IPv6 READY

IMS Interoperability Specification

Technical Document

Revision 0.1.0

IPv6 Forum *http://www.ipv6forum.org*
Converged Test Specification *http://www.ipv6ready.org*
UNH InterOperability Lab (USA)

MODIFICATION RECORD

Version 1.0 September 2, 2004

ACKNOWLEDGMENTS

The IPv6 Forum would like to acknowledge the efforts of the following organizations in the development of this test suite.

University of New Hampshire – InterOperability Laboratory

INTRODUCTION

Overview

The IPv6 forum plays a major role to bring together industrial actors, to develop and deploy the new generation of IP protocols. Contrary to IPv4, which started with a small closed group of implementers, the universality of IPv6 leads to a huge number of implementations. Interoperability has always been considered as a critical feature in the Internet community.

Due to the large number of IPv6 implementations, it is important to provide the market a strong signal proving the level of interoperability across various products.

To avoid confusion in the mind of customers, a globally unique logo program should be defined. The IPv6 logo will give confidence to users that IPv6 is currently operational. It will also be a clear indication that the technology will still be used in the future. To summarize, this logo program will contribute to the feeling that IPv6 is available and ready to be used.

Abbreviations and Acronyms

REF-Host: Reference Host
REF-Router: Reference Router
TAR-Host: Target Host
TAR-Router: Target Router

TEST ORGANIZATION

This document organizes tests by Section based on related test methodology or goals. Each group begins with a brief set of comments pertaining to all tests within that group. This is followed by a series of description blocks; each block describes a single test. The format of the description block is as follows:

Test Label: The test label and title comprise the first line of the test block. The test label is composed by concatenating the short test suite name, the section number, the group number, and the test number within the group. These elements are separated by periods. The Test Number is the section, group and test number, also separated by periods.

Purpose: The Purpose is a short statement describing what the test attempts to achieve. It is usually phrased as a simple assertion of the feature or capability to be tested.

References: The References section lists cross-references to the specifications and documentation that might be helpful in understanding and evaluating the test and results.

Resource Requirements: The Resource Requirements section specifies the software, hardware, and test equipment that will be needed to perform the test.

Discussion: The Discussion is a general discussion of the test and relevant section of the specification, including any assumptions made in the design or implementation of the test as well as known limitations.

Test Setup: The Test Setup section describes the configuration of all devices prior to the start of the test. Different parts of the procedure may involve configuration steps that deviate from what is given in the test setup. If a value is not provided for a protocol parameter, then the protocol's default is used for that parameter.

Procedure: This section of the test description contains the step-by-step instructions for carrying out the test. These steps include such things as enabling interfaces, unplugging devices from the network, or sending packets from a test station. The test procedure also cues the tester to make observations, which are interpreted in accordance with the observable results given for that test part.

Observable Results: This section lists observable results that can be examined by the tester to verify that the NUT is operating properly. When multiple observable results are possible, this section provides a short discussion on how to interpret them. The determination of a pass or fail for each test is usually based on how the NUT's behavior compares to the results described in this section.

Possible Problems: This section contains a description of known issues with the test procedure, which may affect test results in certain situations.

REFERENCES

The following documents are referenced in this text:

[TS24.229] 3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (Release 7), 3GPP TS 24.229 v7.8.0.

[TS33.203] 3rd Generation Partnership Project Technical Specification Group Services and System Aspects; 3G security Access security for IP-based services (Release 7), 3GPP TS 33.203 v7.8.0.

[SIP] J.Rosenberg, H. Schulzrinne, G.Camarillo, A.Johnston, J. Peterson, R. Sparks, M, Handley, E. Schooler, SIP: Session Initiation Protocol, RFC 3261, June 2002.

[SDP] J. Rosenberg, H. Schulzrinne, An Offer/Answer Model with the Session Description Protocol (SDP), RFC 3264, June 2002.

[SIPEVENT] A. B. Roach, Session Initiation Protocol (SIP)-Specific Event Notification, RFC 3265, June 2002.

[RFC3329] J. Arkko, V. Torvinen, G. Camarillo, A. Niemi, and T.Haukka, Security Mechanism Agreement for the Session Initiation Protocol (SIP), RFC 3329, January 2003.

[RFC4566] M. Handley, V. Jacobson, and C. Perkins, SDP: Session Description Protocol, RFC 4566, July 2006.

TABLE OF CONTENTS

Group 1: Registration and Authentication

Scope

Test in this group verify that the target devices properly registers and authenticates.

Overview

The following tests verify operations such as initial registration, registration, reregister, and deregister.

Test IMS.Interop.1.1: Initial Registration

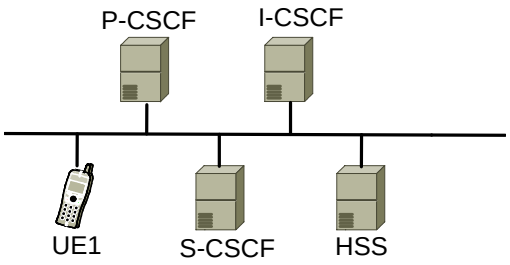
Purpose: To verify that a UE completes initial registration properly.

References:

- [TS24.229] – Section 5.1.1.2

Discussion: The initial registration procedure consists of the UE sending an unprotected initial REGISTER request and, upon being challenged, sending the integrity protected REGISTER request. The UE can register a public user identity with its contact address at any time after it has acquired an IP address, discovered a P-CSCF, and established an IP-CAN bearer that can be used for SIP signalling. However, the UE shall only initiate a new registration procedure when it has received a final response from the registrar for the ongoing registration, or the previous REGISTER request has timed out.

Test Setup: Connect the devices as per the figure below. Configure the P-CSCF, S-CSCF, I-CSCF, and HSS to be in the same domain. UE1 is unregistered.



Procedure:

1. Initialize UE1.
2. Observe the packets on all networks.

Observable Results:

Step 2: UE1 transmits a REGISTER request to P-CSCF. The P-CSCF transmits a 401 Unauthorized response to UE1. UE1 transmits a new REGISTER request with valid credentials to P-CSCF. The P-CSCF transmits a 200 response to UE1.

Possible Problems:

- None.

Test IMS.Interop.1.2: Register Message

Purpose: To verify that a UE properly registers.

References:

- [TS24.229] – Section 5.1.1

Discussion: On sending a REGISTER request, the UE shall populate the header fields as follows:

a) an Authorization header, with:

- the username directive, set to the value of the private user identity;
- the realm directive, set to the domain name of the home network;
- the uri directive, set to the SIP URI of the domain name of the home network;
- the nonce directive, set to an empty value; and
- the response directive, set to an empty value;

b) a From header set to the SIP URI that contains the public user identity to be registered;

c) a To header set to the SIP URI that contains the public user identity to be registered;

d) a Contact header set to include SIP URI(s) containing the IP address of the UE in the hostport parameter or

FQDN. If the UE supports GRUU (see table A.4, item A.4/53), it shall include a +sip.instance parameter

containing the instance ID. The UE shall include all supported ICSI values (coded as specified in subclause 7.2A.8.2), and IARI values (coded as specified in subclause 7.2A.9.2), for the IMS communication services and IMS applications it intends to use in a sip.app-subtype feature tag according to draft-rosenberg-sip-app-media-tag [120] and RFC 3840 [62]. If the REGISTER request is protected by a security association, the UE shall also include the protected server port value in the hostport parameter;

e) a Via header set to include the IP address or FQDN of the UE in the sent-by field. For the UDP, if the REGISTER request is protected by a security association, the UE shall also include the protected server port value in the sent-by field, while for the TCP, the response is received on the TCP connection on which the request was sent;

NOTE 1: If the UE specifies its FQDN in the host parameter in the Contact header and in the sent-by field in the Via header, then it has to ensure that the given FQDN will resolve (e.g., by reverse DNS lookup) to the IP address that is bound to the security association.

NOTE 2: The UE associates two ports, a protected client port and a protected server port, with each pair of security association. For details on the selection of the port values see 3GPP TS 33.203 [19].

f) an Expires header, or the expires parameter within the Contact header, set to the value of 600 000 seconds as the value desired for the duration of the registration;

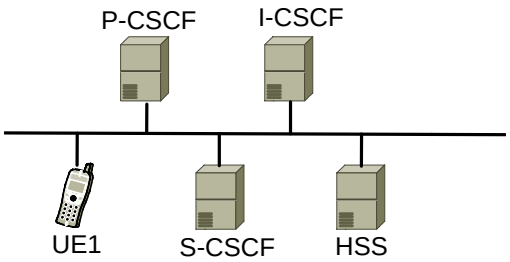
NOTE 3: The registrar (S-CSCF) might decrease the duration of the registration in accordance with network policy. Registration attempts with a registration period of less than a predefined minimum value defined in the registrar will be rejected with a 423 (Interval Too Brief) response.

g) a Request-URI set to the SIP URI of the domain name of the home network;

h) the Security-Client header field set to specify the security mechanism the UE supports, the IPsec layer algorithms the UE supports and the parameters needed for the security association setup. The UE shall support the setup of two pairs of security associations as defined in 3GPP TS 33.203 [19]. The syntax of the parameters needed for the security association setup is specified in

Annex H of 3GPP TS 33.203 [19]. The UE shall support the "ipsec-3gpp" security mechanism, as specified in RFC 3329 [48]. The UE shall support the IPsec layer algorithms for integrity and confidentiality protection as defined in 3GPP TS 33.203 [19], and shall announce support for them according to the procedures defined in RFC 3329 [48];
i) the Supported header containing the option tag "path", and if GRUU is supported, the option tag "gruu"; and
j) if a security association exists, and if available to the UE (as defined in the access technology specific annexes for each access technology), a P-Access-Network-Info header set as specified for the access network technology (see subclause 7.2A.4).

Test Setup: Connect the devices as per the figure below. Configure the P-CSCF, S-CSCF, I-CSCF, and HSS to be in the same domain. UE1 is unregistered.



Procedure:

1. Initialize UE1.
2. UE1 transmits a REGISTER request to P-CSCF.
3. P-CSCF transmits a 401 Unauthorized response to UE1.
4. Observe the packets on all networks.

Observable Results:

Step 3: UE1 transmits a REGISTER request with the following header fields:

- From Header set to SIP URI that contains UE1 public user identity.
- To Header set to SIP URI that contains UE1 public user identity.
- Contact Header set to SIP URI that contains IPv6 addresses or FQDN of UE1.
- Via Header set to contain IPv6 address or FQDN of UE1.
- Expires Header set to 600 000 or the expire parameter is set to 600 000 in the Contact header.
- Request URI Header set to SIP URI that contains UE1 public user identity.
- Security Client Header set to contain the security mechanisms supported by UE1.
- Supported Header set to contain option tag “path”.

Possible Problems:

- None.

Test IMS.Interop.1.3: Reregistration

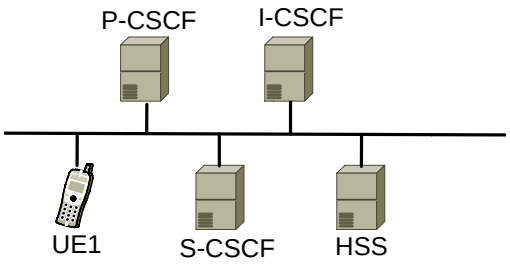
Purpose: To verify that a UE can perform the reregistration.

References:

- [TS24.229] – Section 5.1.1.4

Discussion: The UE can perform the reregistration of a previously registered public user identity with its contact address at any time after the initial registration has been completed. The UE shall perform the reregistration over the existing set of security associations that is associated with the related contact address.

Test Setup: Connect the devices as per the figure below. Configure the P-CSCF, S-CSCF, I-CSCF, and HSS to be in the same domain. UE1 is unregistered.



Procedure:

1. Initialize UE1.
2. Allow UE1 to register a public user identity.
3. Wait 600 seconds.
4. Observe the packets on all networks.

Observable Results:

Step 4: UE1 transmits a REGISTER request to the P-CSCF using the existing security associations. The P-CSCF transmits a 200 OK response to UE1.

Possible Problems:

- None.

Group 2: Registration-State Event Package

Scope

Test in this group verify that the target devices properly receives the registration-state event package.

Overview

The following tests verify operations of registration-state event package using the SUBSCRIBE and NOTIFY framework.

Test IMS.Interop.2.1: Subscription

Purpose: To verify that a UE properly supports subscription.

References:

- [TS24.229] – Section 5.1.2

Discussion: Upon receipt of a 2xx response to the initial registration, the UE shall subscribe to the reg event package for the public user identity registered at the user's registrar (S-CSCF) as described in RFC 3680 [43].

The UE shall use the default public user identity for subscription to the registration-state event package, if the public user identity that was used for initial registration is a barred public user identity. The UE may use either the default public user identity or the public user identity used for initial registration for the subscription to the registration-state event package, if the initial public user identity that was used for initial registration is not barred.

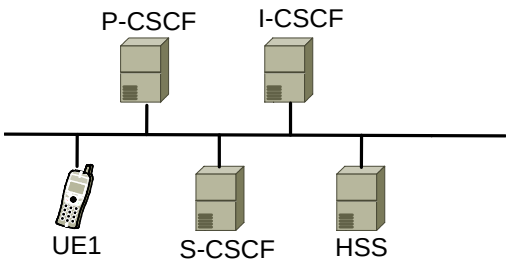
On sending a SUBSCRIBE request, the UE shall populate the header fields as follows:

a) a Request URI set to the resource to which the UE wants to be subscribed to, i.e. to a SIP URI that contains the public user identity used for subscription;
b) a From header set to a SIP URI that contains the public user identity used for subscription;
c) a To header set to a SIP URI that contains the public user identity used for subscription;
d) an Event header set to the "reg" event package;
e) an Expires header set to 600 000 seconds as the value desired for the duration of the subscription
f) if available to the UE (as defined in the access technology specific annexes for each access technology), a P-Access-Network-Info header set as specified for the access network technology (see subclause 7.2A.4); and
g) a Contact header set to contain the same IP address or FQDN, and with the protected server port value as in the initial registration.

Upon receipt of a 2xx response to the SUBSCRIBE request, the UE shall store the information for the established dialog and the expiration time as indicated in the Expires header of the received response.

If continued subscription is required, the UE shall automatically refresh the subscription by the reg event package, for a previously registered public user identity, either 600 seconds before the expiration time if the initial subscription was for greater than 1200 seconds, or when half of the time has expired if the initial subscription was for 1200 seconds or less. If a SUBSCRIBE request to refresh a subscription fails with a non-481 response, the UE shall still consider the original subscription valid for the duration of the most recently known "Expires" value according to RFC 3265 [28].
Otherwise, the UE shall consider the subscription invalid and start a new initial subscription according to RFC 3265 [28].

Test Setup: Connect the devices as per the figure below. Configure the P-CSCF, S-CSCF, I-CSCF, and HSS to be in the same domain. UE1 is unregistered.



Procedure:

1. Initialize UE1.
2. UE1 transmits a REGISTER request to P-CSCF.
3. P-CSCF transmits a 401 Unauthorized response to UE1.
4. UE1 transmits a REGISTER request with valid credentials to P-CSCF.
5. P-CSCF transmits a 200 response to UE1.
6. Observe the packets on all networks.

Observable Results:

Step 6: UE1 transmits a SUBSCRIBE request to P-CSCF with the following headers included:

- From Header set to SIP URI that contains UE1 public user identity.
- To Header set to SIP URI that contains UE1 public user identity.
- Event Header set to “reg” event package.
- Expires Header set to 600 000 seconds.
- Contact Header set to contain IPv6 address or FQDN of UE1.
- Request URI Header set to SIP URI that contains UE1 public user identity.

Possible Problems:

- None.

Group 3: Session

Scope

Test in this group verify that the target devices properly initiates and receives IMS calls.

Overview

The following tests verify that IMS call all can be completed.

Test IMS.Interop.3.1: Call Initiation (UE-originating case)

Purpose: To verify that a UE properly terminates a session.

References:

- [TS24.229] – Section 5.1.2A.2

Discussion: The "integration of resource management and SIP" extension is hereafter in this subclause referred to as "the precondition mechanism" and is defined in RFC 3312 [30] as updated by RFC 4032 [64].

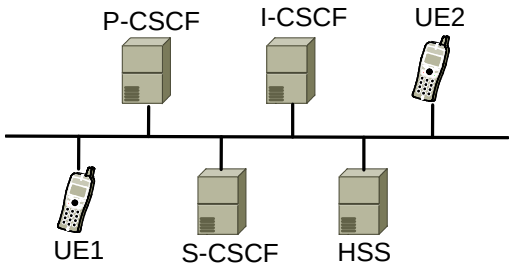
The preconditions mechanism should be supported by the originating UE.

The UE may initiate a session without the precondition mechanism if the originating UE does not require local resource reservation.

> NOTE 1: The originating UE can decide if local resource reservation is required based on e.g. application requirements, current access network capabilities, local configuration, etc.

In order to allow the peer entity to reserve its required resources, an originating UE supporting the precondition mechanism should make use of the precondition mechanism, even if it does not require local resource reservation.

Test Setup: Connect the devices as per the figure below. Configure the P-CSCF, S-CSCF, I-CSCF, and HSS to be in the same domain. UE1 is unregistered. UE2 is already registered.



Procedure:

1. Initialize UE1.
2. UE1 transmits a REGISTER request to P-CSCF.
3. P-CSCF transmits a 401 Unauthorized response to UE1.
4. UE1 transmits a REGISTER request with valid credentials to P-CSCF.
5. P-CSCF transmits a 200 response to UE1Initialize UE1.
6. UE1 subscribes to the registration-state event package.
7. UE1 calls UE2.

8. Observe the packets on all networks.
9. UE2 answers.
10. Observe the packets on all networks.

Observable Results:

Step 8: UE1 transmits an INVITE request. UE2 transmits 100 Trying response to UE1. UE1 receives a 183 Session Progress from P-CSCF. UE2 transmits a 180 Ringing response to UE1.
Step 10: UE2 transmits a 200 OK to UE1. UE1 transmits ACK to UE2 in response.

Possible Problems:

- None.

Test IMS.Interop.3.2: Call Initiation (UE-terminating case)

Purpose: To verify that a UE properly terminates a session.

References:

- [TS24.229] – Section 5.1.2A.2

Discussion: The preconditions mechanism should be supported by the terminating UE.
The handling of incoming initial INVITE requests at the terminating UE is mainly dependent on the following conditions:

- the specific service requirements for "integration of resource management and SIP" extension (hereafter in this subclause known as the precondition mechanism and defined in RFC 3312 [30] as updated by RFC 4032 [64], and with the request for such a mechanism known as a precondition); and
- the UEs configuration for the case when the specific service does not require the precondition mechanism.

If an initial INVITE request is received the terminating UE shall check whether the terminating UE requires local resource reservation.

NOTE 1: The terminating UE can decide if local resource reservation is required based on e.g. application requirements, current access network capabilities, local configuration, etc.

If local resource reservation is required at the terminating UE and the terminating UE supports the precondition mechanism, and:

a) the received INVITE request includes the "precondition" option-tag in the Supported header or Require header, the terminating UE shall make use of the precondition mechanism and shall indicate a Require header with the "precondition" option-tag in any response or subsequent request it sends towards to the originating UE; or

b) the received INVITE request does not include the "precondition" option-tag in the Supported header or Require header, the terminating UE shall not make use of the precondition mechanism.

If local resource reservation is not required by the terminating UE andthe terminating UE supports the precondition
mechanism and:

a) the received INVITE request includes the "precondition" option-tag in the Supported header and:
   - the required resources at the originating UE are not reserved, the terminating UE shall use the precondition mechanism; or

   - the required local resources at the originating UE and the terminating UE are available, the terminating UE may use the precondition mechanism;

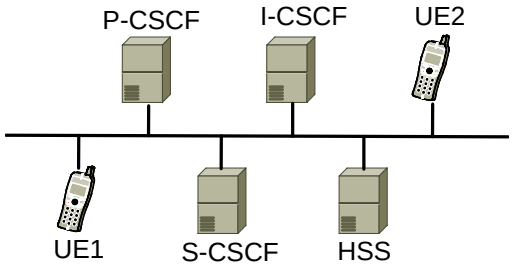
b) the received INVITE request does not include the "precondition" option-tag in the Supported header or Require header, the terminating UE shall not make use of the precondition mechanism; or

c) the received INVITE request includes the "precondition" option-tag in the Require header, the terminating UE shall use the precondition mechanism.

NOTE 2: Table A.4 specifies that UE support of forking is required in accordance with RFC 3261 [26].

NOTE 3: If the terminating UE does not support the precondition mechanism it will apply regular SIP session
initiation procedures.
If the terminating UE requires a reliable alerting indication at the originating side, it shall send the 180 (Ringing)
response reliably. If the received INVITE indicated support for reliable provisionable responses, but did not require
their use, the terminating UE shall send provisional responses reliably only if the provisional response carries SDP or
for other application related purposes that requires its reliable transport.

Test Setup: Connect the devices as per the figure below. Configure the P-CSCF, S-CSCF, I-CSCF, and HSS to be in the same domain. UE1 is unregistered. UE2 is already registered.



Procedure:

1. Initialize UE1.
2. UE1 transmits a REGISTER request.
3. P-CSCF transmits a 401 Unauthorized response.
4. UE1 transmits a REGISTER request with valid credentials to P-CSCF.
5. P-CSCF transmits a 200 response to UE1.
6. UE1 subscribes to the registration-state event package.
7. UE2 calls UE1.
8. Observe the packets on all networks.
9. UE1 answers.
10. Observe the packets on all networks.

Observable Results:

Step 8: UE2 transmits an INVITE request. UE1 transmits 100 Trying response to UE2. UE2 transmits a 183 Session Progress. UE1 transmits a 180 Ringing response to UE2.
Step 10: UE1 transmits a 200 OK to UE2. UE2 transmits ACK to UE1 in response.

Possible Problems:

- None.