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SS7 MTP2-User Adaptation Layer (M2UA)
SS7 Test Specifications
M2UA-SS7TEST
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Status of this Memo

Copyright

Abstract

This Internet-Draft provides information for the Internet community on the implementation of test cases for testing the *SS7 MTP2-User Adaptation Layer* [M2UA] Signalling Gateway (SG) based on the conformance test specifications for SS7 MTP Level 2 [Q.780], [Q.781], [M2PATEST07].

1. Introduction

This draft provides details for implementation of testing of *SS7 MTP-User Adaptation Layer* [M2UA] Signalling Gateways (SG) based on the test specifications for SS7 MTP Level 2 [Q.780], [Q.781], [M2PATEST07]. The general aspects for SS7 protocol testing [Q.780], [M2PATEST07] describes the requirement for an *MTP Level 3 Simulator* in the test environment for SS7 MTP Level 2 testing [Q.781], [M2PATEST07]. This *MTP Level 3 Simulator* is responsible for issuing and accepting request and indication primitives as well as sending and receiving signalling messages [Q.780], [M2PATEST07].

This memo describes how the *MTP Level 3 Simulator* would use SS7 MTP2-User Adaptation Layer messages to test a Signalling Gateway implementation of [M2UA].

1.1. Scope

Although the SS7 MTP Level 2 test cases [Q.781], [M2PATEST07] are applicable in entirety to SS7 signalling links implemented at the M2UA Signalling Gateway, this memo details the mapping of M2UA messages to SS7 Message Transfer Part (MTP) Signalling Link [Q.703], [M2PA] signals used in the SS7 MTP Level 2 tests [Q.781], [M2PATEST07].

1.2. Abbreviations

ANSI —American National Standards Institute.
ASP —Application Server Process.
BSNT —Backward Sequence Number Transmitted.
CPT —Compatibility Test.
ETSI —European Telecommunications Standards Institute.
FSNC —Forward Sequence Number Confirmed.
I-D —Internet-Draft.
IETF —Internet Engineering Task Force.
IOT —Interoperability Test.
IPSP —IP Signalling Point.
ITU —International Telecommunications Union.
IUT —Implementation Under Test.
M2PA —SS7 MTP2-User Peer-to-Peer Adaptation Layer.
M2UA —SS7 MTP2-User Adaptation Layer.
MTP2 —MTP Level 2.
MTP —Message Transfer Part.
PT —Protocol Tester.
RFC —Request For Comments.
RTB —Retransmission Buffer.
SCTP —Stream Control Transmission Protocol.
SG —Signalling Gateway.
SGP —Signalling Gateway Process.
SP —Signalling Point.
SS7 —Signalling System No. 7.
TC —Test Case.
TS —Test Suite.
VAT —Validation Test.

1.3. Terminology

Compatibility Test (CPT)— A test where multiple implementations are tested in interaction with each other to test for compatibility between implementations.

Implementation Under Test (IUT)— An implementation being tested (the object of testing) as part of a validation, compatibility or interoperability test within the test environment.

Interoperability Test (IOT)— A test where multiple implementations are tested in interaction with each other to test for interoperability between implementations.

M2UA Monitor— A device or function used to monitor, capture, record and analyze the exchange of M2UA messages across and IP network between implementations or protocol testers. This device function may be integrated with a protocol tester.

MTP Level 3 Simulator— A device or function used to simulate the SS7 MTP Level 3 [Q.704] to SS7 MTP Level 2 [Q.703], [M2PA] implementation. This device or function may be integrated within the *Test Environment*. This device or function is normally required for SS7 MTP Level 2 Test Specifications [Q.781], [M2PA] validation, compatibility or interoperability tests.

Protocol Tester (PT)— A device or function used to generate normal or abnormal messages and test sequences for the purpose of validation testing.

Signalling Link— A signalling link, SS7 [Q.703] or M2PA [M2PA], used to carry SS7 MTP Level 2 signalling between IUT and PT.

Test Case— A particular sequence of messages and patters that make up a single validation, compatibility or interoperability test.

Test Environment— The environment that contains the testing device and functiosn necessary and sufficient for executing a test suite.

Test Suite— A collection of test cases meant to acheive a specific objective of validation, compatibility or interoperability testing.

Validation Test (VAT)— A test where a single implementation is tested in interaction with a protocol tester to test for validation of the implementation to a technical specification.

1.4. Conventions

The key words "**MUST**", "**MUST NOT**", "**REQUIRED**", "**SHALL**", "**SHALL NOT**", "**SHOULD**", "**SHOULD NOT**", "**RECOMMENDED**", "**MAY**", and "**OPTIONAL**" in this document are to be interpreted as described in [RFC2119].

2. Test Environment

The test environment for SS7 MTP Level 2 [Q.781], [M2PATEST07] testing is described in the General Aspects of SS7 testing [Q.780], [M2PATEST07]. There are two types of testing that are accomodated as follows:

Validation Testing — consists of validating a single Implementation Under Test (IUT). This is performed by connecting the IUT to a Protocol Tester (PT) within the test enviroment.

Validation testing is more extensive that compatibility testing. This is because it is possible, with the use of the Protocol Tester (PT), to generate messages and patterns, that cannot normally be generated from an implementation, to test the response of the Implementation Under Test (IUT) to abnormal conditions.

Compatibility Testing — consists of testing the compatiability of one Implementation Under Test (IUT) with another. This is performed by connecting the IUTs together within the test environment.

Compatibility testing is less extensive than validation testing. This is because it is not normally possible to generate non-compliant test patterns with an implementation that conforms to validation testing. However, compatibility tests are better at testing the interoperability of two implementations.

Interoperability Testing — consists of testing the interoperability of one Implementation Under Test (IUT) with another. This is performed by connecting the IUT together within the test environment.

Interoperability testing is more extensive than compatibility testing and less extensive than validation testing. Where compatibility testing assumes that the IUT have passed validation testing, interoperability testing makes no such assumption. In addition, the test environment is expected to have more control over the IUT in interoperability testing than in compatibility testing. It may be possible to generate some message and command or response sequences that would not normally by possible with an IUT during compatibility testing.

The objectives of interoperability testing are often different than compatibility testing. The object of compatibility testing is to assure that an implementation that passes validation testing is, in other respects not tested by validation testing, compatible with other such implementations. The object of interoperability testing is to show that there exist implementations with which each of the IUT being tested can indeed function.

Although they have different objectives, the test environment configuration for interoperability testing is the same as that for compatibility testing.

2.1. Test Configurations

This section details the Validation and Compatibility test configurations used for testing M2UA SG and ASP for SS7 MTP Level 2 conformance.

2.1.1. Validation Test Configuration

Validation testing consists of validating a single Implementation Under Test (IUT) for SS7 MTP Level 2 conformance. Several test configurations can be used with M2UA Signalling Gateways (SG) and Application Server Processes (ASP) as follows:

2.1.1.1. SS7 Validation Test Configuration

Figure 1 illustrates the Validation Test configuration. As described in the SS7 Test Specification [Q.780], [M2PATEST07], the SS7 Level 2 validation testing environment consists of the following components:

(1) The *Implementation Under Test (IUT)* that is being validated a position "SP A".

(2) The *MTP Level 3 Simulator* attached to the IUT at position "SP A".

(3) The *Protocol Tester (PT)* performing validation tests at position "SP B".

(4) A *Signalling Link* [Q.703 or M2PA] between the PT at position "SP B" and the IUT at position "SP A".

(5) A *Link Monitor* monitoring the message exchange accross the Signalling Link [Q.703 or M2PA]. This function **MAY** be integrated with the Protocol Tester or the Test Environment.

For this configuration, the interface between the Implementation Under Test (IUT) and the *MTP Level 3 Simulator* is that described in the SS7 Test Specification [Q.780], [M2PATEST07]. This is the normal configuration for SS7 MTP Level 2 testing [Q.781], [M2PATEST07] and is not modified by this memo. Normal SS7 MTP Level 2 testing **SHOULD** be performed on the M2UA SG before performing validation, compatibility or interoperability tests in the other configurations described in this memo.

2.1.1.2. SG Validation Test Configuration

Figure 2 illustrates the Validation Test configuration. As described in the SS7 Test Specification [Q.780], [M2PATEST07], the SS7 Level 2 validation testing environment consists of the following components:

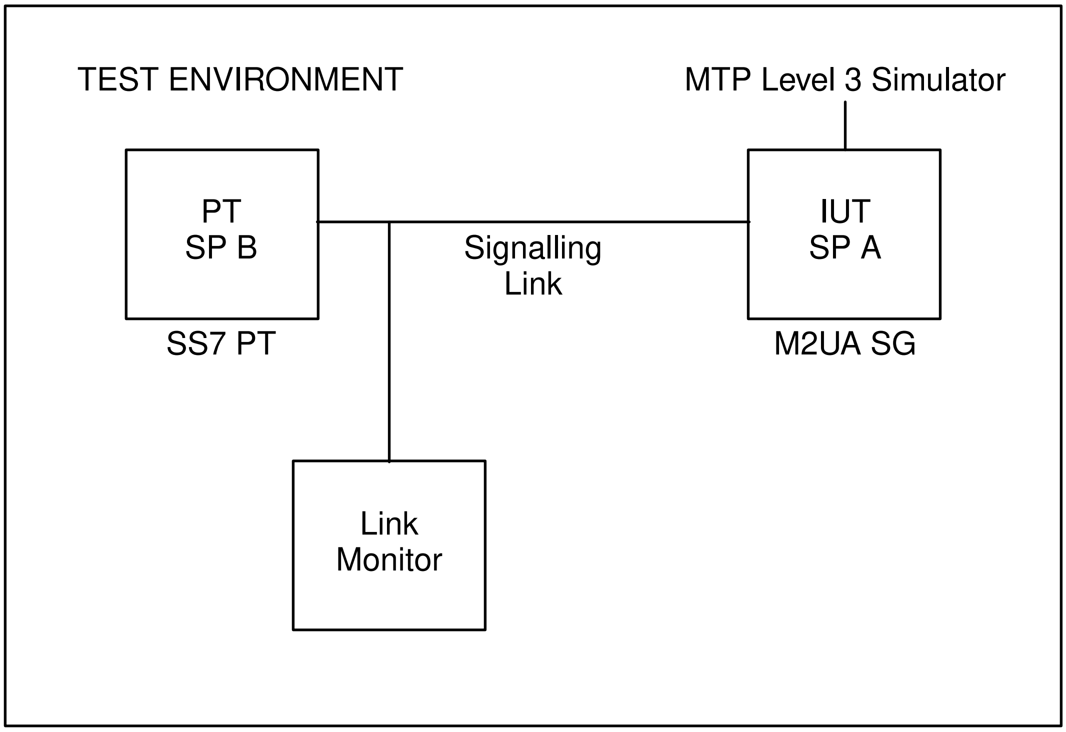

Figure 1. Validation Test Configuration #1

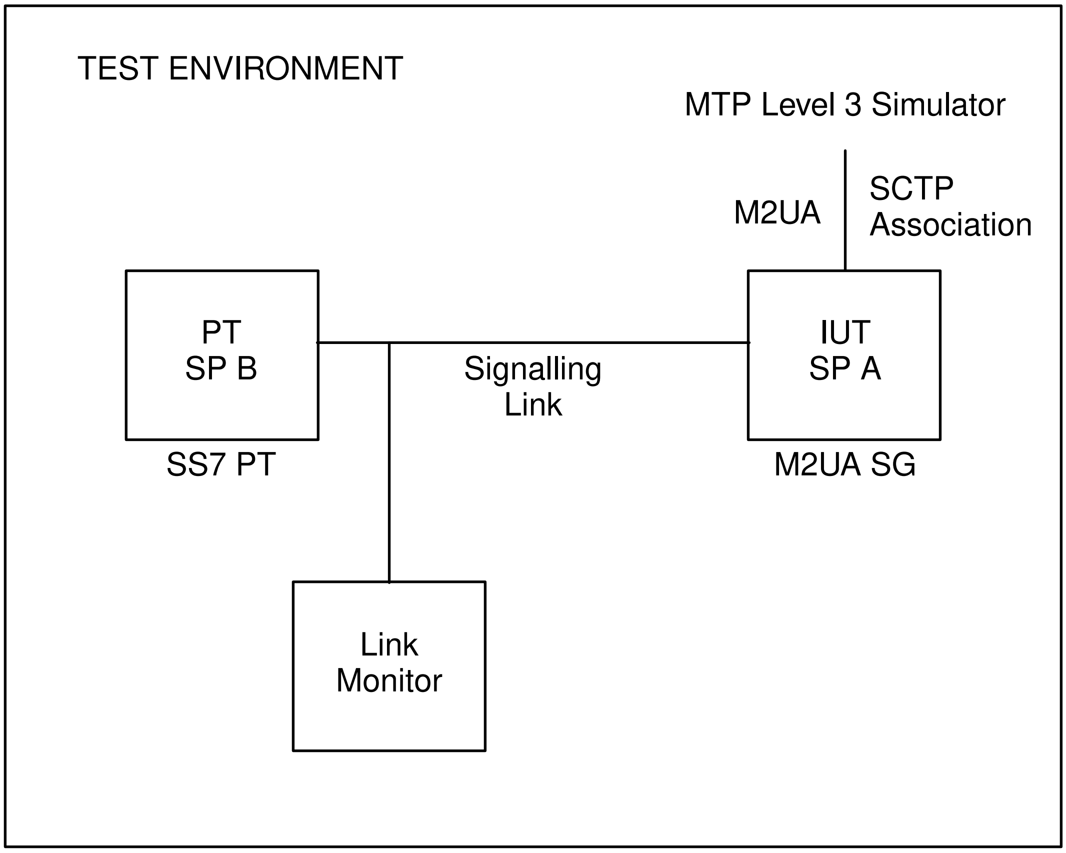

Figure 2. Validation Test Configuration #2

(1) The *Implementation Under Test (IUT)* that is being validated at position "SP A".

(2) An *MTP Level 3 Simulator* attached to the IUT at position "SP A".

(3) The *Protocol Tester (PT)* performing validation tests at position "SP B".

(4) A *Signalling Link* [Q.703 or M2PA] between the PT at position "SP B" and the IUT at position "SP A".

(5) A *Link Monitor* monitoring the message exchange accross the Signalling Link [Q.703 or M2PA]. This function **MAY** be integrated with the Protocol Tester or the Test Environment.

In addition, this memo specifies the interface between the Implementation Under Test (IUT) and the MTP Level 3 Simulator [Q.780], [M2PATEST07] within the test environment.

The *MTP Level 3 Simulator* **SHALL** be attached to the IUT a position "SP A" using an M2UA SCTP Association. The *MTP Level 3 Simulator* **SHALL** inject and collect M2UA messages to and from the IUT during the performance of SS7 MTP Level 2 testing [Q.781], [M2PATEST07]. The *MTP Level 3 Simulator* **SHALL** inject and collect the M2UA messages as decribed in *§4* of this document.

2.1.1.3. SG-ASP Validation Test Configuration

Figure 3 illustrates a Validation Test Configuration that includes an ASP in the validation tests. In this case the *MTP Level 3 Simulator* is connected at the ASP rather than directly to the SG. In this configuration, the combination of ASP and SG form the Implementation Under Test (IUT).

For this configuration the interface between the *MTP Level 3 Simulator* and the M2UA ASP is the same as for normal SS7 MTP Level 2 Testing [Q.780], [Q.781], [M2PATEST07]. The test envirnoment **SHOULD** include monitoring of the M2UA SCTP Association to ensure the mapping between SS7 MTP Level 2 [Q.703], [M2PA] signals, SS7 MTP Level 2 Test Specification [Q.781], [M2PATEST07] commands, and SS7 MTP2-User

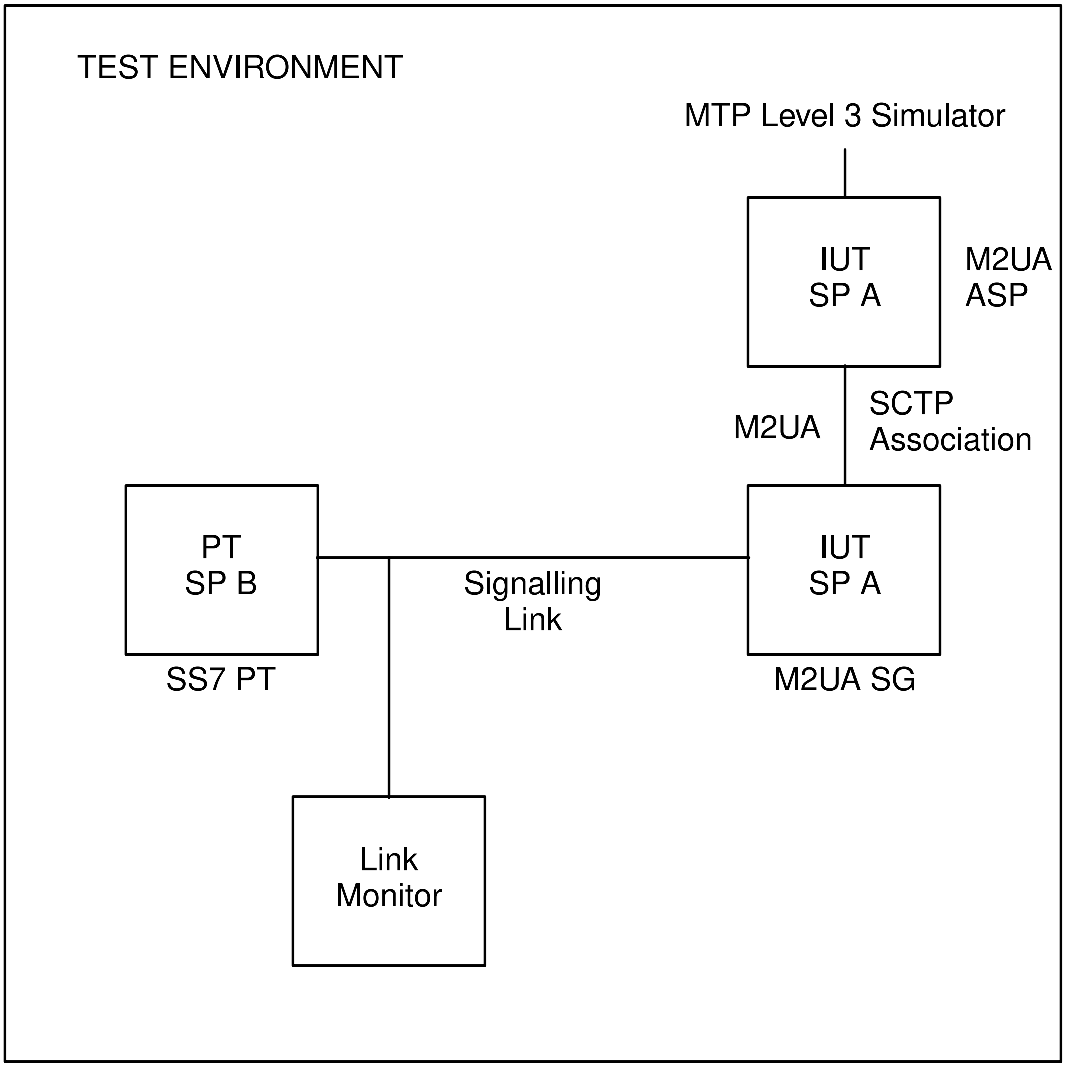

Figure 3. Validation Test Configuration #3

Adaptation Layer [M2UA] messages as described in *§4*.

2.1.2. Compatibility Test Configurations

Compatibility testing consists of testing two Implementations Under Test (IUT) for compatibility with each other. Several test configurations can be used with M2UA Signalling Gateways (SG) and Application Server Processes (ASP) as follows:

2.1.2.1. SS7 Compatibility Test Configuration

Figure 4 illustrates the Compatibility Test configuration. As described in the SS7 Test Specification [Q.780], [M2PATEST07], The SS7 Level 2 compatibility testing environment consists of the following components:

(1) One *Impementation Under Test (IUT)* for compatibility testing at position “SP A”.

(2) An *MTP Level 3 Simulator* attached to the IUT at position “SP A”.

(3) Another *Impementation Under Test (IUT)* for compatibility testing at position “SP B”.

(4) Another *MTP Level 3 Simulator* attached to the IUT at position “SP B”.

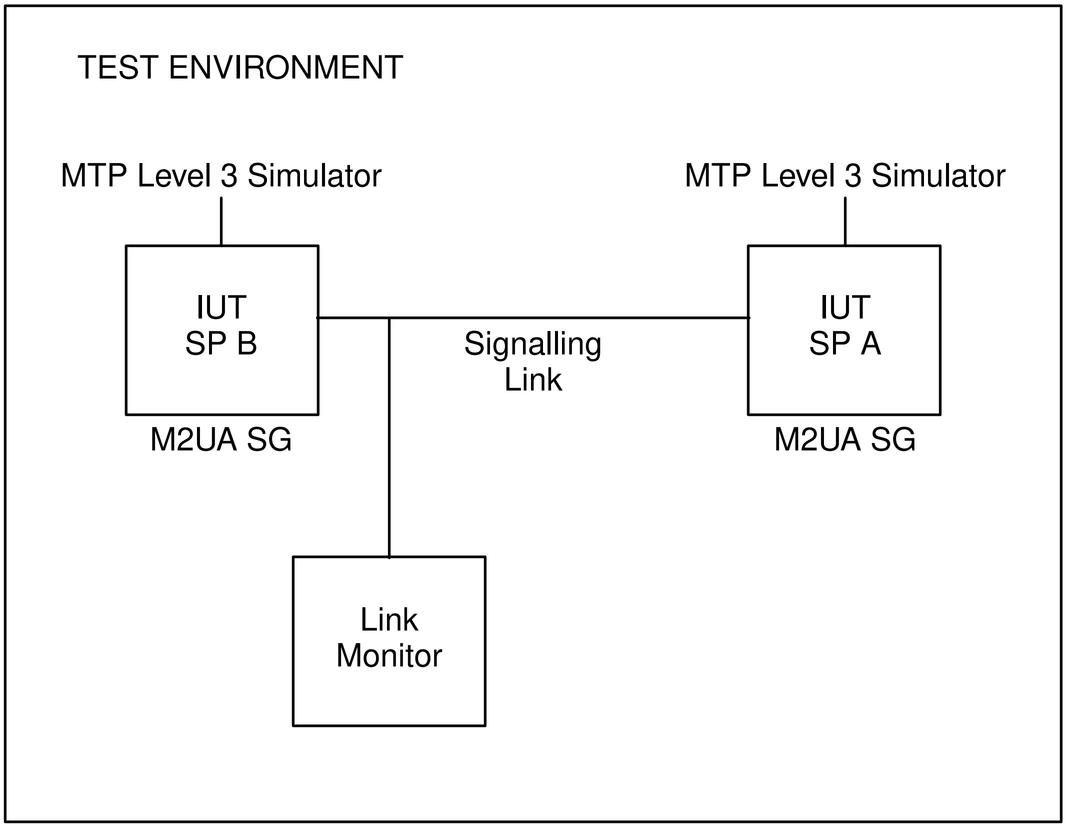

Figure 4. Compatibility Test Configuration #1

(5) A *Signalling Link* [Q.703 or M2PA] between IUT at position “SP A” and IUT at position “SP B”.

(6) A *Link Monitor* monitoring the message exchange accross the Signalling Link [Q.703 or M2PA].

For this configuration, the interface between each Implementation Under Test (IUT) and the *MTP Level 3 Simulator* is that described in the SS7 Test Specifications [Q.780], [M2PATEST07]. This is the normal configuration for SS7 MTP Level 2 testing [Q.781], [M2PATEST07] and is not modified by this memo. Normal SS7 MTP Level 2 testing **SHOULD** be peformed on the M2UA SG before performing compatibility tests in the other configurations described in this memo.

2.1.2.2. SG Compatibility Test Configuration

Figure 5 illustrates the Compatibility Test configuration. As described in the SS7 Test Specification [Q.780], [M2PATEST07], The SS7 Level 2 compatibility testing environment consists of the following components:

(1) One *Impementation Under Test (IUT)* for compatibility testing at position “SP A”.

(2) An *MTP Level 3 Simulator* attached to the IUT at position “SP A”.

(3) Another *Impementation Under Test (IUT)* for compatibility testing at position “SP B”.

(4) Another *MTP Level 3 Simulator* attached to the IUT at position “SP B”.

(5) A *Signalling Link* [Q.703 or M2PA] between IUT at position “SP A” and IUT at position “SP B”.

(6) A *Link Monitor* monitoring the message exchange accross the Signalling Link [Q.703 or M2PA].

In addition, this memo specifies the interface between the Implementation Under Test (IUT) and the MTP Level 3 Simulator [Q.780], [M2PATEST07] within the test environment.

The *MTP Level 3 Simulators* **SHALL** be attached to the IUT at position “SP A” and the IUT at position “SP B” using an M2UA SCTP Association. The *MTP Level 3 Simulator* **SHALL** inject and collect M2UA messages

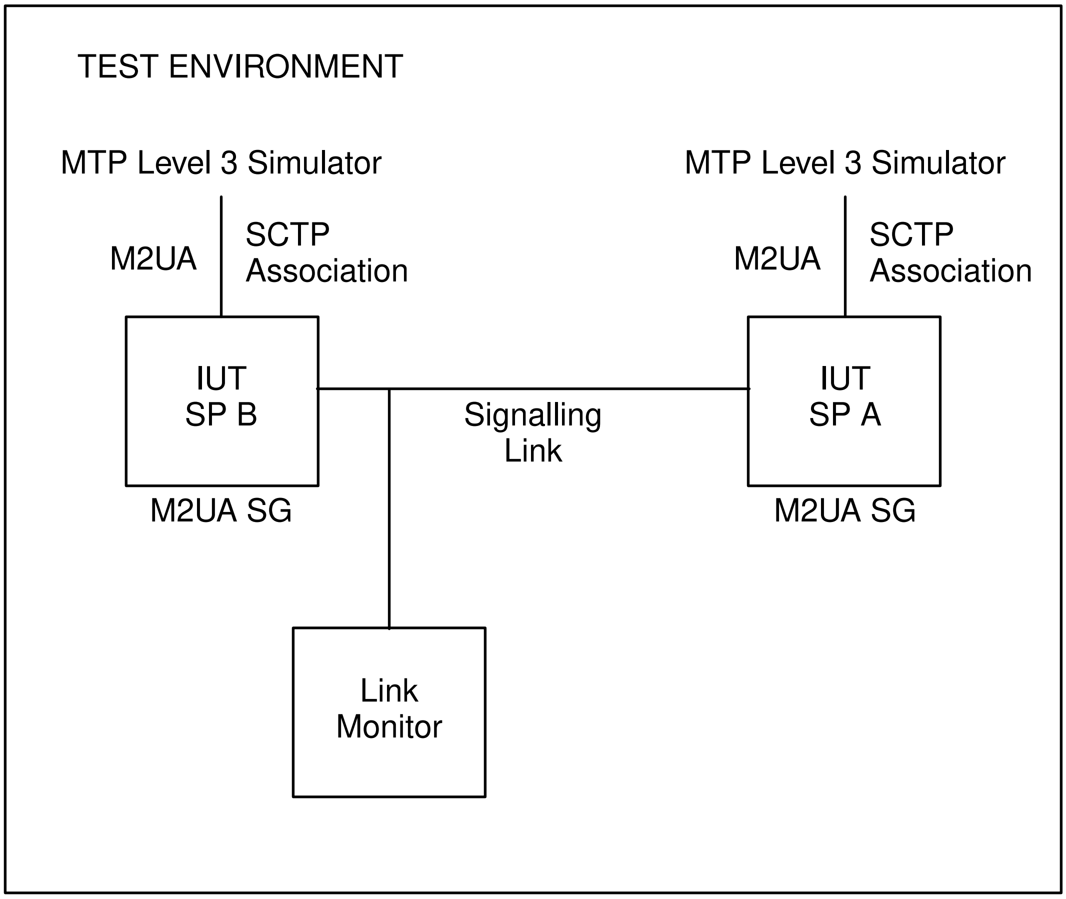

Figure 5. Compatibility Test Configuration #2

to and from the IUT during the performance of SS7 MTP Level 2 testing [Q.781], [M2PATEST07]. The *MTP Level 3 Simulator* **SHALL** inject and collect the M2UA messages as decribed in *§4* of this document.

2.1.2.3. SG-ASP Compatibility Test Configuration

Figure 6 illustrates a Compatibility Test Configuration that includes an ASP in the compatibility tests. In this case the *MTP Level 3 Simulator* is connected at the ASP rather than directly to the SGs. IN this configuration, the combination of each ASP and SG form the two Implementations Under Test (IUT).

For this configuration, the interface between the *MTP Level 3 Simulator* and the M2UA ASP is the same as for normal SS7 MTP Level 2 Testing [Q.780], [Q.781], [M2PATEST07]. The test environment **SHOULD** include monitoring of the M2UA SCTP Association to ensure the mapping between SS7 MTP Level 2 [Q.703], [M2PA] signals, SS7 MTP Level 2 Test Specification [Q.781], [M2PATEST07] commands, and SS7 MTP2-User Adaptation Layer [M2UA] messages as described in *§4*.

2.2. Testing Methodologies

2.2.1. Test Sequence

Testing of a particular M2UA SG implementation **SHOULD** be performed in the following order.

(1) **Validation Test Configuration #1** — validation tests [Q.781 or M2PATEST07] directly.

(2) **Validation Test Configuration #2** — validation tests [Q.781 or M2PATEST07] with M2UA interface between SG and *MTP Level 3 Simulator*.

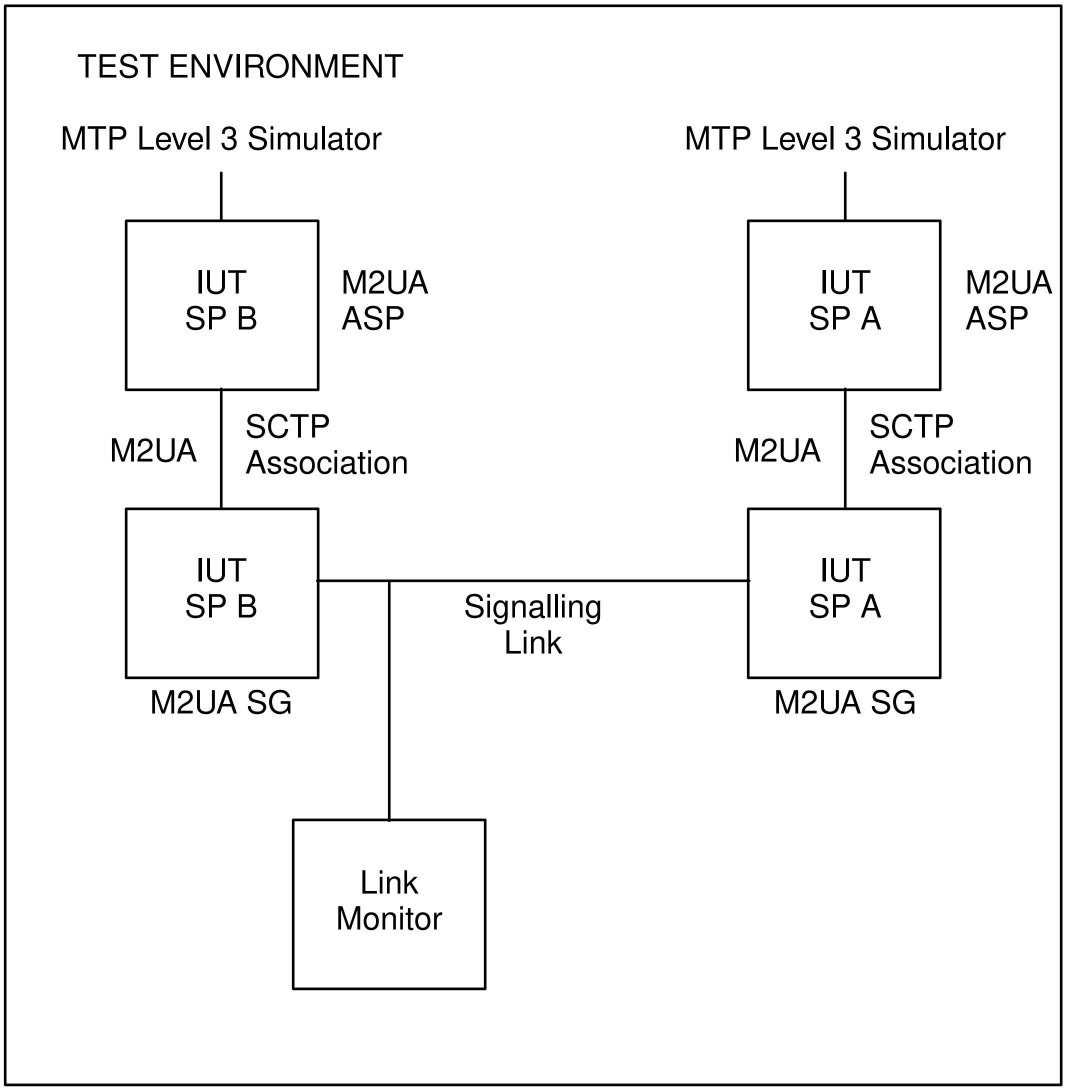

Figure 6. Compatibility Test Configuration #3

(3) **Compatibility Test Configuration #1** — compatibility tests [Q.781 or M2PATEST07] directly.

(4) **Compatibility Test Configuration #2** — compatibility tests [Q.781 or M2PATEST07] with M2UA interface between SG and *MTP Level 3 Simulator*.

Testing of a particular M2UA ASP implementation against an SG implementation (already tested per above) **SHOULD** be performed in the following order:

(5) **Validation Test Configuration #3** — validation tests [Q.781 or M2PATEST07] directly, with SG/ASP interaction within the IUT.

(6) **Compatibility Test Configuration #3** — compatibility tests [Q.781 or M2PATEST07] directly, with SG/ASP interaction within the IUT.

In addtion, validation testing of the M2UA protocol between ASP and SG **SHOULD** be performed independent of SS7 MTP Level 2 validation testing in accordance with a validation test suite for M2UA<1>. Also, compatibility testing of the M2UA protocol between ASP and SG **SHOULD** be performed independent of SS7 MTP Level 2 compatibility testing in accordance with a compatibility test suite for M2UA<2>.

The normal methodology for testing SS7 MTP Level 2 [Q.781], [M2PATEST07] is to perform validation testing on an IUT before performing compatibility testing. The tests presented in [Q.781 and M2PATEST07] test the functionality of the MTP Level 2 state machines; however, they do not adequately test the L2 to L3 interface.

To complete validation and compatibility testing of M2UA, the validation and compatibility tests presented in the SS7 MTP Level 3 Test Specification [Q.782] **SHOULD** be performed with the M2UA ASP in the test environment to assure that the M2UA IUT has properly implemented the L2 to L3 interface. The test environment for executing [Q.782] tests are outside the scope of this document.

(7) **MTP Level 3 Validation Tests** — validation tests [Q.781] performed with SG/ASP interaction within the IUT.

(8) **MTP Level 3 Compatibility Tests** — compatibility tests [Q.781] performed with SG/ASP interaction within the IUT.

Notes for §2

<1> At the time of writing this memo, there did not exist an IETF validation test suite specification for the M2UA protocol. The author of this memo is working on the development of such a specification.

<2> At the timer of writing this memo, there did not exist an IETF compatibility test suite specificaiton for the M2UA protocol. There does exist, however, several M2UA Interop test plans that come close to such a specification. The author of this memo is also working on the development of such a specification.

3. Tests

This section details the validation and compatibility tests to be performed.

3.1. Test Cases

In each test configuration, the applicable Validation tests or Compatibility tests of the SS7 MTP Level 2 Test Specification [Q.781], [M2PATEST07], or other applicatble SS7 MTP Level 2 test specification, **SHALL** be performed.

4. Mapping of Signals

The mapping of SS7 MTP Level 2 [Q.703], [M2PA] signals, SS7 MTP Level 2 Test [Q.781], [M2PATEST07] commands, and SS7 MTP2-User Adaptation Layer [M2UA] messages are listed in *Table 1*. Each [Q.703], [M2PA] signal **SHALL** be mapped onto a [Q.781], [M2PATEST07] command or indication and onto a [M2UA] message. When the SS7 MTP Level 2 [Q.781], [M2PATEST07] test case calls for a given [Q.703], [M2PA] signal or [Q.781], [M2PATEST07] command or indication, the corresponding [M2UA] message **SHALL** be injected or collected by the *MTP Level 3 Simulator*.

Table 1. Mapping of Q.703 Signals, Q.781 Commands and M2UA Messages

M2UA Message	M2UA Parameter	Q.703 Signal	Q.781 Notation
ESTABLISH Request		Start	:start
ESTABLISH Confirm		In Service	*<1>*
RELEASE		Stop	:stop

M2UA Message	**M2UA Parameter**	**Q.703 Signal**	**Q.781 Notation**
Request			
RELEASE Confirm		*<5>*	*<5>*
RELEASE Indication		Link Failure	*<2>*
STATE Request	*STATUS_LPO_SET*	Local Processor Outage	:set LPO
	STATUS_LPO_CLR	Local Processor Recovered	:clear LPO
	STATUS_EMER_SET	Emergency	:set EM
	STATUS_EMER_CLR	Emergency Ceases	:clear EM
	STATUS_FLUSH_BUFFERS	Flush Buffers	*<3>*
	STATUS_CONTINUE	Continue	*<3>*
	STATUS_CLEAR_RTB	Clear RTB	*<3>*
	STATUS_CONG_ACCEPT	Congestion Accept	*<4>*
	STATUS_CONG_DISCARD	Congestion Discard	:make congestion state
	STATUS_CONG_CLEAR	No Congestion	:clear congestion state
STATE Confirm		*<5>*	*<5>*
STATE Indication	*EVENT_RPO_ENTER*	Remote Processor Outage	*<9>*
	EVENT_RPO_EXIT	Remote Processor Recovered	*<9>*
DATA RETRIEVAL Request	*ACTION_RTRV_BSN*	Retrieve BSNT	*<7>*
	ACTION_RTRV_MSGS	Retrieval Request and FSNC	*<7>*
DATA RETRIEVAL Confirm	*ACTION_RTRV_MSGS*	Retrieved Message	*<7>*
	ACTION_RTRV_BSN	BSNT	*<7>*
DATA RETRIEVAL		Retrieval Complete	*<7>*

M2UA Message	M2UA Parameter	Q.703 Signal	Q.781 Notation
COMPLETE Indication			
CONGESTION Indication		*<6>*	*<6>*
DATA Acknowledge		*<5>*	*<5>*
DATA Request		Message for Transmission	*<8>*
DATA Indication		Received Message	
<10>		Power On	:power ON
<10>		—	:tx break

Notes for *Table 1***:**

<1> MTP Level 2 Test Specifications [Q.781], [M2PATEST07] do not provide a notation for "In Service" indication; however, in a number of test cases it is necessary to establish that the link is in the "In Service" state. The **ESTABLISH Confirm** [M2UA] message sent by the SG can be used to confirm that the link has acheived the "In Service" state.

<2> MTP Level 2 Test Specifications [Q.781], [M2PATEST07] do not provide a notation for "Link Failure" indication; however, in a number of test cases it is necessary to establish that the link has failed. The **RELEASE Indication** [M2UA] message sent by the SG can be used to confirm that the link has failed.

<3> MTP Level 2 Test Specifications [Q.781], [M2PATEST07] do not provide a notation for "Flush Buffers," "Clear RTB," "Continue," or "Resume." However, use of these primitives is necessary in some test cases (e.g. test case 4.1 [Q.781], test case 3.4.1 [M2PATEST07]). The **STATE Request** [M2UA] message with the *STATUS_FLUSH_BUFFERS*, *STATUS_CLEAR_RTB* or *STATUS_CONTINUE* state values **SHOULD** be used to perform these functions.

<4> MTP Level 2 Test Specifications [Q.781], [M2PATEST07] do not require the use of this request.

<5> There are no SS7 MTP Level 2 [Q.703], [M2PA] signals or SS7 MTP Level 2 Test [Q.781], [M2PATEST07] actions that correspond to these [M2UA] messages; however, these messages are required by the [M2UA] specifications and it **SHOULD** be verified that the SG issues these messages to the test enviroment under the appropriate conditions during testing.

<6> Although SS7 MTP Level 2 [Q.703], [M2PA] provides signals to SS7 MTP Level 3 [Q.704] indicating congesiton onset and abatement that use these [M2UA] messages, SS7 MTP Level 2 Tests [Q.781], [M2PATEST07] do not perform congestion testing that would generate these indications to the test environment.

<7> MTP Level 2 Test Specifications [Q.781], [M2PATEST07] do not test retrieval. Retrieval tests are performed by SS7 MTP Level 3 testing [Q.782].

<8> MTP Level 2 Test Specifications [Q.781], [M2PATEST07] do not have a notation for signalling messages (other than indicating that an MSU is sent or received); however, signalling messages are exchanged

between L2 and L3 as a normal course of most of the SS7 MTP Level 2 tests [Q.781], [M2PATEST07].

<9> MTP Level 2 Test Specifications [Q.781], [M2PATEST07] do not provide a notation for "Remote Processor Outage" or "Remote Processor Recovered" indications. These indications are not required in SS7 MTP Level 2 tests [Q.781], [M2PATEST07]; however, these indications **SHOULD** be delivered to the test environment on entry and exit from the "Remote Processour Outage" state.

<10> MTP Level 2 Test Specifications [Q.781], [M2PATEST07] defines these signals, and these signals are required within the test environment [Q.780], [M2PATEST07]; however, these signals are outside the scope of the SS7 MTP2-User Adaptation Layer [M2UA] protocol and **SHOULD** be generated by other means.

Note that it is possible that some implementations might use the **REGISTRATION Request** or **ASP-ACTIVE** [M2UA] messages for powering on the signalling link.

All of the applicable validation or compatibility tests of the SS7 MTP Level 2 Test Specification [Q.781], [M2PATEST07] **SHALL** be performed in this fashion with the mapping presented in *Table 1*. For other SS7 Conformance Test Specifications, a similar mapping and the test configurations presented **SHOULD** be used.

5. Examples

Security Considerations

There are no security considerations for this draft.

IANA Considerations

There are no IANA considerations for this draft.

0. Change History

This section provides historical information on the changes made to this draft. This section will be removed from the document when the document is finalized.

0.3. Changes from Version 0.2 to Version 0.3

(1) updated to new boilerplate and idnits-2.00.1

(2) updated references, version numbers and dates

0.2. Changes from Version 0.1 to Version 0.2

(1) Updated version numbers and resubmitted.

(2) Updated first and last page to IETF boiler plate.

Updated dates, versions and references.

0.1. Changes from Version 0.0 to Version 0.1

Updated dates and references.

0.0. Version 0.0

This is the first version of this document.

0.0.0. Change Log

```
$Log: draft-bidulock-sigtran-m2ua-ss7test-03.me,v $
Revision 0.9.2.1  2007/02/03 15:47:17  brian
- added new drafts

Revision 0.9.2.5  2006/06/27 09:41:12  brian
- rereleased drafts

Revision 0.9.2.4  2006/06/18 20:53:33  brian
- preparing for draft rerelease

Revision 0.9.2.3  2005/10/17 11:53:44  brian
- updated drafts for republication

Revision 0.9.2.2  2005/05/14 08:33:15  brian
- copyright header correction

Revision 0.9.2.1  2004/08/21 10:14:37  brian
- Force checkin on branch.

Revision 0.9  2004/02/17 09:44:31  brian
- Baseline for documentation.

Revision 0.8.2.3  2003/07/28 13:10:34  brian
Reformatting.
```

```
Revision 0.8.2.2  2003/07/27 08:15:27  brian
Checking in changes.

Revision 0.8.2.1  2003/07/26 23:19:03  brian
Minor corrections to table.

Revision 0.8  2003/07/26 19:10:57  brian
Added new drafts.
```

Normative References

[**RFC2119**] Bradner, S., *"Key words for use in RFCs to Indicate Requirement Levels,"* **BCP 14/RFC 2119**, The Internet Society (March 1997). **<http://www.ietf.org/rfc/rfc2119.txt>**

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