

The drawings contain in this Recommendation have been done in Autocad.
Recommendation Q.782

MTP LEVEL 3 TEST SPECIFICATION

1 Introduction

protocol. These tests intend to validate the protocol specified in Q.704 and Q.707 Recommendations. The level 3 performance aspects specified in Q.706 Recommendation are also partly checked whenever possible. This Recommendation conforms to the Q.780 Recommendation. However, in addition to the objectives and guidelines of the latter Recommendation, other general principles specific to level 3 tests are presented below.

2 General principles of level 3 tests

2.1 *Presentation of test descriptions*

Each test description mentions the type of SP involved in the test. Three cases are possible:

- test applicable to an SP having no STP function:
- test applicable to an SP having STP function:
STP
- test applicable to all types of SPs:
ALL

Each test description includes the environment in which the point under test must be inserted in order to pass the test. Four test configurations are necessary (named A, B, C and D); they are presented in § 3.

Each test is precisely described. Nevertheless, some events not directly concerning the point under test, or without direct link with the test nature, are not explicitly described. This is, for example, the case of TFPs propagation when a point becomes isolated, or of the changeover procedure in a test concerning transfer allowed procedure.

In order to preserve the test description implementation independence, a certain flexibility has been left in the test descriptions. This is particularly the case when it is necessary to deactivate a link (where it is only mentioned “Deactivate” with no more precision). The operator will choose, according to the implementation particularities and the events expected in the test description, the appropriate deactivation means (MML, provoked failure, etc.).

In the test descriptions, the signalling links are identified as follows: “number of linkset” – “number of link in the linkset” (e.g. 1 – 1 means link 1 of the linkset 1). This identification is independent of SLC attributed to these links. When the number of the link is X, that means that the concerned message can use any link of the linkset. When the field “number of link in the linkset” is, for example, “1, 2, . . .”, that means that the traffic uses all indicated links. Finally, when the links are identified by the mention ALL, that means that the traffic will use all available links of the point.

The orders “Start traffic”, “Wait” and “Stop traffic” apply to the test configuration. They are placed at the beginning of the line.

2.2 *Presentation of the test list*

These tests, as a whole, aim at a complete validation of the level 3 protocol without redundancies.

The test list is presented in § 4. The national options and the various signalling link management “policies” are not included in this Recommendation.

The first set of tests in the list checks that, before some more precise tests, the point under test can perform the basic functions, i.e. can connect itself to the external environment and exchange signalling messages.

The second set basically validates the signalling message handling function of the point under test. A main point of this part concerns the validation of load sharing procedures. If an implementation does not use the load sharing between linksets, some tests would not be applicable, and other should be adapted.

The third and fourth sets check changeover and changeback procedures. They include tests like changeover and changeback to/from two linksets which will be performed only if the point under tests allows this possibility.

Rerouting procedures are checked using the tests in parts 5 and 6.

Part 7 concerns tests to check inhibition and uninhibition procedures. To limit the test numbers, it was not considered that the messages used in these procedures can be transferred via STPs.

Part 8 concerns tests to check transfer controlled procedure and MTP user flow control for the international signalling network.

Part 9 concerns tests to check signalling route management functions in a point having an STP function. To limit the test numbers and to avoid to complicate the test configuration, it was not considered that TFPs and TFAs can be transferred via STPs.

Part 10 concerns tests for the point restart procedure.

Part 11 deals with STP traffic test.

Part 12 checks the signalling link test procedure.

Finally, part 13 contains solely validation tests and aims at checking the actions of the tested system on reception of invalid level 3 messages.

2.3 *Test traffic*

Running the tests described in this Recommendation requires the exchange of traffic between the point under test and its environment. The traffic used is a test traffic especially generated for the test of the system. It uses variable length messages, structured as described below:

Fig. /T110980-88 = 10 cm

The mechanisms of generation and reception of this test traffic may be internal to the point under test or external (using a simulator for example). The tests presented here do not impose the choice of one of these mechanisms except for the tests of the STP function itself (tests 2.7, 8.2, 10 and 11) where the test traffic is necessarily generated outside the STP. The test traffic should be recorded and analysed subsequently for each described test.

Note – For compatibility testing (CPT), use SI value for MTP testing user part, for validation testing (VAT) value is to be chosen as required.

3 Test configurations

3.1 Definition

The set of tests described in this Recommendation assumes that the point under test is inserted in a test environment called “test configuration”. A **test configuration** is defined as being:

- a) the set of points, real or simulated, linked between them by signalling linksets, real or simulated, and of which some are connected to the point under test by one or several signalling linksets,
- b) the set of routing rules applied in different points and also in point under test,
- c) the flows of test traffic generated and received by:
- d) a set of generation and reception means (see § 2.3),
- e) the means (program, operator interface, etc.) to run the described tests; notably the possibilities of storage and analysis of test traffic and level 3 messages, and, in the case of validation tests, the possibility to send at any stage of a test, any messages (level 3 or test) valid or not.

3.2 *Presentation of test configurations*

3.2.1 *General*

The set of tests described in this Recommendation requires 4 different configurations named A, B, C and D. For each test, only the three first aspects of the above definition are precisely defined (set of points, set of routing rules and test traffic flows, see § 3.1).

3.2.2 *Configuration A*

This simple configuration is adapted to the validation of all procedures concerning only one or more signalling links belonging to one linkset. It is used for the tests:

- of activation and deactivation of links;
- of changeover and changeback procedures;
- of inhibition and uninhibition of links;
- invalid messages.

Configuration A is shown in Figure 1/Q.782.

Fig. 1/Q.782 /T1109990-88 = 5 cm

Configuration A makes use of a point C in all validation tests in order to check the impact of the procedures on various traffic flows. Point C is not used in configuration A in the case of compatibility tests.

Linkset 1 has four signalling links in order to check, for example, changeover procedure to several links within a linkset (test 3.15).

In real networks, the procedures checked with this configuration act on the traffic carried in both directions of a link. Consequently, the flows of test traffic used are, regarding the routing label of messages:

- OPC = A, DPC = B and OPC = B, DPC = A
- OPC = A, DPC = C and OPC = C, DPC = A (in validation test only).

TABLE 1/Q.782

Routing rules in configuration A

®

A

B

C

A

-

L1

L1

B

L1

-

L2

C

L2

L2

–

3.2.3 Configuration B

Configuration B is adapted to the validation of all procedures concerning several signalling linksets. It is used for the tests:

- of signalling message handling;
- of changeover and changeback;
- of forced and controlled rerouting.

Configuration B is shown in Figure 2/Q.782.

Fig. 2/Q.782 /T1110000-88 = 9.5 cm

In configuration B, Table 2/Q.782, the point under test A is linked to the external world with 3 signalling linksets. This is the minimum required number of linksets in order to check:

- load sharing between three linksets;
- changeover and changeback from/to two linksets (Recommendation Q.704, § 5.3.1).

When the SP A is an SP having no STP function, this configuration is also the minimum to run the tests in a network situation where associated mode and quasi-associated mode are used (Recommendation Q.701, § 3.1.2).

This configuration comprises point D in all validation tests in order to check the impact of the procedures on various traffic flows (relations A–D and A–E). The point D is not used in configuration B in case of compatibility tests.

In a real network, some procedures (changeover, changeback) checked with this configuration act on the traffic in both directions on the concerned linksets. Consequently, the test traffic flows used are, regarding the routing label of messages:

- OPC = A, DPC = E and OPC = E, DPC = A
- OPC = A, DPC = D and OPC = D, DPC = A (in validation test only).

TABLE 2/Q.782

Routing rules in configuration B

®

A

B

C

D

E

A

-

L2,L3

L3,L2

L1-L2-L3

L2-L3

B

L2,L4

-

L4

L5,L4

L6,L4

C

L3,L4

L4

-

L8,L4

L7,L4

D

L1,L5,L8

L5,L8

L8,L5

–

Any

E

L7,L6

L6,L7

L7,L6

Any

–

Li,Lj: Li normal linkset and Lj alternative linkset

Li-Lj: load sharing between Li and Lj

3.2.4 Configuration C

This configuration is adapted to the validation of some functions specific to an STP like:

- message transfer function;
- sending of TFC;
- traffic test.

Configuration C is shown in Figure 3/Q.782.

Fig. 3/Q.783 /T1110010-88 = 5 cm

In configuration C, Table 3/Q.782, the point under test A carries the test traffic from B to C and from C to B. The linkset 1 has two links, this a minimum to create an overload situation to trigger the sending of TFC independently of the implementation of the flow control procedure.

The tests performed with this configuration require that the traffic crosses the STP under test in both directions. Consequently the test traffic flows are, regarding the routing label of messages:

- OPC = B, DPC = C and OPC = C, DPC = B

TABLE 3/Q.782

Routing rules in configuration C

®

A

B

C

A

–

L1

L2

B

L1

–

L1

C

L2

L2

–

3.2.5 *Configuration D*

This configuration is adapted to the validation of all procedures concerning exclusively the points having an STP function. It is used to check the signalling route management procedures.

Configuration D is shown in Figure 4/Q.782.
Fig. 4/Q.782 /T1110020-88 = 5 cm

Configuration D, Table 4/Q.782, is used only to check the signalling route management: transfer prohibited and transfer allowed procedures. Consequently, all linksets of this configuration have only one signalling link.

The STP under test is linked to the external world with three linksets: one terminal linkset (to an SP without STP function) and two inter STP linksets. This structure is minimal to check the various aspects of the broadcasting of TFPs and TFAs:

- TFPs or TFAs concerning several destinations;
- TFPs or TFAs to several destinations.

This configuration includes points D and E. This is necessary in order to check the sending of TFP on an alternative linkset: in A the routing rules are such that the linksets 1 and 2 are used to reach D using normal/alternative routing and to reach E using load sharing routing (sending of TFP in the first case and not in the second).

The tests performed with this configuration, which check the signalling route procedures, require that the test traffic uses the concerned signalling routes. The test traffic flows used in this Recommendation are, regarding the routing label messages:

- OPC = F, DPC = D
- OPC = F, DPC = E
- OPC = A, DPC = D

TABLE 4/Q.782

Routing rules in configuration D

®

A

B

C

D

E

F

A

–

L1,L2

L2,L1

L1,L2

L1,L2

L3

B

L1,L4

–

L4

L5,L4

L6,L4

L1

C

L2,L4

L4

–

L8,L4

L7,L4

L2

D

Any

–

Any

E

Any

–

Any

F

L3

L3

L3

L3

L3

–

4 Test list

All tests with the indication “*” are validation and compatibility tests. The tests without asterisk are validation test only.

1 *Signalling link management*

* 1.1 First signalling link activation

* 1.2 Signalling linkset deactivation

- * 1.3 Signalling linkset activation
- 2 *Signalling message handling*
 - 2.1 Message received with an invalid SSF (discrimination function)
 - 2.2 Message received with an invalid DPC (discrimination function)
 - 2.3 Message received with an invalid SI (distribution function)
 - 2.4 Load sharing within a linkset
 - * 2.4.1 All links available
 - 2.4.2 With one link unavailable
 - 2.5 Load sharing between linksets
 - * 2.5.1 Between two linksets
 - 2.5.2 Between three linksets
 - 2.5.3 Between three linksets and one route unavailable
 - 2.5.4 Between three linksets and one linkset unavailable
 - 2.6 Inaccessible destination
 - 2.6.1 Due to a linkset failure
 - 2.6.2 Due to a route failure
 - 2.6.3 Due to a linkset and route failures
 - * 2.7 Message transfer function
- 3 *Changeover*
 - 3.1 Changeover initiated at one side of a linkset (COO <--> COA)
 - 3.2 Changeover initiated at the both ends at the same time (COO <--> COO)
 - 3.3 Changeover on expiration of timer T2 (COO or ECO --> -)
 - 3.4 Unreasonable FSN in COO/COA
 - 3.5 Reception of a changeover acknowledgement without sending a changeover order

(-	<-	COA	or
ECA)			
 - 3.6 Reception of an additional changeover order (- <- COO or ECO)
 - 3.7 Emergency changeover at one side of a linkset (COO <--> ECA)
 - 3.8 Emergency changeover at one side of a linkset (COO <--> ECO)
 - 3.9 Emergency changeover at one side of a linkset (ECO <--> COA)
 - 3.10 Emergency changeover at one side of a linkset (ECO <--> ECA)

- 3.11 Emergency changeover at one side of a linkset (ECO <--> COO)
- 3.12 Emergency changeover initiated at the both ends at the same time (ECO <--> ECO)
- 3.13 Reactivation of a link during a changeover procedure
- 3.14 Simultaneous changeover
- 3.15 Changeover to several alternative links within a linkset
- * 3.16 Changeover to another linkset with the adjacent SP accessible
- * 3.17 Changeover to another linkset with the adjacent SP inaccessible
- 3.18 Changeover to two linksets
- 3.19 Changeover due to various reasons
- 3.20 Changeover as compatibility test
- 3.21 Reception of a changeover order on an available link
- 4 *Changeback*
- * 4.1 Changeback within a linkset
- 4.2 Additional CBA
- 4.3 Additional CBD
- 4.4 No acknowledgement to first CBD
- 4.5 No acknowledgement of repeat changeback declaration
- 4.6 Simultaneous changeback
- 4.7 Changeback from several alternative links within a linkset
- * 4.8 Changeback from another linkset
- 4.9 Changeback from two linksets
- 4.10 Changeback due to various reasons
- * 4.11 Time controlled diversion procedure
- * 5 *Forced rerouting*
- * 6 *Controlled rerouting*
- 7 *Management inhibiting*
- 7.1 Inhibition of a link
- * 7.1.1 Available link
- * 7.1.2 Unavailable link
- 7.2 Inhibition not permitted

- * 7.2.1 Local reject on an available link
- * 7.2.2 Local reject on an unavailable link
- 7.2.3 Sending of LID
- 7.2.4 Reception of LID
- 7.3 Expiration of T14
 - 7.3.1 On an available link
 - 7.3.2 On an unavailable link
- 7.4 Additional inhibition messages (LIA, LID, LIN)
- 7.5 Inhibition asked by the both ends
- 7.6 Manual uninhibition of a link
 - * 7.6.1 With changeback
 - * 7.6.2 Without changeback
- 7.7 Expiration of T12
- * 7.8 Not possible uninhibition
- 7.9 Automatic uninhibition of a link
- 7.10 Forced uninhibition of a link
 - 7.10.1 Sending of LFU
 - 7.10.2 Reception of LFU
- 7.11 Expiration of T13
- 7.12 Additional uninhibition messages (LUA, LUN, LFU)
- 7.13 Uninhibition at one side after test 7.5
- 7.14 Automatic uninhibition after test 7.5
- 7.15 Automatic uninhibition when two links are inhibited
- 7.16 Reception of traffic on an inhibited link
- 7.17 Management inhibiting test
 - * 7.17.1 Normal procedure
 - 7.17.2 Reception of an LLT or LRT on an uninhibited link
 - 7.17.3 Reception of an LLT on a link locally inhibited
 - 7.17.4 Reception of an LRT on a link remotely inhibited
- 8 *Signalling traffic flow control*
 - 8.1 Reception of a TFC

- 8.2 Sending of TFCs
- 8.3 Reception of an UPU
- 8.4 Sending of an UPU
- 9 *Signalling route management*
 - 9.1 Sending of a TFP on an alternative route
 - * 9.1.1 Failure of normal linkset
 - * 9.1.2 On reception of a TFP
 - 9.2 Broadcast of TFPs
 - * 9.2.1 On one linkset failure
 - * 9.2.2 On multiple failures
 - 9.3 Reception of a message for an inaccessible destination
 - 9.4 Sending of a TFA on an alternative route
 - * 9.4.1 Recovery of normal linkset
 - * 9.4.2 On reception of a TFA
 - 9.5 Broadcast of TFAs
 - * 9.5.1 On one linkset recovery
 - * 9.5.2 Various reasons
 - 9.6 Periodic sending of signalling–route–set–test messages
 - 9.7 Reception of signalling–route–set–test messages
- 10 *Signalling point restart*
 - 10.1 Recovery of a linkset (SP A has not the STP function)
 - * 10.1.1 With use of point restart procedure
 - 10.1.2 Without use of point restart procedure
 - 10.2 Recovery of a linkset (SP A has the STP function)
 - * 10.2.1 With use of point restart procedure
 - 10.2.2 Without use of point restart procedure
 - 10.3 An adjacent signalling point becomes accessible via another signalling point (SP A has not STP function)

10.4 An adjacent signalling point becomes accessible via another signalling point
(SP A has STP function)

* 10.5 Restart of an SP having no STP function

* 10.6 Restart of an SP having STP function

10.7 Reception of an unexpected TRA

10.7.1 In an SP having no STP function

10.7.2 In an SP having STP function

- 11 *Traffic test*
- 12 *Signalling link test*
 - * 12.1 After activation of a link
 - 12.2 No acknowledgement to first SLTM
 - 12.3 No acknowledgement to second SLTM
 - 12.4 Unreasonable field in an SLTA
 - 12.5 Reception of an SLTM in an attempt state
 - * 12.6 Additional SLTA, SLTM
- 13 *Invalid messages*
 - 13.1 Invalid H0.H1 in a signalling network management message
 - 13.2 Invalid changeover messages
 - 13.3 Invalid changeback messages
 - 13.4 Invalid changeback code
 - 13.5 Invalid inhibition messages
 - 13.6 Invalid transfer control messages
 - 13.7 Invalid signalling route management messages
 - 13.8 Invalid Signalling–Route–Set–Test messages
 - 13.9 Invalid traffic restart allowed message
 - 13.10 Invalid H0–H1 in a signalling network testing and maintenance message
 - 13.11 Invalid signalling link test messages
 - 13.12 Invalid user part unavailable messages