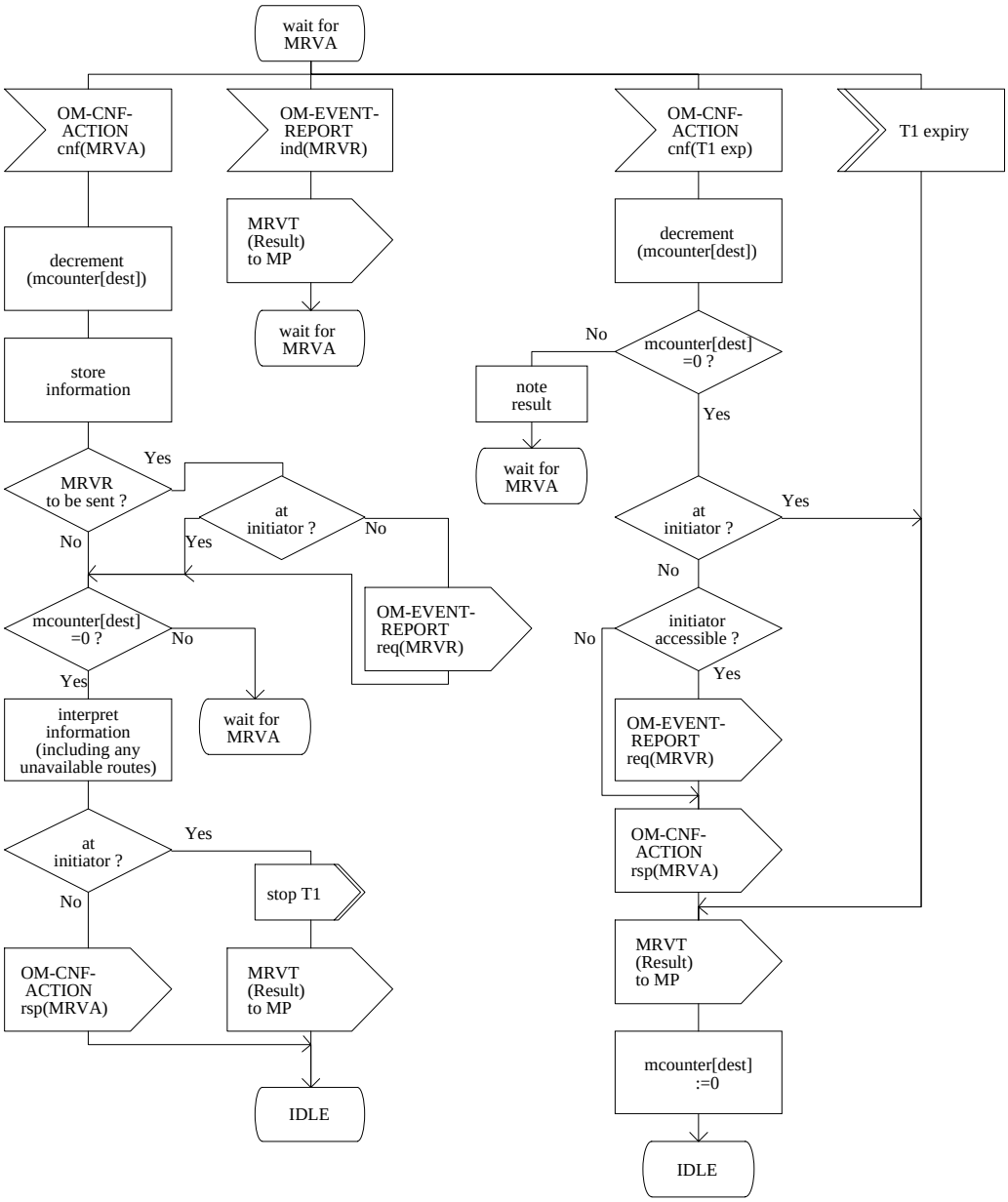


Figure 4 of 4: Procedure OMASE_User_mrvt

Insert new annex A to ITU-T Recommendation Q.753 [3]:

Annex A

(This annex forms an integral part of this Recommendation).

A.1 Detailed model of the OMASE-User

The OMASE-User can be described (note that this does not imply its implementation) as consisting of a set of MRVT functions.

In order for the indication and confirmation OM-primitives to be routed to the correct set of functions, a distribution function is also required inside the OMASE-User. This distributes the primitives on the basis of the object identifier (mtp-Routing-Tables-1992 for MRVT, etc.). The invoke and dialogue identities are assumed to be included in all primitives, as are the calling and called addresses and sequence information from SCCP.

For request OM-primitive invocations, a function is required to assign unique dialogue and invoke identities across MRVT functions. See figure A.1 for a diagram.

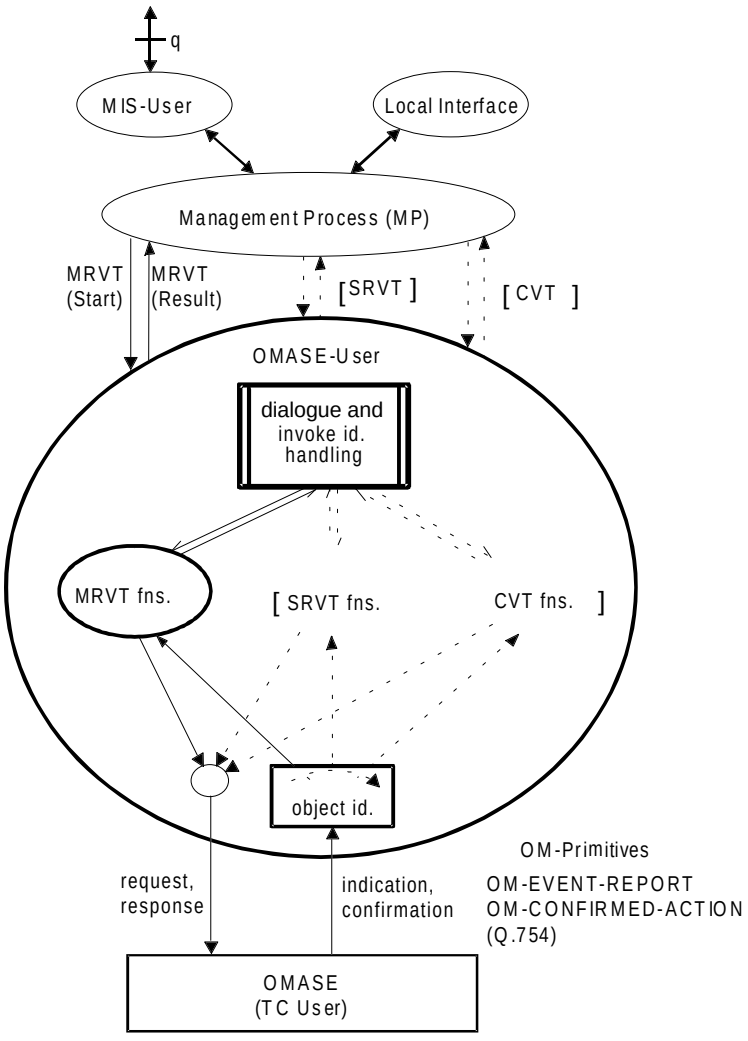


Figure A.1/Q.753: Detailed model of the OMASE-User and its interfaces

A.2 MIS-User to Management Process interface

This interface is used to control MRVT functions. The mrvt managed object class defined in ITU-T Recommendation Q.751.1 [11] has ACTIONs confirmedAction to start the MRVT, and NOTIFICATIONs eventReport. The MRVT confirmedAction maps to MRVT(Start) from the MP to OMASE-User, MRVT(Result) maps to eventReport.

For MRVT the confirmedAction as defined in figure 3 in ITU-T Recommendation Q.754 [4] employs startMRVT. The information model is as follows:

```
-- Management Process information model
MP {itu-t(0) identified-organization(4) etsi(0) 1007 mp(1) version1(1) }
DEFINITIONS EXPLICIT TAGS::=
BEGIN
EXPORTS EVERYTHING;
IMPORTS OPERATION, ERROR FROM TCAPMessages { ccitt recommendation q 773 modules(2) messages(1)
version2(2) } eventReport, confirmedAction, CNF-ACTION, EVENT, failure, partialSuccess,
PointCodeList, CopyData FROM OMASE { itu(0) identified-organization(4) etsi(0)
1007 omase(0) version1(1) };
startMRVT CNF-ACTION
    ACTIONARG SEQUENCE {
                        traceRequested  [1] IMPLICIT BOOLEAN,
                        threshold       [2] IMPLICIT INTEGER,
                        infoRequest     [13] IMPLICIT BIT STRING {
                                        pointCode(0),
                                        pointCodeList(1),
                                        ... } OPTIONAL,
    -- infoRequest is used to indicate that the test initiator node can accept a routeTraceNew
    -- RVR message, and also asks for particular parameters to be returned in it, if it is sent.
    -- This parameter can only be inserted at the initiator node, but it can be copied into
    -- regenerated MRVTs.
                        returnUnknownParams [14]  IMPLICIT BIT STRING {
                                            tag15(0),
                                            tag16(1),
                                            …} OPTIONAL ,
    -- returnUnknownParams is used to indicate which parameters that a node does not understand
    -- should be returned in an RVR if one is sent (or in an RVA message in the copyData field
    -- if the test initiator is unknown). Bit 0 represents an RVT parameter with tag value 15, bit 1
    -- an RVT parameter with tag value 16, etc.
    -- This parameter can only be present if infoRequest is present.
                        …}

    SPECIFICERRORS  { success , failure , partialSuccess }
    ::= 1

                                -- FIGURE A.2/Q.753 (sheet 1 of 2)
                                    -- Formal syntax of the MP


success SPECIFIC-ERROR

    PARAMETER CHOICE    {
                        empty       [0] IMPLICIT NULL,
                        trace       [1] IMPLICIT PointCodeList,
                        traceNew    [2] IMPLICIT SEQUENCE
                                        {
                                        pointCodeList   [2] IMPLICIT PointCodeList,
                                        copyData        [4] IMPLICIT CopyData OPTIONAL,
                                        …}
                        }
    ::= 0
    -- success is defined as a specific error to avoid ASN.1 complications
    -- the supporting definitions are as in Figure 3 in Q.754. On the MIS-User to MP interface, the
    -- copyData parameter is used to report parameters not understood in the RVT message (for
    -- "success", by the test destination, for other results by the node detecting the error).
END  -- MP syntax
                                -- FIGURE A.2/Q.753 (sheet 2 of 2)
                                    -- Formal syntax of the MP
```

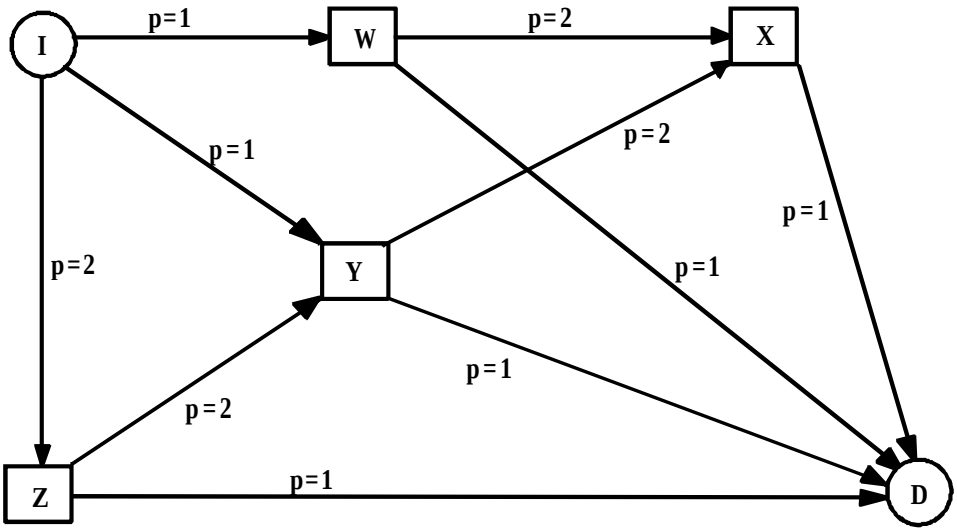
INSERT NEW ANNEX B to ITU-T Recommendation Q.753 [3]:

ANNEX B
to Q.753

(This Annex is informative)

B.1 Example of successful MRVT

The following diagram illustrates the test.



Here, the test initiator is denoted by I, the test destination by D, and W, X, Y and Z denote intermediate STPs. All the routes defined in the routing tables are shown, and their directions. The priorities of the routes to the test destination are also shown (thus e.g. the route WXD, forming part of the route IWXD, has priority 2 at W. The linksets IW and IY have equal first priority, and form a combined linkset to D). Assume for the purposes of this example that all routes to D are available.

The first step of the MRV Test is for I to send an MRVT message to W, another to Y, and another to Z. I notes the SPs to which it has sent MRVTs, its TC starts a timer for an MRVA acknowledging each MRVT sent.

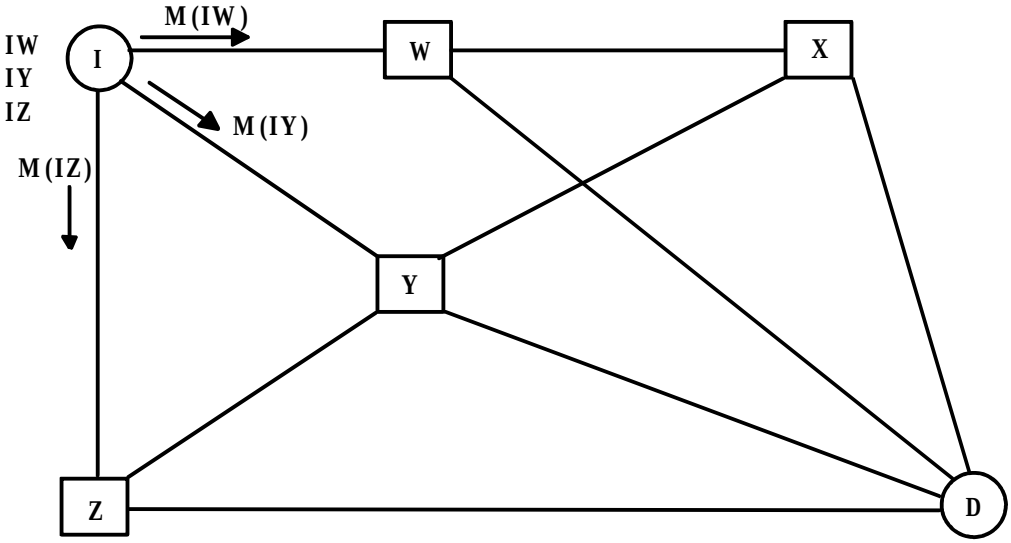
The next step is for W to send out an MRVT to X, and another to D. Y sends out two MRVTs also, one to D and another to X. Z sends out an MRVT to D and another to Y. W starts a timer for each MRVT message sent, as do Y and Z.

MRVT messages are regenerated in this manner at each STP used to reach D. Each MRVT contains the test initiator and test destination identities, and a pointCodesTraversed parameter. Each MRVT has associated with it its origin (i.e. the SP sending the MRVT), and a transaction identity, which identify the MRVT uniquely.

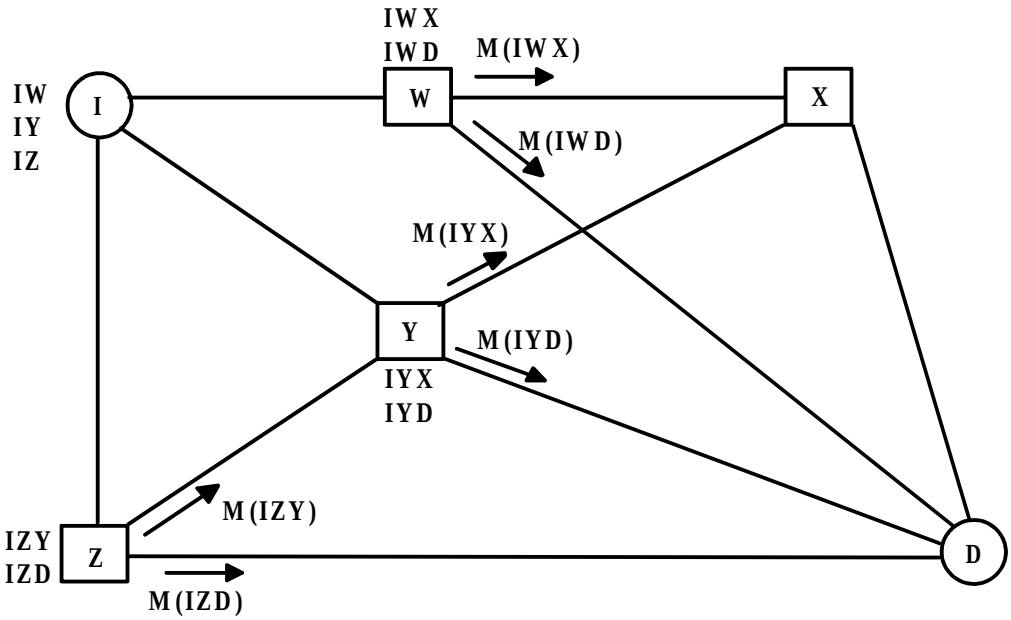
As D receives each MRVT message, it returns an MRVA, with the transaction identity (and invoke identity also) of the prompting MRVT. If a trace of the route was requested in the MRVT, pointCodesTraversed is copied from the MRVT to the MRVR.

An intermediate STP receiving an MRVA notes the contents of the MRVA (and would keep a running tally of any failures detected). When each MRVT previously sent out has been acknowledged by an MRVA (or the respective TC timer has expired), the STP constructs and sends an MRVA to acknowledge the MRVT **it** received, with the results of the MRVAs it received noted in this MRVA. The STP then stops its test timer.

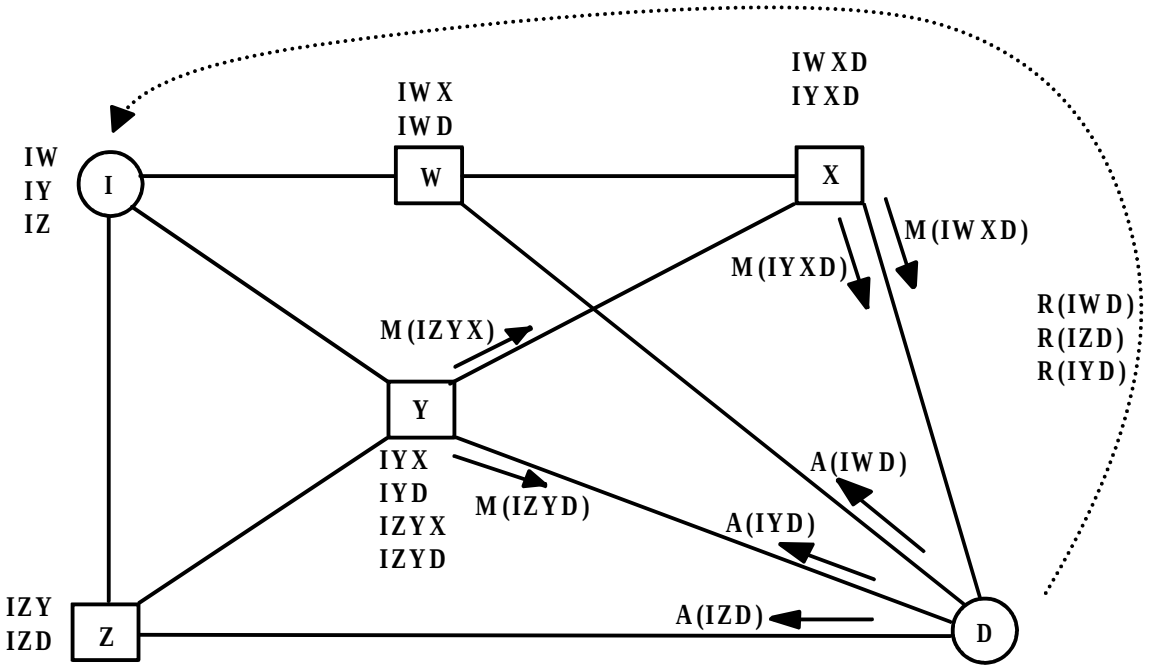
The messages sent in this example are as follows (where M(abc) represents an MRVT message sent from b to c stimulated by one from a, A(abc) is the MRVA acknowledging this MRVT. The list of MRVT messages awaiting MRVAs is given against each SP):



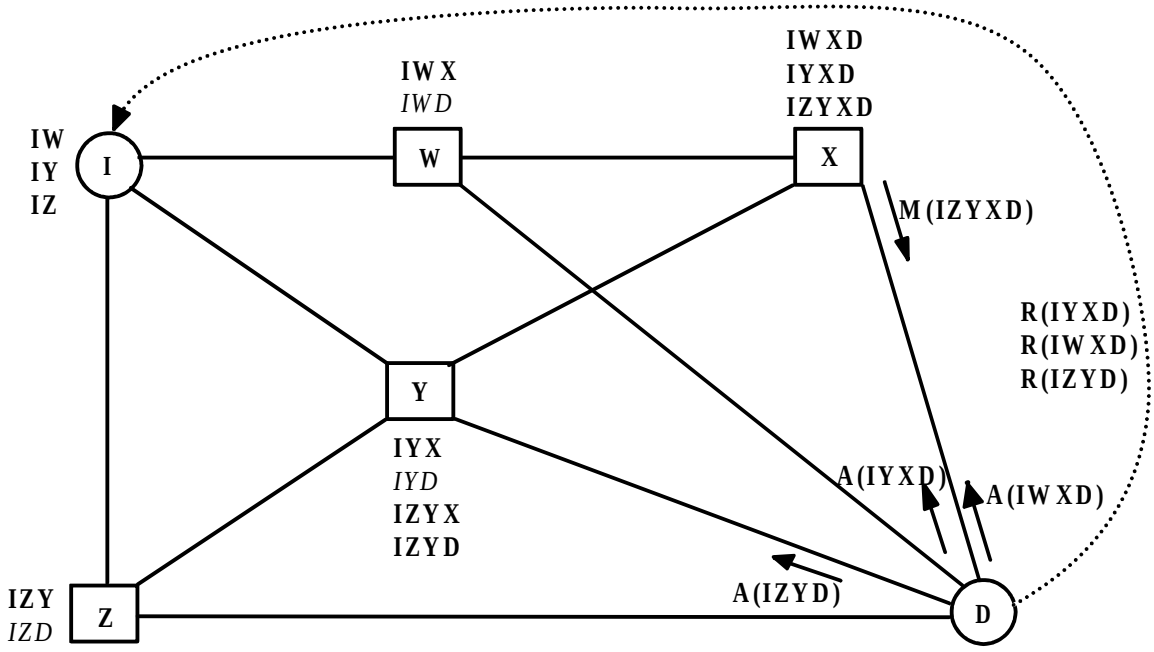
Stage 1



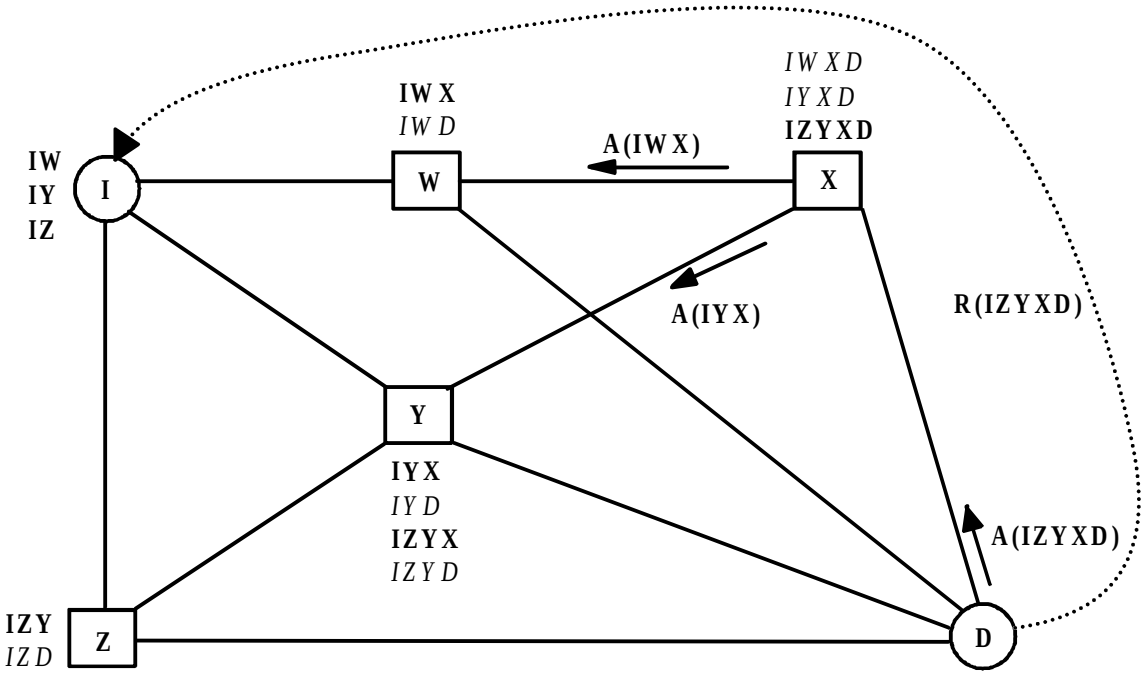
Stage 2



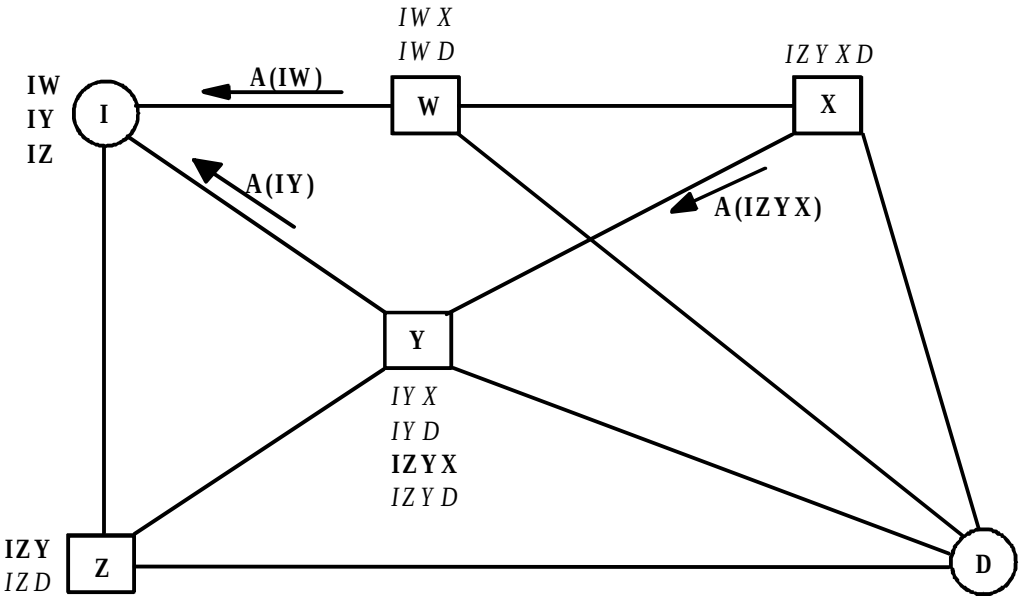
Stage 3



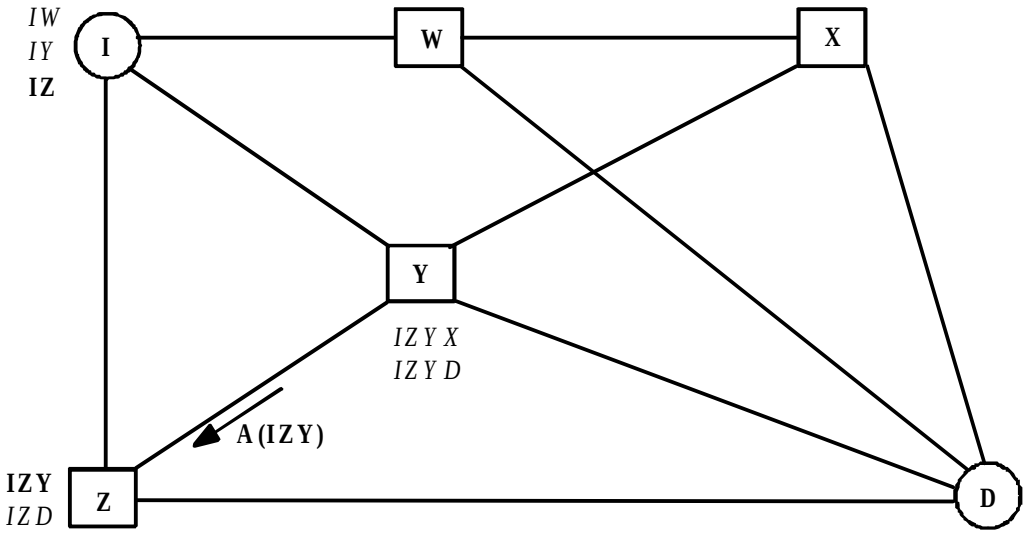
Stage 4



Stage 5



Stage 6



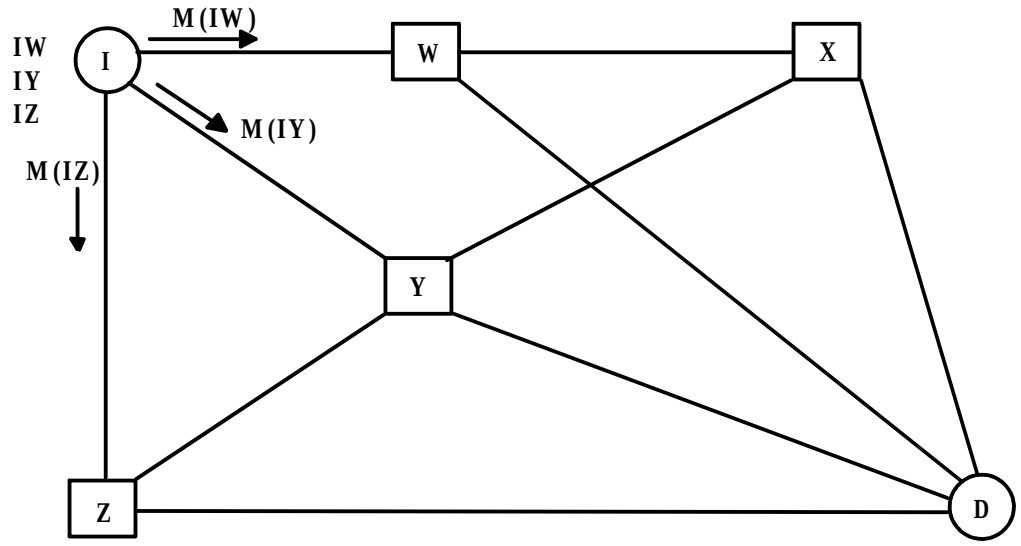
Stage 7

The remaining steps are obvious.

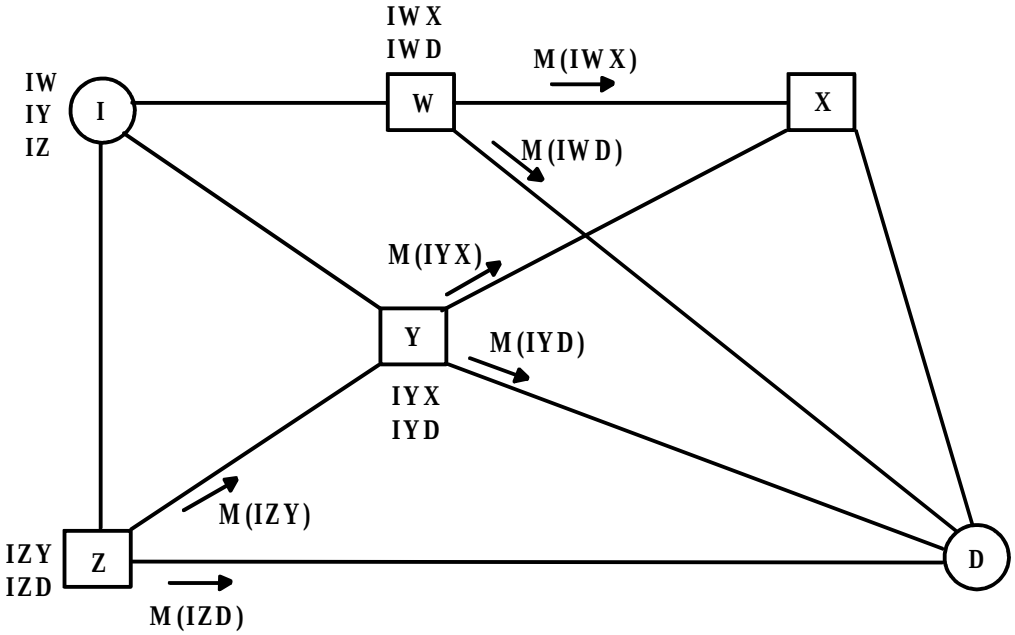
B.2 Example of unsuccessful test (STP X does not know initiator I)

Here, the notation R(¬IWX) is for an MRVR message where the test failed, because there is no route to D from I via X (in this test, X does not know I, so the MRVR is sent by W for X). A(¬IWX) is used for the MRVA with the result "failure" in response to the MRVT M(IWX).

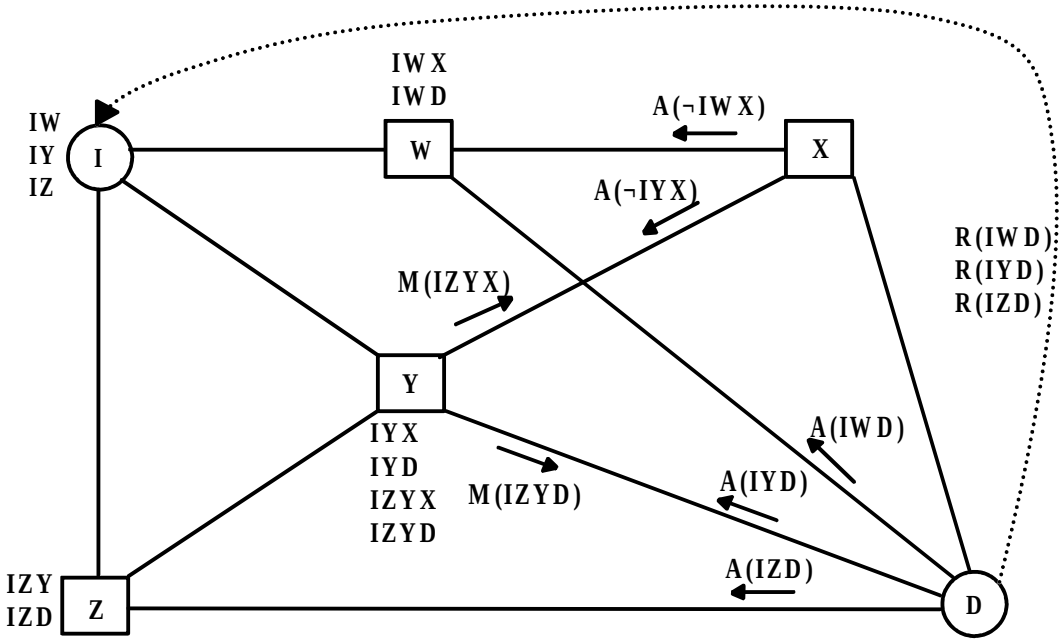
The notation A(pIW) is for an MRVA message with the result "partial success" in response to the MRVT message M(IW).



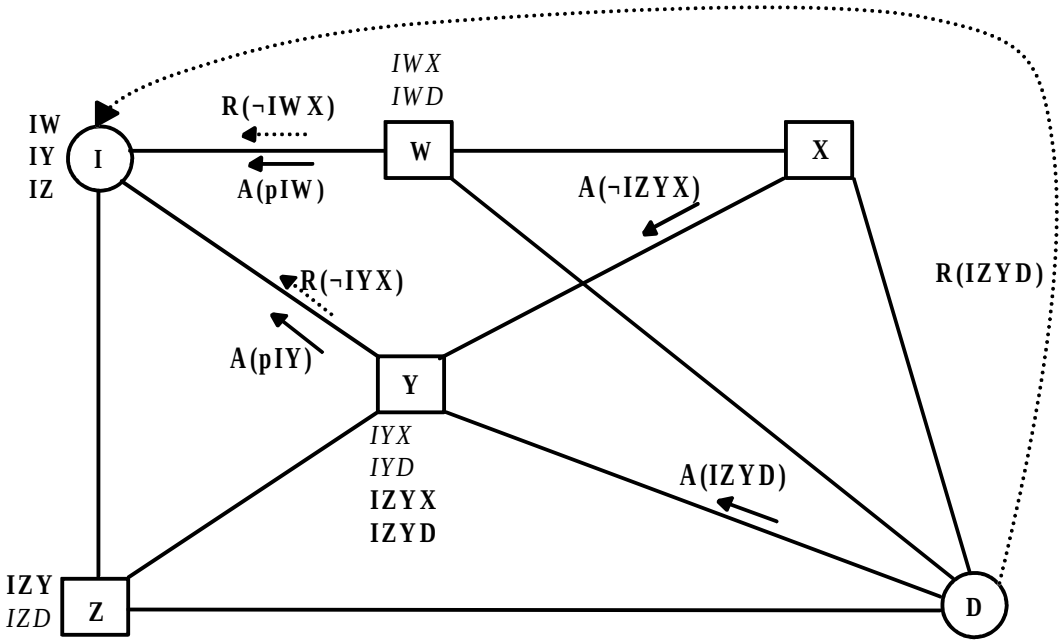
Stage 1



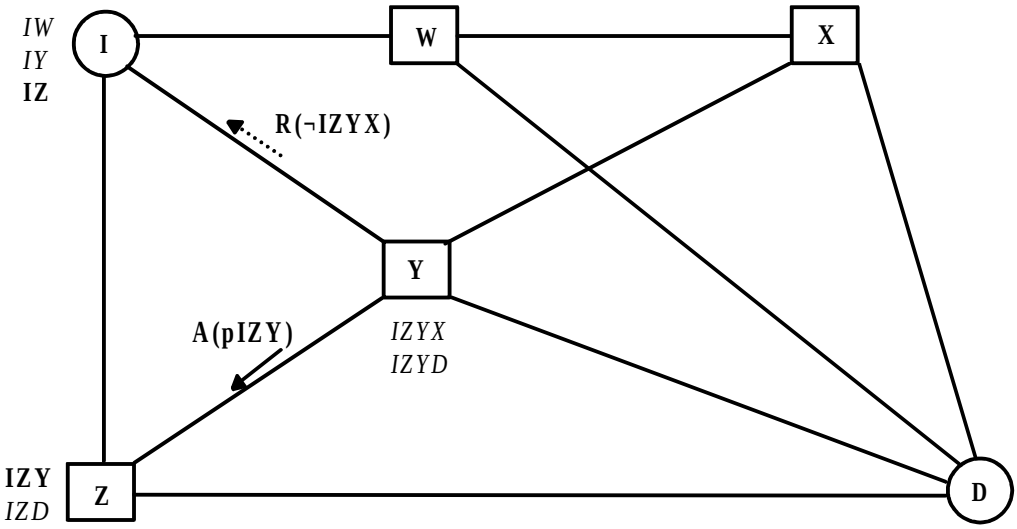
Stage 2



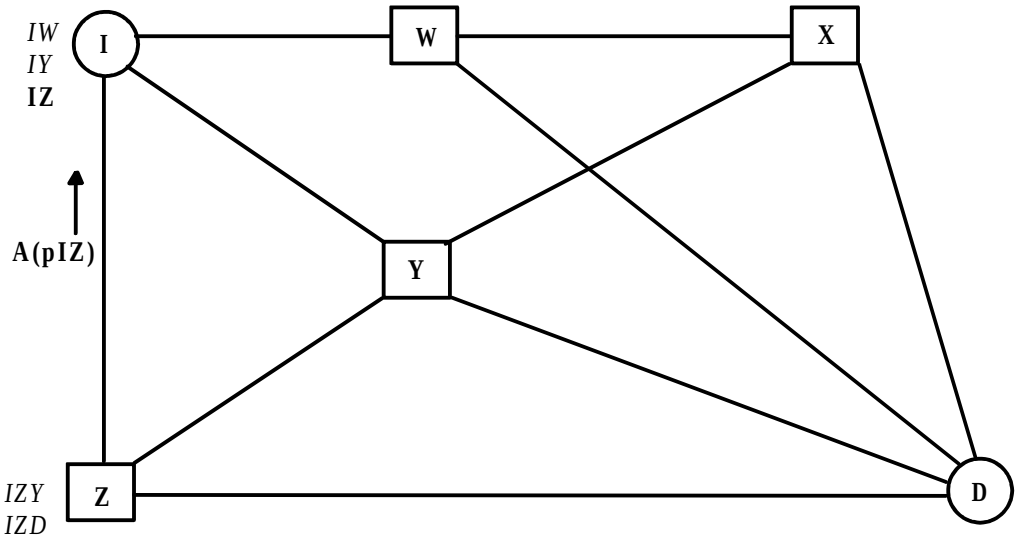
Stage 3



Stage 4

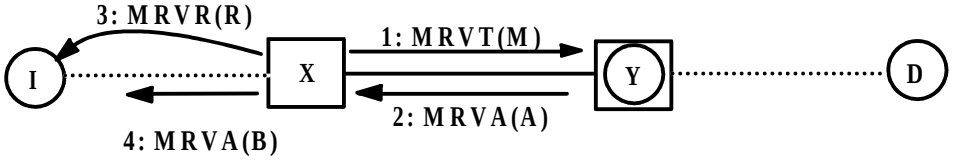


Stage 5



Stage 6

B.3 Example of "unknown initiator" response with copyData parameter



Consider the preceding diagram. I is an MRV Test initiator, X an STP which apparently has a route to the test destination D through Y. I is unknown to Y.

Consider the sequence:

1) X sends an MRVT message M to Y, concerning tested destination D, with test initiator I. The MRVT message contains a returnUnknownParams parameter. Suppose that there are parameters in M that Y does not recognize, and that some of them are indicated in M's returnUnknownParams parameter.

2) Y then returns an MRVA(A) to X, indicating that I is unknown to Y, and that an MRVR has not been sent. Included in MRVA(A) will be a copyData parameter containing the parameters of MRVT(M) that were not understood by Y, and that were also requested to be returned in the returnUnknownParams parameter of M.

3) X constructs an MRVR(R) message and sends it to I. MRVR(R) contains the copyData parameter copied from MRVA(A).

4) X also returns an MRVA message B, which does not contain the copyData parameter, but it does indicate that an MRVR message has been sent.

END of ANNEX B Q.753

7.4 Q.754

Only sections 1, 2, 6 and annex A are applicable to the MRVT.

7.4.1 Subclause 1

OMASE is only required to support the MRVT for the present document.

The encoding of the content of the messages defined here shall use the Basic Encoding Rules (BER) of ASN.1. See CCITT Recommendation X.209 (1988) [10] or ITU-T Recommendation X.690 (1994) [14]. Octet string parameters shall be encoded as primitive, not constructed, elements.

7.4.2 Subclause 2

Delete section 2 and replace it with the following:

START REPLACEMENT in Q.754:

Subclause 2 MTP

Subclause 2.1 MTP Routing Verification Test (MRVT)

The MRV Test (see note) initiated at the test origin results in an OM-CONFIRMED-ACTION primitive being used from the OMASE-User to OMASE, which includes the testRoute command as a parameter. If a trace of the routes is requested, or a fault exists, the OM-EVENT-REPORT primitive is invoked at the test originator from OMASE, which includes the routeTrace or routeTraceNew event as a parameter.

NOTE: See CCITT Recommendations X.208 [15] and X.209 [10] for the description of the formal notation.

testRoute is specified using the CNF-ACTION macro defined in the OMASE protocol of subclause 7.4.3 of the present document, routeTrace and routeTraceNew are specified using the EVENT macro defined in subclause 7.4.3.

For MRVT, the ObjectClass indicates MTP Routing Tables, and the ObjectInstance contains the Point Code of the test destination. The testRoute Action makes use of the BEGIN (MRVT) message with result (MRVA) returning in an END. The routeTrace Event (MRVR) uses a BEGIN message with pre-arranged end.

Subclause **2.1.1 testRoute Action**

The testRoute Action is invoked to initiate an MTP routing verification test. At the initiator node, this invocation is requested by the Administration via a local interface, through the OMAP Management Process and OMASE-User. At subsequent nodes, the Action is requested implicitly by the receipt of a testRoute Action invocation. A successful reply indicates successful completion of the test at the point it was invoked and, implicitly, at all subsequent points where the test was invoked. A failure indication is returned to indicate that the test failed in this or a subsequent node.

See subclause 7.4.3 of the present document.

Subclause **2.1.1.1 testRoute Action Arguments**

Subclause 2.1.1.1.1 initiatingSP

The initiatingSP identifies the original requester of the test.

Subclause **2.1.1.1.2 traceRequested**

traceRequested indicates that a trace of all routes used to reach the destination should be reported to the originator (the routeTrace Event is described in subclause 2.1.2).

Subclause **2.1.1.1.3 threshold**

The originator sets a maximum threshold level of Signalling Points (SP) which are allowed to be crossed in the course of the test (including the initiator if it is an STP). This aids in detecting overly long routes.

Subclause **2.1.1.1.4 pointCodesTraversed**

As each intermediate SP is crossed, it adds its own Point Code to the list of Point Codes traversed. This aids in detecting loops and is also useful information in case of a failure or if a route trace is requested.

Subclause **2.1.1.1.5 reserved**

Subclause 2.1.1.1.6 infoRequest

This parameter is inserted only by the SP initiating the test, and indicates that the initiator can recognize MRVR messages occasioned by the routeTraceNew event type. The infoRequest parameter indicates which information is

requested if an MRVR message should be sent to the initiator. It also can indicate which parameters should be updated as the MRVT messages traverse the network. Current values can be pointCode (bit 0 = 1), and/or pointCodeList (bit 1 = 1).

Subclause **2.1.1.1.7 returnUnknownParams**

This optional parameter is inserted, if at all, only by the SP initiating the test. It indicates which MRVT parameters a following node should return, if the following node does not recognize those parameters. The unrecognized MRVT parameters are to be copied into the (new) MRVR message (routeTraceNew) if the following node has occasion to return an MRVR (or in an MRVA message in the copyData parameter if the initiator is unknown to it). Bit 0 in returnUnknownParams indicates an MRVT parameter with tag value 15, bit 1 an MRVT parameter with tag value 16, etc.

Subclause **2.1.1.2 Action Results**

There are no contents in a successful return indication.

Subclause **2.1.1.3Action Errors**

SpecificErrors are possible errors which can occur during this test, and which are unique to this test. These specific errors are in addition to the errors already identified in the OM-CONFIRMED-ACTION service and appear as parameters to the Processing Failure Error.

Subclause **2.1.1.3.1 failure**

failure indicates a condition of total failure, where no route worked correctly. Most often this will be used as a failure indication from the point which detects the error and does not invoke any further testRoute Actions. "failure" has with it a parameter to indicate the error condition causing the failure. This parameter, failureType, is represented as a bit string. The second parameter is to be used when failureType indicates the error unknownInitiatingSP. traceSent indicates whether or not a routeTrace Event has been invoked to report trace information. It is necessary to indicate this for this error since the node detecting the error cannot send the routeTrace, thus the previous node must. traceSent has type BOOLEAN. The third parameter is optional, it may be present if failureType is "unknownInitiatingSP"; traceSent is FALSE; and the prompting MRVT contained a requestInfo or a returnUnknownParams parameter.

Subclause **2.1.1.3.2 partialSuccess**

This indication is given when at least one testRoute CNF-ACTION invocation failed and at least one succeeded (at least partially). In this case, each type of error that occurred will be noted and sent in the final reply. The format and contents of partial success are the same as failure.

Subclause **2.1.2 routeTrace Event**

The routeTrace Event reports trace information. Trace information consists of zero, one or more Point Codes, such as the Point Code detecting an error or the entire list of Point Codes traversed along a route. This event is invoked either at the explicit request of the originating node (indicated by traceRequested, see subclause 2.1.1.1.2) or by failure at any point along the route. This event is not confirmed, therefore no replies to this invocation are expected (no error or success indications are expected). routeTrace is invoked, rather than routeTraceNew, only if the prompting testRoute (MRVT message) did not contain an infoRequest parameter.

Subclause **2.1.2.1Event Information**

Subclause 2.1.2.1.1 success

On successful completion, the trace of the Point Codes (one or more) of the crossed SPs are included.

Subclause **2.1.2.1.2 detectedLoop**

When a loop is detected, the trace of Point Codes of the crossed SPs augmented in order by the Point Code of the SP detecting the loop and the Point Code of the SP completing the loopare included.

Subclause **2.1.2.1.3 excessiveLengthRoute**

When an excessively long route is found (threshold exceeded), the entire route is included.

Subclause **2.1.2.1.4 unknownDestination**

If the destination is unknown, no additional information is required, since the infoRequest parameter was not included in the testRoute CNF-ACTION request.

Subclause **2.1.2.1.5 routeInaccessible**

The Point Code of the node where the route was inaccessible is included.

Subclause **2.1.2.1.6 processingFailure**

If a processing failure occurs, no additional information is required.

Subclause **2.1.2.1.7 unknownInitiatingSP**

The Point Code of the node detecting the unknown Initiating SP is included.

Subclause **2.1.2.1.8 timerExpired**

The Point Code(s) of the node(s) from where no result for the testRoute Action was received is included.

Subclause **2.1.2.1.9 sPNotAnSTP**

If the intermediate SP receiving an MRVT message does not have the MTP transfer function, the list of crossed SPs to reach this SP is included.

The value "sPNotAnSTP" of failureType can also mean that the intermediate signalling point receiving an MRVT message is not authorized to transfer messages, received from the MRVT sender, with its MTP label OPC that of the test initiator and DPC that of the test destination.

Subclause **2.1.2.1.10 reserved**

Subclause 2.1.2.1.11 maxNrMRVTestsAlready

This report is used by the signalling point receiving the MRVT message if the maximum number of MRV Tests n_T are already running at the SP. It is reported as "processingFailure", see subclause 2.1.2.1.6, if the prompting MRVT message (testRoute) did not contain the infoRequest parameter.

Subclause **2.1.3 routeTraceNew**

This report is used if the prompting testRoute action contained an infoRequest parameter.

Subclause **2.1.3.1 Event information**

Subclause 2.1.3.1.1 success

On successful completion, the trace of the Point Codes (one or more) of the SPs crossed are included in pointCodeList (copied from the pointCodesTraversed parameter of the testRoute action).

If there are parameters in the prompting testRoute action that are not understood, and testRoute contains a returnUnknownParams parameter which requests them, they are copied into the copyData parameter.

Subclause **2.1.3.1.2 detectedLoop**

If a loop is detected, the trace of Point Codes of the crossed SPs augmented in order by the Point Code of the SP detecting the loop and the Point Code of the SP completing the loop are included in pointCodeList.

If there are parameters in the prompting testRoute action that are not understood, and testRoute contains a returnUnknownParams parameter which requests them, they are copied into the copyData parameter.

Subclause **2.1.3.1.3 excessiveLengthRoute**

If this error occurs, the entire route is copied from the testRoute action pointCodesTraversed parameter into the pointCodeList parameter.

If there are parameters in the prompting testRoute action that are not understood, and testRoute contains a returnUnknownParams parameter which requests them, they are copied into the copyData parameter.

Subclause **2.1.3.1.4 unknownDestination**

This is equivalent to unknownDestination of section 2.1.2.1.4. If the infoRequest parameter of the prompting testRoute action requested it, the pointCodesTraversed parameter of the testRoute action is copied into pointCodeList.

If there are parameters in the prompting testRoute action that are not understood, and testRoute contains a returnUnknownParams parameter which requests them, they are copied into the copyData parameter.

Subclause **2.1.3.1.5 routeInaccessible**

If this event is reporting just one inaccessible SP, its point code is placed in pointCode.

If the event is reporting more than one inaccessible SP (and hence the prompting testRoute action indicated that the originator could accept it), the list of all such inaccessible SPs is put into pointCodeList.

If there are parameters in the prompting testRoute action that are not understood, and testRoute contains a returnUnknownParams parameter which requests them, they are copied into the copyData parameter.

Subclause **2.1.3.1.6 processingFailure**

If the test cannot be run due to local conditions, the event reports a processing failure. This includes rejection of the testRoute action by SCCP or TC at a remote SP.

If the testRoute action infoRequest parameter was present, and had bit 0 set to 1, the point code of the SP where the test failed is put into the pointCode parameter.

If there are parameters in the prompting testRoute action that are not understood, and testRoute contains a returnUnknownParams parameter which requests them, they are copied into the copyData parameter.

Subclause **2.1.3.1.7 unknownInitiatingSP**

The point code of the SP detecting the unknown initiator is returned.

If the prompting testRoute result contained a copyData parameter, this is copied into the routeTraceNew copyData parameter.

Subclause **2.1.3.1.8 timerExpired**

The point codes of the SPs from which no result of the testRoute actions were received are included into pointCodeList.

Subclause **2.1.3.1.9 sPNotAnSTP**

This error occurs if the intermediate SP does not have the STP function, or it is known that it is not authorized to transfer messages from the test initiator to the test destination.

The pointCodesTraversed parameter of the prompting testRoute action is copied into pointCodeList.

If there are parameters in the prompting testRoute action that are not understood, and testRoute contains a returnUnknownParams parameter which requests them, they are copied into the copyData parameter.

Subclause **2.1.3.1.10 reserved**

Subclause 2.1.3.1.11 maxNrMRVTestsAlready

This report is used by the signalling point receiving the MRVT message if the maximum number of MRV Tests n_T are already running at the SP .

If the testRoute action infoRequest parameter was present, and had bit 0 set to 1, the point code of the SP where the test failed is put into the pointCode parameter.

If there are parameters in the prompting testRoute action that are not understood, and testRoute contains a returnUnknownParams parameter which requests them, they are copied into the copyData parameter.

END REPLACEMENT in Q.754

7.4.3 Subclause 6 of Q.754

The value for the object identifier mtp-Routing-Tables-1992 of 0011857200 (Hexadecimal) shall be used for the MRVT specified in the present document.

Change to subclause 6.2.3.2.2

The last paragraph should read:

"If the APDU contains extra parameters, they are passed on transparently to the OMASE-User by the OMPM."

Change to subclause 6.2.3.2.7

The first sentence of the last paragraph should read:

"If the OMPM receives a TC-L-REJECT indication with a TC-END indication, it issues an OM-CONFIRMED-ACTION confirm primitive with the specific error "failure" of CNF-ACTION, and if testRoute was invoked, the parameter failureType in the confirm primitive indicates "processingFailure"."

Change to subclause 6.2.3.2.8

The body should now read:

"In this case the OMPM issues an OM-CONFIRMED-ACTION confirm primitive with the specific error "failure" of CNF-ACTION, and if testRoute was invoked, the parameter failureType in the confirm primitive indicates "processingFailure"."

Change to subclause 6.2.3.2.9

The last paragraph should now read:

"In this case the OMPM issues an OM-CONFIRMED-ACTION confirm primitive with the specific error "failure" of CNF-ACTION, and if testRoute was invoked, the parameter failureType in the confirm primitive indicates "processingFailure"."

Change to subclause 6.2.3.2.10

The body should now read:

"In this case the OMPM issues an OM-CONFIRMED-ACTION confirm primitive with the specific error "failure" of CNF-ACTION, and if testRoute was invoked, the parameter failureType in the confirm primitive indicates "processingFailure"."

Change to subclause 6.3 (OMASE module) of Q.754:

Delete the whole of section 6.3 and replace it with:

```
-- OMASE  protocol
OMASE { itu(0) identified-organization(4) etsi(0) 1007 omase(0) version1(1) }
DEFINITIONS ::=
BEGIN
-- TCAP definitions
EXPORTS EVENT, CNF-ACTION, SPECIFIC-ERROR, eventReport, confirmedAction, failure, partialSuccess,
PointCodeList, CopyData;
IMPORTS OPERATION, ERROR FROM TCAPMessages { itu-t recommendation q 773 modules(2) messages(1)
version2(2) };
-- OMASE operations
    eventReport OPERATION
    PARAMETER eventReportArgument   EventReportArgument
    ::= localValue 0
    confirmedAction OPERATION
    PARAMETER actionArgument    ActionArgument
    RESULT  actionResult    ActionResult
    ERRORS  { accessDenied, invalidArgumentValue,
            noSuchAction, noSuchArgument,
            noSuchObjectClass, noSuchObjectInstance,
            processingFailure }
    ::= localValue 7
-- The om-service error definitions are as follows:
noSuchObjectClass           ERROR
PARAMETER                   ObjectClass
```

```
::= localValue 0
noSuchObjectInstance            ERROR
PARAMETER                   ObjectInstance
::= localValue 1
accessDenied                ERROR
::= localValue 2
noSuchAction                ERROR
PARAMETER                   NoSuchAction
::= localValue 9
processingFailure           ERROR
PARAMETER                   ProcessingFailure -- optional
::= localValue 10
noSuchArgument              ERROR
PARAMETER                   NoSuchArgument
::= localValue 14
invalidArgumentValue            ERROR
PARAMETER                   InvalidArgumentValue
::= localValue 15


-- The following gives the supporting type definitions:

ActionArgument          ::= SEQUENCE    { COMPONENTS OF         BaseManagedObjectId,
                            accessControl                       [5] AccessControl OPTIONAL,
                            actionInfo                          [12] IMPLICIT ActionInfo }

ActionInfo          ::= SEQUENCE    { actionType            ActionTypeId,
                                    actionInfoArg           [4] ANY DEFINED BY actionType
                                                            OPTIONAL }

ActionResult        ::= SEQUENCE    { managedObjectClass    ObjectClass
                                                            OPTIONAL,
                                    managedObjectInstance   ObjectInstance OPTIONAL,
                                    currentTime             [5] IMPLICIT GeneralizedTime
                                                            OPTIONAL,
                                    actionReply             [6] IMPLICIT ActionReply
                                                            OPTIONAL }

ActionTypeId        ::= CHOICE      {
                                -- globalForm ...
                                    localForm                   [3] IMPLICIT CNF-ACTION }
BaseManagedObjectId ::= SEQUENCE    { baseManagedObjectClass    ObjectClass,
                                    baseManagedObjectInstance   ObjectInstance }

EventReportArgument ::= SEQUENCE    { managedObjectClass        ObjectClass,
                                    managedObjectInstance       ObjectInstance,
                                    eventTime                   [5] IMPLICIT GeneralizedTime
                                                                OPTIONAL,
                                    eventType                   EventTypeId,
                                    eventInfo                   [8] ANY DEFINED BY eventType
                                                                OPTIONAL }

EventTypeId         ::= CHOICE      {
                                -- globalForm ...
                                    localForm                   [7] IMPLICIT EVENT }

ActionReply         ::= SEQUENCE    { actionType                ActionTypeId,
                            actionInfoArg                       [4] ANY DEFINED BY actionType }

AccessControl       ::= EXTERNAL

InvalidArgumentValue    ::= CHOICE      { actionValue               [0] IMPLICIT ActionInfo,
                                    eventValue                  [1] IMPLICIT SEQUENCE {
                                    eventType                   EventTypeId,
                                    eventInfo                   [8] ANY DEFINED BY eventType
                                                                OPTIONAL }}

NoSuchAction        ::= SEQUENCE    { managedObjectClass        ObjectClass,
                                    actionType                  ActionTypeId }

NoSuchArgument      ::= CHOICE      { actionId              [0] IMPLICIT SEQUENCE {
                                    managedObjectClass      ObjectClass OPTIONAL,
                                    actionType              ActionTypeId },
                                    eventId                 [1] IMPLICIT SEQUENCE {
                                    managedObjectClass      ObjectClass OPTIONAL,
                                    eventType               EventTypeId }}

ObjectClass         ::= CHOICE      { globalForm            [0] IMPLICIT
                                                            OBJECT IDENTIFIER,
                                    -- ...
                                    }

ObjectInstance      ::= CHOICE      {
```

```
                                    -- ...
                                    nonSpecificForm         [3] IMPLICIT OCTET STRING,
                                    -- ...
                                    }

ProcessingFailure   ::= SEQUENCE    { managedObjectClass    ObjectClass
                                                            OPTIONAL,
                                    managedObjectInstance   ObjectInstance OPTIONAL,
                                    specificErrorInfo       [5] IMPLICIT SpecificErrorInfo }

SpecificError       ::= INTEGER     -- defined by object class

SpecificErrorInfo   ::= SEQUENCE    { errorType             [0] IMPLICIT SpecificError,
                                    errorParm               [1] ANY DEFINED BY errorType
                                                            OPTIONAL }

Timer               ::= INTEGER     -- seconds
-- Specific event reports are categorised by object class. The protocol uses may be described
-- by the EVENT MACRO below.
    EVENT MACRO ::=
    BEGIN
        TYPE NOTATION       ::= EventInfo
        VALUE NOTATION      ::= value(VALUE INTEGER)
        EventInfo           ::= "EVENTINFO" NamedType|empty
        NamedType           ::= identifier type|type
    END

-- Specific Actions are categorised by object class. The protocol uses may be described
-- by the CNF-ACTION macro below.
    CNF-ACTION MACRO ::=
    BEGIN
        TYPE NOTATION       ::= ActionArg ActionResult SpecificErrors
        VALUE NOTATION      ::= value(VALUE INTEGER)
        ActionArg           ::= "ACTIONARG" NamedType|empty
        ActionResult        ::= "ACTIONRESULT" NamedType|empty
        SpecificErrors      ::= "SPECIFICERRORS" "{" SpecificErrorList "}"|empty
        NamedType           ::= identifier type|type
        SpecificErrorList   ::= SpecificError|SpecificErrorList "," SpecificError
        SpecificError       ::= value(SPECIFIC-ERROR)
    END

-- Errors that are action or event specific are defined using the SPECIFIC-ERROR macro below.
        SPECIFIC-ERROR MACRO ::=
        BEGIN
            TYPE NOTATION       ::= ProcessingErrorParm
            VALUE NOTATION      ::= value(VALUE INTEGER)
            ProcessingErrorParm ::= "PARAMETER" NamedType|empty
            NamedType           ::= identifier type|type
        END


--specific OMASE constructs follow

testRoute CNF-ACTION
        ACTIONARG SEQUENCE {
                            initiatingSP        [0] IMPLICIT PointCode,
                            traceRequested      [1] IMPLICIT BOOLEAN,
                            threshold           [2] IMPLICIT INTEGER,
                            pointCodesTraversed [3] IMPLICIT PointCodeList
                            infoRequest         [13] IMPLICIT BIT STRING {
                                                pointCode(0),
                                                pointCodeList(1),
                                                reserved(2),
                                                ... } OPTIONAL,
    -- infoRequest is used to indicate that the test initiator node can accept a routeTraceNew
    -- MRVR message, and also asks for particular parameters to be returned in it, if it is sent.
                            returnUnknownParams [14]  IMPLICIT BIT STRING {
                                                tag15(0),
                                                tag16(1),
                                                ... } OPTIONAL ,
    -- returnUnknownParams is used to indicate which parameters that a node does not understand
    -- should be returned in an MRVR if one is sent (or in an MRVA message in the copyData field
    -- if the test initiator is unknown). Bit 0 represents an MRVT parameter with tag value 15,
    -- bit 1 an MRVT parameter with tag value 16, etc. To avoid confusion in the copyData field,
    -- when defining a new parameter in the MRVR message, the tag should have the same value as it
    -- has in the MRVT message.

                            ... }
    SPECIFICERRORS          { failure, partialSuccess }
    ::= 1
```

```
    -- TC timer = T1, class = 1

PointCode ::= OCTET STRING
PointCodeList ::= SEQUENCE OF PointCode

failure SPECIFIC-ERROR
    PARAMETER SEQUENCE      {failureType        [0] IMPLICIT FailureString,
                             traceSent          [1] IMPLICIT BOOLEAN,
                             copyData           [4] IMPLICIT CopyData OPTIONAL,
    -- copyData might be present if failureType is unknownInitiatingSP, traceSent is FALSE,
    -- and the prompting MRVT message contained a requestInfo parameter, or returnUnknownParams
    -- was in the MRVT message.
                             ... }
    ::= 1

    FailureString ::= BIT STRING
                    { detectedLoop(0),
                    excessiveLengthRoute(1),
                    unknownObjectInstance(2),
                    routeInaccessible(3),
                    processingFailure(4),
                    unknownInitiatingSP(5),
                    timerExpired(6),
                    sPNotAnSTP(7),
                    maxNrMRVTestsAlready(16),
                    ... }

    CopyData::=OCTET STRING

partialSuccess  SPECIFIC-ERROR
                PARAMETER SEQUENCE  {failureType    [0] IMPLICIT FailureString,
                                     traceSent      [1] IMPLICIT BOOLEAN,
                                     copyData       [4] IMPLICIT CopyData
                                                    OPTIONAL,
    --  copyData might be present if failureType is unknownInitiatingSP, traceSent is FALSE,
    --  and the prompting MRVT message contained a requestInfo parameter,
    -- or returnUnknownParams was in the MRVT message.
                                    ... }
                ::= 2

routeTrace  EVENT
    EVENTINFO CHOICE {
                    success                 [0] IMPLICIT PointCodeList,
                    detectedLoop            [1] IMPLICIT PointCodeList,
                    excessiveLengthRoute    [2] IMPLICIT PointCodeList,
                    unknownObjectInstance   [3] IMPLICIT NULL,
                    routeInaccessible       [4] IMPLICIT PointCode,
                    processingFailure       [5] IMPLICIT NULL,
                    unknownInitiatingSP     [6] IMPLICIT PointCode,
                    timerExpired            [7] IMPLICIT PointCodeList,
                    sPNotAnSTP              [8] IMPLICIT PointCodeList
                    }
    ::= 2

-- TC timer = 0, class = 4
routeTraceNew   EVENT
    EVENTINFO SEQUENCE {
                        result              [0] IMPLICIT ErrorTag,
                        pointCode           [1] IMPLICIT PointCode OPTIONAL,
                        pointCodeList       [2] IMPLICIT PointCodeList OPTIONAL,
                        copyData            [4] IMPLICIT CopyData OPTIONAL,
--  copyData allows any parameters included in an MRVA message, when the
--  test initiator is unknown, to be copied into the MRVR, without enhancing it. It also
--  allows new OPTIONAL MRVT parameters not understood by the node generating the
--  MRVR from the MRVA message to be returned, when requested by the test initiator.
--  Note that a new parameter defined in routeTraceNew should, if it is also defined in
--  testRoute, have the same tag value as in testRoute.
--  One MRVR message should be sent for each error detected (no error diagnostics should be
--  "or'd" together).
                        ... }
            ::=4
-- TC timer = 0, class = 4

        ErrorTag::=INTEGER {
                            success(0),
                            detectedLoop(1),
                            excessiveLengthRoute(2),
                            unknownDestination(3),
                        -- unknownDestination is equivalent to unknownObjectInstance of routeTrace.
                            routeInaccessible(4),
                            processingFailure(5),
                            unknownInitiatingSP(6),
                            timerExpired(7),
```

```
                        sPNotAnSTP(8),
                        maxNrMRVTestsAlready(17),
                        ... } (0..255)

END -- OMASE protocol
```

Annex A (informative): Issues to be determined for the MRV test

Following is a list of the items noted still for study or requiring agreement by all network operators:

a) unanimous agreement among network operators that MRVTs may be run;

b) circumstances of the use of the MRVR trace on success;

c) value of the MRVT time *D* (see also replacement subclause 2.4.3 in ITU-T Recommendation Q.753 [3];

d) allowable maximum number *N* of crossed STPs (see also replacement subclause 2.4.3 in ITU-T Recommendation Q.753 [3]);

e) conditions under which MRVT may be run on demand by the local maintenance staff (or from a network centre - this latter is linked to the use of TMN to control Signalling System No.7 management);

f) the value of n_T, the number of simultaneous different MRV Tests at an SP (see also replacement subclause 2.4.3 in ITU-T Recommendation Q.753 [3]);

g) the value of timer T_1 could be increased if the priority of the MRV Test is low at the nodes of the network. This approach requires discretion: T_1 should be short enough to give a true picture of the network's routing, but long enough to provide a low message frequency;

h) receipt of an unexpected MRVR message (indicating "unknown Destination Point Code") which causes an MRV Test to start could also be used as follows: ITU-T Recommendation Q.704 [6] section 13.2.2 iii) defines sending a transfer prohibited message from a signalling transfer point Y relating to a destination X when Y is unable to transfer messages to X. If Y has no routing data for X, routeset tests to Y for the unknown destination X might be started by the recipient of the transfer prohibited message. The MRV Test could be used to diagnose the errors in the routing table; the MRVR message which triggered the test indicates that any routeset tests started on receipt of related transfer prohibited messages should be stopped, e.g. by manual intervention.

Annex B (informative): Network interconnection issues

This annex contains a list of interconnection issues, as yet it provides no solutions.

See the bibliography as well as ITU-T Recommendation Q.750 [1], Q.752 [2], Q.753 [3], Q.754 [4] and Q.704 [6] in the normative references.

B.1 Network design issues

These issues need to be tackled for network interconnection as well as in the design of a unified network. Some of the input parameters that have to be determined and agreed are:

a) expected voice, data and signalling traffic levels and their characteristics (including management traffic). These could be in the form of traffic matrices per type of traffic, the entries accessed by origin and destination, where a type is e.g. ISUP, or SCCP connectionless, or ISUP-requested connection oriented SCCP messages, etc.; from these the needed signalling relations and their use can be determined;

b) the location of existing Signalling Points and their capabilities (the capabilities include the number of signalling links that an SP can control, message traffic capacity, voice and data traffic capacity {originating, terminating and transit}, split of end point and STP message traffic capacities, SCCP end point and relay point traffic capacities, message and call setup delays, etc.);

c) the transmission plan;

d) use of Basic Error Correction (BEC) or Preventive Cyclic Retransmission (PCR) for signalling links;

e) SS7 routing plan (MTP, SCCP with or without Global Title Translation etc.);

f) Agreement will then be needed on a number of items, during which the input parameters may well be modified. The items to be agreed include:

   i) the use of associated and non-associated signalling;

   ii) the choice of STPs for non-associated mode of signalling, and agreements about the routing of message traffic streams. For control of some traffic streams, the function to prevent unauthorized use (see Q.705 [22] subclause 8) could be used. In addition, mutual payment for STP message traffic might be considered;

   iii) the security arrangements for routes: decisions upon alternative routes (with implications for ii) above). Decisions upon combined linksets, for traffic loading and security reasons. Numbers of STPs in tandem in the routes;

   iv) SCCP relay point arrangements, including SCCP relay point accounting;

   v) choice of concerned SPs for any SCCP management purposes.

B.2 Network naming issues

These include:

a) choice of point codes for signalling points;

b) allocation of Signalling Link Codes (SLCs) to signalling links, and the transmission paths to use for these;

c) allocation of Circuit Identification Codes (CICs) to trunks.

B.3 Network implementation issues

These include:

a) the choice of measurements from ITU-T Recommendation Q.752 [2]) to measure network performance and monitor for errors, also to trigger diagnostics;

b) preventive TFPs on highest priority routes see ITU-T Recommendation Q.704 [6] subclause 9 and 13.2;

c) the phased introduction of the MRVT (with items to be agreed in clause A.1);

d) the possible use of the CVT - note that the CVT is not currently part of the present document;

e) MTP routing table management requirements (and any policing table arrangements also, see Q.705 [22] subclause 8.2 and 8.3). Circular routing prevention should be considered in management of the MTP routing tables;

f) Global Title translation table management;

g) the possible use of the SRVT - note that the SRVT is not currently part of the present document;

h) methods for controlling network resources that span two or more network operators - "controlling owner" and "non-controlling owner(s)";

i) testing to be done to bring the network constituents into service, and also during service. See Q.780 and its references and Q.755 [5].

History

Document history				
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