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Methods for Testing and Specification (MTS);
Internet Protocol Testing (IPT);
IPv6 Mobility;
Conformance Test Suite Structure and
Test Purposes (TSS&TP)

Reference

RTS/MTS-IPT-015[2]IPv6-MobTSST

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Contents

Intellectual Property Rights 5
Foreword 5
1 Scope 6
2 References 6
2.1 Normative references 6
2.2 Informative references 7
3 Definitions and abbreviations 7
3.1 Definitions 7
3.2 Abbreviations 7
4 Test Suite Structure (TSS) 7
Annex A (normative): Test Purposes (TP) 10
A.1 IPv6 Mobility - RFC 3775 10
A.1.1 Overview of mobile IPv6 security 10
A.1.1.1 Return routability procedure 10
A.1.1.2 Authorizing binding management messages 12
A.1.1.3 Updating node keys and nonces 13
A.1.2 New IPv6 protocol, message types, and destination option 13
A.1.2.1 Home address option 13
A.1.3 Modifications to IPv6 neighbor discovery 14
A.1.3.1 Modified router advertisement message format 14
A.1.3.2 New advertisement interval option format 15
A.1.3.3 New home agent information option format 15
A.1.4 Correspondent_Node operation 16
A.1.4.1 Processing mobility headers 16
A.1.4.2 Packet processing 22
A.1.4.2.1 Receiving packets with home address option 22
A.1.4.3 Sending binding error messages 24
A.1.4.4 Return routability procedure 24
A.1.4.4.1 Receiving home test init messages 24
A.1.4.4.2 Receiving care-of test init messages 24
A.1.4.5 Processing bindings 25
A.1.4.5.1 Receiving binding updates 25
A.1.4.5.2 Requests to delete a binding 29
A.1.4.5.3 Sending binding acknowledgements 29
A.1.4.5.4 Sending binding refresh requests 30
A.1.5 Home agent operation 31
A.1.5.1 Processing bindings 31
A.1.5.1.1 Primary care-of address registration 31
A.1.5.1.2 Primary care-of address de-registration 36
A.1.5.2 Packet processing 37
A.1.5.2.1 Intercepting packets for a mobile node 37
A.1.5.2.2 Processing intercepted packets 38
A.1.5.2.3 Multicast membership control 39
A.1.5.2.4 Handling reverse tunnelled packets 40
A.1.5.3 Dynamic home agent address discovery 40
A.1.5.3.1 Receiving router advertisement messages 40
A.1.5.4 Sending prefix information to the mobile node 42
A.1.5.4.1 Scheduling prefix deliveries 42
A.1.6 Mobile node operation 44
A.1.6.1 Packet processing 44
A.1.6.1.1 Sending packets while away from home 44
A.1.6.1.2 Interaction with outbound ipsec processing 46

A.1.6.1.3 Receiving packets while away from home 46
A.1.6.1.4 Routing multicast packets 48
A.1.6.1.5 Receiving binding error messages 49
A.1.6.2 Home agent and prefix management 50
A.1.6.2.1 Dynamic home agent address discovery 50
A.1.6.2.2 Sending mobile prefix solicitations 50
A.1.6.2.3 Receiving mobile prefix advertisements 51
A.1.6.3 Movement 52
A.1.6.3.1 Using multiple care-of addresses 52
A.1.6.3.2 Returning home 53
A.1.6.4 Return routability procedure 54
A.1.6.4.1 Receiving test messages 54
A.1.6.5 Processing bindings 56
A.1.6.5.1 Sending binding updates to the home agent 56
A.1.6.5.2 Receiving binding acknowledgements 57
A.1.6.5.3 Receiving binding refresh requests 59

A.2 IPv6 Mobility - RFC 4068 59
A.2.1 Protocol operation of network-initiated handover 59
A.2.2 Protocol details 59
A.2.3 Miscellaneous 66
A.2.3.1 Handover capability exchange 66
A.2.3.2 Fast or erroneous movement 66

Annex B (informative): Bibliography 67

History 68

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Methods for Testing and Specification (MTS).

1 Scope

The purpose of the present document is to provide Test Suite Structure and Test Purposes (TSS&TP) for conformance tests of the mobility IPv6 protocol based on the requirements defined in the IPv6 requirements catalogue (TS 102 559 [2]) and written according to the guidelines of TS 102 351 [1], ISO/IEC 9646-2 [4] and ETS 300 406 [5].

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI TS 102 351: "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT); IPv6 Testing: Methodology and Framework".

[2] ETSI TS 102 559: "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT): IPv6 Mobility; Requirements Catalogue".

[3] ISO/IEC 9646-1: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".

[4] ISO/IEC 9646-2: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 2: Abstract Test Suite specification".

[5] ETSI ETS 300 406: "Methods for Testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".

[6] IETF RFC 3775: "Mobility Support in IPv6".

[7] IETF RFC 4068: "Fast Handovers for Mobile IPv6".

2.2 Informative references

Not applicable.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

abstract test case: Refer to ISO/IEC 9646-1 [3].

Abstract Test Suite (ATS): Refer to ISO/IEC 9646-1 [3].

Implementation Under Test (IUT): Refer to ISO/IEC 9646-1 [3].

Test Purpose (TP): Refer to ISO/IEC 9646-1 [3].

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ATS	Abstract Test Suite
IETF	Internet Engineering Task Force
IPv6	Internet Protocol version 6
IUT	Implementation Under Test
RC	Requirements Catalogue
RQ	Requirement
TP	Test Purpose
TSS	Test Suite Structure

4 Test Suite Structure (TSS)

Test Purposes have been written for IPv6 mobile nodes, correspondent nodes and home agents according to the Requirements (RQ) of the Requirements Catalogue (RC) in TS 102 559 [2]. Test Purposes have been written for behaviours requested with "MUST" or "SHOULD", optional behaviour described with "MAY" or similar wording indicating an option has not been turned into Test Purposes.

The Test Purposes have been divided into two groups:

Group 1: IPv6 Mobility - RFC 3775 [6].

Group 2: IPv6 Mobility - RFC 4068 [7].

The sub-grouping of these two group follows the structure of the RC.

Group 1 RFC 3775 [6].

Group 1.1 Overview of Mobile IPv6 Security.

Group 1.1.1 Return Routability Procedure.

Group 1.1.2 Authorizing Binding Management Messages.

Group 1.1.3 Updating Node Keys and Nonces.

Group 1.2 New IPv6 Protocol, Message Types, and Destination Option.

Group 1.2.1 Home Address option.

Group 1.3 Modifications to IPv6 Neighbor Discovery.

Group 1.3.1 Modified Router Advertisement Message Format.

Group 1.3.2 New Advertisement Interval Option Format.

Group 1.3.3 New Home Agent Information Option Format.

Group 1.4 Correspondent_Node Operation.

Group 1.4.1 Processing Mobility Headers.

Group 1.4.2 Packet Processing.

Group 1.4.2.1 Receiving Packets with Home Address Option.

Group 1.4.3 Sending Binding Error Messages.

Group 1.4.4 Return Routability Procedure.

Group 1.4.4.1 Receiving Home Test Init Messages.

Group 1.4.4.2 Receiving care-of test Init Messages.

Group 1.4.5 Processing Bindings.

Group 1.4.5.1 Receiving binding updates.

Group 1.4.5.2 Requests to Delete a Binding.

Group 1.4.5.3 Sending Binding Acknowledgements.

Group 1.4.5.4 Sending Binding Refresh Requests.

Group 1.5 Home Agent Operation.

Group 1.5.1 Processing Bindings.

Group 1.5.1.1 Primary Care-of Address Registration.

Group 1.5.1.2 Primary Care-of Address De-Registration.

Group 1.5.2 Packet Processing.

Group 1.5.2.1 Intercepting Packets for a Mobile Node.

Group 1.5.2.2 Processing Intercepted Packets.

Group 1.5.2.3 Multicast Membership Control.

Group 1.5.2.4 Handling Reverse Tunnelled Packets.

Group 1.5.3 Dynamic Home Agent Address Discovery.

Group 1.5.3.1 Receiving Router Advertisement messages.

Group 1.5.4 Sending Prefix Information to the Mobile Node.

Group 1.5.4.1 Scheduling Prefix Deliveries.

Group 1.6 Mobile Node Operation.

Group 1.6.1 Packet Processing.

Group 1.6.1.1 Sending Packets While Away From Home.

Group 1.6.1.2 Interaction With Outbound IPsec Processing.

Group 1.6.1.3 Receiving Packets While Away From Home.

Group 1.6.1.4 Routing Multicast Packets.

Group 1.6.1.5 Receiving Binding Error Messages.

Group 1.6.2 Home Agent and Prefix Management.

Group 1.6.2.1 Dynamic Home Agent Address Discovery.

Group 1.6.2.2 Sending Mobile Prefix Solicitations.

Group 1.6.2.3 Receiving Mobile Prefix Advertisements.

Group 1.6.3 Movement.

Group 1.6.3.1 Using Multiple Care-of Addresses.

Group 1.6.3.2 Returning Home.

Group 1.6.4 Return Routability Procedure.

Group 1.6.4.1 Receiving Test Messages.

Group 1.6.5 Processing Bindings.

Group 1.6.5.1 Sending binding updates To The Home Agent.

Group 1.6.5.2 Receiving Binding Acknowledgements.

Group 1.6.5.3 Receiving Binding Refresh Requests.

Group 2 RFC 4068 [7].

Group 2.1 Protocol Operation of Network-initiated Handover.

Group 2.2 Protocol Details.

Group 2.3 Miscellaneous.

Group 2.3.1 Handover Capability Exchange.

Group 2.3.2 Fast or Erroneous Movement.

Annex A (normative): Test Purposes (TP)

The Test Purposes have been written in the formal notation TPlan as described in annex A of TS 102 351 [1]. This original textual output file ASCII file (MOB.tplan) is contained in archive TS_102595v010200p0.zip which accompanies the present document. The raw text file has been converted to a table format in this annex to allow better readability.

The two formats shall be considered equivalent. In the event that there appears to be syntactical or semantic differences between the two then the textual TPlan representation takes precedence over the table format in this annex.

A.1 IPv6 Mobility - RFC 3775

A.1.1 Overview of mobile IPv6 security

A.1.1.1 Return routability procedure

Test Purpose			
Identifier:	**TP_MOB_1048_01**		
Summary:	Test of Return Routability Procedure at mobile node		
References:	RQ_001_1048, RQ_001_1049, RQ_001_1047, RQ_001_1053,RQ_001_1054, RQ_001_1709, RQ_001_1711, RQ_001_1712		
IUT Role:	Mobile_Node	**Test case:**	TC_MOB_1048_01

```
with { IUT away_from_home
       IUT 'assigned a care-of address'
       IUT ready to start Return_Routability_Procedure
     }
ensure that
     { when {     IUT is requested to start Return_Routability_Procedure }
       then {     IUT sends Home_Test_Init to Home_Agent in tunneled_mode
                      containing source_address
                          set to home_address
                      and containing destination_address
                          set to Correspondent_Node_address
                      and containing home_init_cookie
                  and IUT sends Care_of_Test_Init to Correspondent_Node
                      containing source_address
                          set to care_of_address
                      and containing destination_address
                          set to Correspondent_Node_address
                      and containing care_of_init_cookie }
     }
```

Test Purpose			
Identifier:	**TP_MOB_1050_01**		
Summary:	Test of Return Routability Procedure at correspondent node		
References:	RQ_001_1050, RQ_001_1051, RQ_001_1056, RQ_001_1057,RQ_001_1058, RQ_001_1059, RQ_001_1046, RQ_001_1033,RQ_001_1034, RQ_001_1035		
IUT Role:	Correspondent_Node	**Test case:**	TC_MOB_1050_01

```
with { IUT ready for Return_Routability_Procedure
     }
ensure that
     { when {      IUT receives Home_Test_Init from Home_Agent
                       containing source_address
                           set to home_address
                   and containing destination_address
                           set to Correspondent_Node_address
                   and containing home_init_cookie
               and IUT receives Care_of_Test_Init from Mobile_Node
                       containing source_address
                           set to care_of_address
                   and containing destination_address
                           set to Correspondent_Node_address
                   and containing care_of_init_cookie }
       then {      IUT sends Home_Test to Home_Agent
                       containing source_address
                           set to Correspondent_Node_address
                   and containing destination_address
                           set to home_address
                   and containing home_init_cookie
                   and containing home_keygen_token
                           set to 'First (64, HMAC_SHA1 (Kcn,
                                  (home address | nonce | 0)))'
                   and containing home_nonce_index
               and IUT sends Care_of_Test to Mobile_Node
                       containing source_address
                           set to Correspondent_Node_address
                   and containing destination_address
                           set to care_of_address
                   and containing care_of_init_cookie
                   and containing care_of_keygen_token
                           set to 'First (64, HMAC_SHA1 (Kcn,
                                  (care-of address | nonce | 1)))'
                   and containing care_of_nonce_index }
     }
```

Test Purpose			
Identifier:	**TP_MOB_1052_01**		
Summary:	Test of answers of Return Routability Procedure at mobile node		
References:	RQ_001_1052, RQ_001_1061, RQ_001_2014, RQ_001_2034		
IUT Role:	Mobile_Node	**Test case:**	TC_MOB_1052_01

```
with {      IUT away_from_home
       and IUT having sent Home_Test_Init
       and IUT having sent Care_of_Test_Init
     }
ensure that
     { when {      IUT receives home_test from Home_Agent in tunneled_mode
                       containing source_address
                           set to Correspondent_Node_address
                   and containing destination_address
                           set to home_address
                   and containing ESP_header
                   and containing home_init_cookie
                   and containing home_keygen_token
                   and containing home_nonce_index
               and IUT receives Care_of_Test_Init from Correspondent_Node
                       containing source_address
                           set to Correspondent_Node_address
                   and containing destination_address
                           set to care_of_address
                   and containing care_of_init_cookie
                   and containing Care_of_keygen_token
                   and containing care_of_nonce_index }
       then {      IUT sends Binding_Update to Correspondent_Node }
     }
```

A.1.1.2 Authorizing binding management messages

Test Purpose			
Identifier:	**TP_MOB_1063_01**		
Summary:	Test of binding update sent by mobile node		
References:	RQ_001_1063, RQ_001_1064, RQ_001_1744, RQ_001_1745,RQ_001_1750, RQ_001_1751, RQ_001_1754, RQ_001_1759		
IUT Role:	Mobile_Node	**Test case:**	TC_MOB_1063_01

```
with {      IUT away_from_home
       and IUT completed Return_Routability_Procedure
     }
ensure that
     { when { IUT is requested to send a Binding_Update }
       then { IUT sends Binding_Update to Correspondent_Node
                   containing source_address
                       set to care_of_address
              and containing destination_address
                       set to Correspondent_Node_address
              and containing a sequence_number
              and containing (nonce_indices_option
                               containing home_nonce_index
                           and containing care_of_nonce_index)
              and containing binding_authorization_data_option
                       set to 'First (96, HMAC_SHA1 (Kbn,
                                      (care-of address | correspondent | BU)))' }
     }
```

A.1.1.3 Updating node keys and nonces

Test Purpose			
Identifier:	**TP_MOB_1075_01**		
Summary:	Test of reaction to unrecognized home nonce in binding update sent by mobile node		
References:	RQ_001_1075, RQ_001_1072		
IUT Role:	Correspondent_Node	**Test case:**	TC_MOB_1075_01

```
with { IUT having completed Return_Routability_Procedure
     }
ensure that
     { when { IUT receives Binding_Update from Mobile_Node
                   containing nonce_indices_option
                   set to an unrecognized home_nonce_index }
       then { IUT sends Binding_Acknowledgement to Mobile_Node
                   containing status
                       set to 136 expired_home_nonce_index
                    or set to 138 expired_nonces }
     }
```

Test Purpose			
Identifier:	**TP_MOB_1075_02**		
Summary:	Test of reaction to unrecognized care-of nonce in binding update sent by mobile node		
References:	RQ_001_1075, RQ_001_1072		
IUT Role:	Correspondent_Node	**Test case:**	TC_MOB_1075_02

```
with { IUT having completed Return_Routability_Procedure
     }
ensure that
     { when { IUT receives Binding_Update from Mobile_Node
          containing nonce_indices_option
              set to unrecognized care_of_nonce_index }
       then { IUT sends Binding_Acknowledgement to Mobile_Node
                   containing status
                       set to 137 expired_care_of_nonce_index
                    or set to 138 expired_nonces }
     }
```


A.1.2 New IPv6 protocol, message types, and destination option

A.1.2.1 Home address option

Test Purpose			
Identifier:	**TP_MOB_1208_01**		
Summary:	Test reaction on home address option when this option is not recognized		
References:	RQ_001_1208, RQ_001_1211		
IUT Role:	Node	**Test case:**	TC_MOB_1208_01

```
with { IUT configured 'so that it does not recognise the Home Address option'
     }
ensure that
     { when {     IUT receives an IPv6Packet
                       containing destination_address
                         set to a multicast_address
                  and containing Home_Address_option }
       then {     IUT discards IPv6Packet
                and IUT sends no response }
     }
```