ATIS STANDARD

ATIS-1000053

EMERGENCY TELECOMMUNICATIONS SERVICE (ETS) PROFILE AND TESTS FOR IP NETWORK-TO-NETWORK INTERCONNECTION

TECHNICAL REPORT

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ATIS-1000053, *Emergency Telecommunications Service (ETS) Profile and Tests for IP Network-to-Network Interconnection*

Is an ATIS Standard developed by the **Next Generation Carrier Interconnect (NG-CI) Task Force** under the **ATIS Packet Technologies and Systems Committee (PTSC)**.

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Technical Report on

Emergency Telecommunications Service (ETS) Profile and Tests for IP Network-to-Network Interconnection

Alliance for Telecommunications Industry Solutions

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Abstract

Emergency Telecommunications Service (ETS) will be supported on IP Network-to-Network interconnections. There is a need to test and verify the ETS requirements relevant to IP Network-to-Network interconnection. This Technical Report provides ETS profile and tests for IP Network-to-Network interconnection.

Foreword

The Alliance for Telecommunication Industry Solutions (ATIS) serves the public through improved understanding between providers, customers, and manufacturers. The Packet Technologies and Systems Committee (PTSC) develops and recommends standards and technical reports related to services, architectures, and signaling, in addition to related subjects under consideration in other North American and international standards bodies. PTSC coordinates and develops standards and technical reports relevant to telecommunications networks in the U.S., reviews and prepares contributions on such matters for submission to U.S. ITU-T and U.S. ITU-R Study Groups or other standards organizations, and reviews for acceptability or per contra the positions of other countries in related standards development and takes or recommends appropriate actions.

The mandatory requirements are designated by the word *shall* and recommendations by the word *should*. Where both a mandatory requirement and a recommendation are specified for the same criterion, the recommendation represents a goal currently identifiable as having distinct compatibility or performance advantages. The word *may* denotes a optional capability that could augment the standard. The standard is fully functional without the incorporation of this optional capability.

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, PTSC, 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time of consensus on this document, PTSC, which was responsible for its development, had the following leadership:

M. Dolly, PTSC Chair [AT&T]
V. Shaikh, PTSC Vice-Chair [Applied Communication Sciences]
M. Desterdick, PTSC NG-CI Chair [Verizon]
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The Next Generation Carrier Interconnect (NG-CI) Task Force was responsible for the development of this document.

Table of Contents

Table of Figures

Table of Tables

Technical Report on --

Emergency Telecommunications Service (ETS) Profile and Tests for IP Network-to-Network Interconnection (NNI)

1 Scope, Purpose, & Application

1.1 Scope

This Technical Report (TR) provides a profile and tests to verify the support of Emergency Telecommunications Service (ETS) on the Internet Protocol (IP) Network-to-Network Interconnection (NNI). The scope of this TR is limited to the minimum number of tests that are needed to verify the ETS requirements for voice services, as specified in ATIS specifications that are relevant to IP Network-to-Network interconnections. Specifically, the following are provided in this TR:

i. Protocol profile for ETS testing.
ii. ETS tests.
iii. Mapping of tests to the requirement being verified.
iv. Template for ETS information exchange between interconnecting service providers (Informative Appendix).

This is a component of the family of ATIS Next Generation Carrier Interconnection (NG-CI) documents on guidelines addressing VoIP services Interconnection over IP-based links/networks and supports next generation service interoperability.

This document is intended to be used together with [ATIS-1000038], [ATIS-1000039], [ATIS-1000040], [ATIS-1000041] as the technical parameters, protocol profile, testing configuration, and tests for basic voice services are not repeated in this TR.

1.2 Purpose

The purpose of these tests are to confirm appropriate implementation of the ETS requirements specified in ATIS documents that are relevant to IP Network-to-Network interconnections between two service providers. This involves tests to confirm appropriate implementation of the SIP Resource Priority Header (SIP RPH) according to the ETS requirements across the NNI and conformance with the respective protocol profiles.

The purpose of these tests is to serve as the basis for developing detailed test cases and scripts to validate conformance to the ETS profile and ETS interoperability between interconnecting carriers, including the protocols used (i.e., SIP RPH).

1.3 Application

This TR is applicable to IP-based carrier interconnection.

This document contains test cases that may be used to test conformance to applicable ETS standards and interoperability between providers before service deployment.

1.4 Assumptions

The following assumptions are made in this TR:

1. This document assumes that testing of basic voice services over the IP Network-to-Network interconnection are first confirmed according to [ATIS-1000038], [ATIS-1000039], [ATIS-1000040], and [ATIS-1000041].

2. This document makes use of the call flows in Section 6.1 (Core Network to Core Network) of ATIS-1000049, *End-to-End NGN GETS Call Flows*.

3. It is assumed that the interconnected carriers will exchange with each other on a bi-lateral basis the unique markings used to differentiate ETS traffic from non-ETS traffic on the IP NNI (e.g., unique COS value or VLAN identifier at layer 2, and unique DSCP or MPLS identifier at layer 3).

4. This document assumes two general scenarios to be tested:

   i. *Scenario 1* where both of the interconnected carriers are ETS compliant according to ATIS standards. In this scenario, it is assumed that both carriers are supporting NGN GETS voice calls/session and will recognize and process the ETS signaling information (i.e., SIP RPH) according to the ATIS ETS standards.

   ii. *Scenario 2* where one of the interconnected carriers is ETS compliant according to ATIS standards and the other is not ETS compliant according to ATIS standards. In this scenario, it is assumed that the non-compliant carrier will transparently pass the ETS signaling information (i.e., SIP RPH).

5. Due to the variety of security configurations and credentials possible between providers, the use of IPsec or TLS to support signaling or media streams will be subject to agreement between those providers and will not be defined within this document.

6. The level of information presented here is intended to be sufficient to support interoperability testing events; however, additional work will be required to develop actual test scripts based on the test scenarios, configurations and protocol suites presented.

7. It is understood that test SIP device endpoint E.164 addresses will need to be exchanged prior to testing. SIP URIs converted from TEL URI format will be used to convey the E164 addresses. (See [ATIS-1000009] for example URIs.)

8. IPv4 is assumed unless otherwise stated.

9. The term "Provider" is used to generically represent all types of parties.

2 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

2.1 ATIS References[1]

[ATIS-1000038] ATIS-1000038, *Technical Parameters for IP Network to Network Interconnection Release 1.0*, August 2010.

[ATIS-1000039] ATIS-1000039, *Testing Configuration for IP Network to Network Interconnection Release 1.0*, August 2010.

[ATIS-1000040] ATIS-1000040, *Protocol Suite Profile for IP Network to Network Interconnection Release 1.0*, August 2010.

[ATIS-1000041] ATIS-1000041, *Test Suites for IP Network to Network Interconnection Release 1.0*, August 2010.

[1] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS), 1200 G Street N.W., Suite 500, Washington, DC 20005. < https://www.atis.org/docstore/default.aspx >

[ATIS-1000010]	ATIS-1000010.2006 (R2011), *Support of Emergency Telecommunications Service in IP Networks*, 2006.
[ATIS-1000023]	ATIS-1000023.2008, *ETS Phase 1 Network Element, 2008*.
[ATIS-1000023.a]	ATIS-1000023.a.2010, *Supplement to ATIS-1000023.2008 – ETS Phase 1 Network Element Requirements for a NGN IMS based Deployments*.
[ATIS-1000011]	ATIS-1000011, *ETS Packet Priority for IP NNI Interfaces - Use of Existing DiffServ Per Hop Behaviors*.
[ATIS-1000020]	ATIS-1000020, *ETS Packet Priority for IP NNI Interfaces - Requirements for a Separate Expedited Forwarding Mechanism*.
[ATIS-1000049]	ATIS-1000049, *Standard for End-to-End NGN GETS Call Flows*.

2.2 IETF References[2]

[IETF RFC 4412] *Communications Resource Priority for the Session Initiation Protocol (SIP)*, February 2006

2.3 Informative References[1]

[ATIS-1000009] ATIS-1000009.2006 (R2011), *IP Network – To Network Interface (NNI) Standard for VoIP*.

3 Definitions, Acronyms, & Abbreviations

3.1 Definitions

Emergency Telecommunications Service (ETS) [ITU-T E.107]: is a national service, providing priority telecommunications to the ETS-authorized user in times of disaster and emergency.

ATIS ETS Compliant: Recognizing and processing of ETS calls/sessions and the ETS signaling information (i.e., SIP RPH) according to ATIS ETS standards ([ATIS-1000010], [ATIS-1000023], and [ATIS-1000023.a]).

ATIS ETS Non-Compliant: Not compliant to ATIS ETS standards ([ATIS-1000010], [ATIS-1000023], and [ATIS-1000023.a]). Non-compliant network will transparently pass received ETS signaling information (i.e., SIP RPH).

3.2 Acronyms & Abbreviations

AN	Access Number
ARD	Advertised Routing Domain
ATIS	Alliance for Telecommunications Industry Solutions
COS	Class of Service
DN	Directory Number
DSCP	DiffServ Code Point
ETS	Emergency Telecommunications Service
GETS	Government Emergency Telecommunication Service
FC	Feature Code
IETF	Internet Engineering Task Force
IP	Internet Protocol

[2] This document is available from the Internet Engineering Task Force (IETF). < http://www.ietf.org >

IPSec	Internet Protocol Security
IPv4	Internet Protocol Version 4
IPv6	Internet Protocol Version 6
ITU	International Telecommunications Union
MG	Media Gateway
MPLS	Multi-Protocol Label Switching
NANP	North American Numbering Plan
NE	Network Element
NGN	Next Generation Network
NG-CI TF	Next Generation Carrier Interconnection Task Force
NNI	Network to Network Interface
NT	Number Translation
PER	Peering Edge Router
PIN	Personal Identification Number
PSTN	Public Switched Telephone Network
PTSC	Packet Technologies and Systems Committee
QoS	Quality of Service
RPH	Resource Priority Header
SBC	Session Border Controller
SDP	Session Description Protocol
SEC GW	Security Gateway
SIP	Session Initiated Protocol
SLA	Service Level Agreement
SP	Service Provider
SUT	Service Under Test
TCP	Transmission Control Protocol
TLS	Transport Layer Security
TR	Technical Report
URD	Unadvertised Routing Domain
UDP	User Datagram Protocol
UE	User Equipment
URD	Unadvertised Routing Domain
URI	Universal (or Uniform) Resource Identifier (or Indicator)
VLAN	Virtual Local Area Network
VoIP	Voice over Internet Protocol
WPS	Wireless Priority Service

4 Testing Configuration

4.1 Introduction

The testing configuration for basic voice services described in [ATIS-1000039] is used for testing of ETS voice services.

4.1.1 Basic Network Configurations

The basic network configurations described in Section 4.2.7 of [ATIS-1000039] are used for testing of ETS voice services. Below is a summary of the basic network configurations. Refer to [ATIS-1000039] for more details.

The basic network configuration provides a view of a provider's network without exposing any unnecessary information about the provider's internal/local networks. The information revealed in the basic configurations, however, allows the providers to choose and negotiate the most appropriate option to connect to each other. The two basic network configurations considered in [ATIS-1000039] are shown in Figure 1 and Figure 2 below.

The following discussion on the figures focuses on the items labeled with letters "A", "B", and "C". These labels will be used to distinguish one network configuration from another across the NNI.

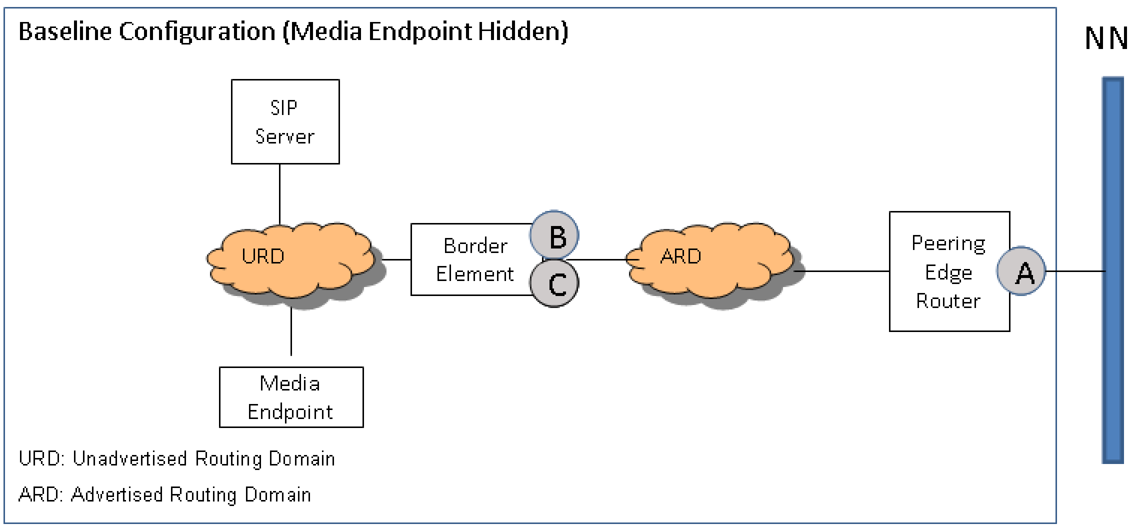


Figure 1 - Baseline Configuration (Media Endpoint Hidden) [Figure 2/ATIS-1000039]

The Peering Edge Router (PER) is the front end IP Network Element (NE) facing the other providers' networks. It provides the IP network connectivity between the local Advertised Routing Domain (ARD) and the NNI. On the NNI side, the PER supports a port labeled as "A" in Figure 1 and Figure 2. Each port is assigned with one or more IP addresses. These addresses are used to exchange IP network routing information and forward IP traffic, among other PER functions.

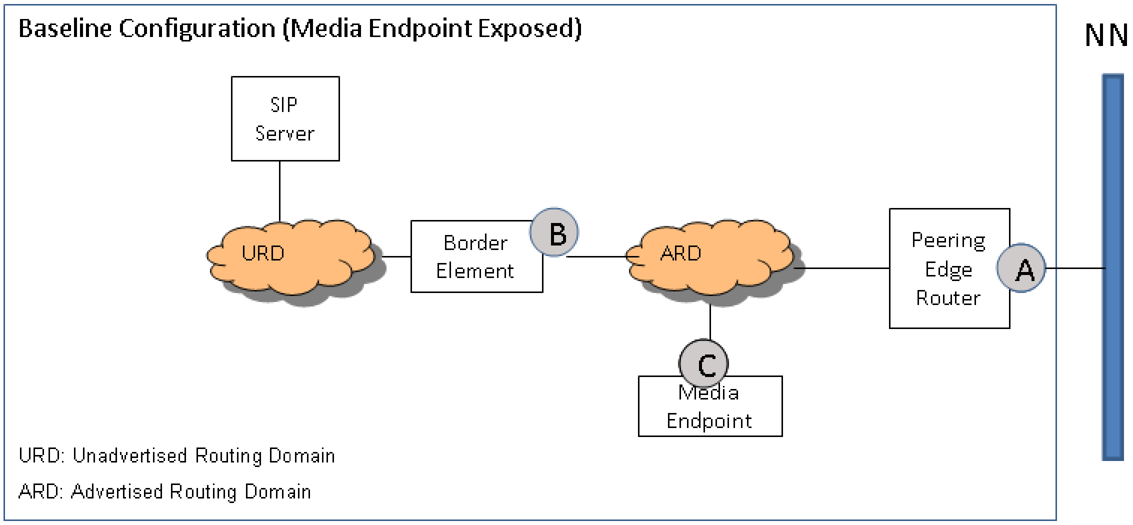


Figure 2 - Baseline Configuration (Media Endpoint Exposed) [Figure 3/ATIS-1000039]

In Figure 1 and Figure 2, the SIP Server is always connected to an Unadvertised Routing Domain (URD) behind a Border Element. The Border Element in both cases serves as a gateway to external SIP servers. To ensure the SIP signaling messages across the ARD and NNI, providers may require the use of a secure protocol such as IPSec tunneling to transport the traffic. The IPSec tunnel or connection can terminate either in the border element or in a security gateway (not shown) adjacent to the Border Element. The signaling address to be advertised across the NNI is hosted by a port on the Border Element, and is represented by the letter “B” in both configurations.

The Media Endpoint may be connected to an URD hidden behind a Border Element, in which case the Border Element would be known to the interconnecting providers as the Media Port as shown in Figure 1. Or, the Media Endpoint may not be hidden behind a separate border element, and therefore be exposed by being directly connected to an ARD and the Peering Edge Router as shown in Figure 2. In this case, the Media Port “C” in Figure 2 is attached to the Media Endpoint. In summary, the Media Port address to be advertised (and known as the Media Port to the other providers) across the NNI may either be a port on the Border Element (Figure 1), or if the Media Endpoint is not behind a border element, then it will be a port on the (actual) Media Endpoint(s) as shown in Figure 2. In both figures, this port is labeled with a letter “C”.

4.1.2 Service Under Test (SUT) Configurations

The Service Under Test (SUT) configurations described in Section 4.3 of [ATIS-1000039] are used for testing of ETS voice services. Below is a summary of the SUT configurations. Refer to [ATIS-1000039] for more details.

The test configurations on each side of the NNI are defined by a set of “logical” service ports (or ports):

1. Peering Edge Router Port;
2. SIP Signaling Port; and
3. Media Port.

This set of ports and the basic network configurations are identified in the previous section. The information required to specify a test configuration is therefore reduced to the specification of these logical ports for voice services.

The complete specification of these ports includes the protocol profiles and the selectable parameters and their values as specified during interconnection negotiation between providers. These port configuration parameters are documented in [ATIS-100040] and [ATIS-100041]. The values of the fixed and selectable parameters will be specified by the providers per service agreement, which will finalize the actual design of the configuration for each test.

5 Technical Parameters

5.1 Introduction

Support for the technical parameters for basic voice services described in [ATIS-1000038] and for the ETS parameters listed in Table 2 is a precursor for testing of ETS voice services.

5.2 Technical Parameters Described in [ATIS-1000038]

Table 1 provides a list of the technical parameters described in [ATIS-1000038] and indicates whether the technical parameter is also applicable for ETS testing.

Table 1 – Protocol Parameters from ATIS-1000038

[ATIS-1000038] Text Section	[ATIS-1000038] Technical Parameter Description	Applicability for ETS Testing
5.1	Signaling Parameters	
5.1.1	Manufacturer/Type	Yes
5.1.2	Software Version	Yes
5.1.3	IP Address(es) & Port(s) SIP Signaling	Yes
5.1.4	Other Signaling Parameters Ring, No-Answer Timer (Seconds)	Yes
5.2	Media Parameters	Yes
5.2.1	Manufacturer/Type	Yes
5.2.2	Software Version	Yes
5.2.3	Integrated? (“Yes” or “No”)	Yes
5.2.4	IP Address(es) & Port(s) RTP/UDP RTP/RTCP	Yes
5.3	Peering Edge Router (PER) and Network Parameters	Yes
5.3.1	Layer 1 and 2 (Optional)	Optional
5.3.2	IP Address for PING	Yes
5.3.3	Interconnect Method (“Private” or “Public”)	Yes
5.3.4	Signaling/Control IP Address(es)	Yes
5.3.5	Forwarding IP Address(es)	Yes
5.4	Basic Voice – Service Parameters	
5.4.1	Voice Codec(s) Accepted and Packetization Period (pp)	Yes
5.4.2	Codec Policy	Yes
5.5	Features Ancillary to Voice Service Parameters	Yes
5.5.1	DTMF Digits (“Supported” or “Not Supported”)	Yes
5.5.2	FAX Supported (“Yes” or “No” for each) G.711 Pass Thru T.38 Fax Relay (Specify Version)	Not applicable

5.3 ETS-Specific Protocol Parameters

It is assumed that the interconnected carriers will exchange with each other on a bi-lateral basis the unique markings used to differentiate ETS traffic from non-ETS traffic on the IP NNI (e.g., unique COS value or VLAN identifier at layer 2, and unique DSCP or MPLS identifier at layer 3). Appendix II provides a template for an ETS data collection questionnaire that can be used by the Service Providers to indicate their support for these ETS parameters. Table 2 provides a list of technical parameters use to differentiate ETS traffic on the IP NNI.

Table 2 – ETS Parameters

Technical Parameter	Description
Layer 3 ETS Signaling Packet Markings	IP NNI support for unique layer 3 marking of ETS call/session signaling traffic
Layer 2 ETS Signaling Packet Markings	IP NNI support for unique layer 2 marking of ETS call/session signaling traffic
Layer 3 ETS Bearer Packet Markings	IP NNI support for unique layer 3 marking of ETS call/session bearer traffic
Layer 2 ETS Bearer Packet Markings	IP NNI support for unique layer 2 marking of ETS call/session bearer traffic

6 Protocol Suite Profile

6.1 Introduction

The protocol suite profile for basic voice services described in [ATIS-1000040] is a precursor for testing of ETS voice services.

6.2 Protocol Suite Profile for Basic Voice [ATIS-1000040]

Table 3 provides a summary of the protocol suite profile for basic voice described in [ATIS-1000040] and indicates whether the protocol profile is also applicable for ETS testing.

Table 3 – Protocol Suite Profile for Basic Voice [ATIS-100040]

[ATIS-1000040] Text Section	[ATIS-1000040] Protocol Suite Profile Description	Applicability for ETS Testing
4	Application/Service Protocol Layer Profile	Yes
4.1	Basic Voice Service	Yes
4.1.1	Signaling	Yes
4.1.1.1	SIP Profile for SIP based VoIP Service Interconnection	Yes
4.1.1.2	SDP	Yes
4.1.2	Media	Yes
4.1.2.1	Voice Codec Profile	Yes
4.1.2.2	RTP/ RTCP	Yes
4.2	DTMF over RTP	Yes
4.2.1	Signaling	Yes
4.2.2.	Media	Yes
4.3.	Basic Fax Service with T.38 Support	Not Applicable
4.3.1.	Signaling	Not Applicable
4.3.2	Media	Not Applicable
4.3.2.1	ITU-T T.38	Not Applicable
4.3.3.1.1	T.38 NNI Protocol Profile	Not Applicable
4.3.3.1.2	Basic Fax Service References	Not Applicable
5.	Transport, Network, Tunnel/Link and Transport Layers	Yes

[ATIS-1000040] Text Section	[ATIS-1000040] Protocol Suite Profile Description	Applicability for ETS Testing
5.1	Transport	Yes
5.1.1	UDP	Yes
5.1.2.	TCP	Yes
5.1.3	TLS	Yes
5.2	IP Network	Yes
5.2.1	IP Routing and Control	Yes
5.2.2	IP Forwarding	Yes
5.3	Tunneling or Link Layer	Yes
5.3.1	Ethernet	Yes
5.4	Physical Layer	Yes
5.4.3	Ethernet	Yes

6.3 Basic Voice Service with RPH based ETS Support

This section provides a protocol profile for basic voice service with SIP Resource Priority Header (RPH) for ETS support across the NNI.

6.3.1 Signaling

Same as those as in [ATIS-1000040] for Basic Voice Service with the following additions for ETS:

6.3.1.1 SIP

The following are applicable for the SIP profile for ETS signaling across an IP-to-IP NNI:

1. [ATIS-1000010]: Section 5.2.2, Section 5.4.2.3, and Section 8.
2. [ATIS-1000023] and [ATIS-1000023.a]: Section 6.1.

6.3.1.2 IP Packet Marking and Transport

The unique markings used at the IP and transport layers to differentiate ETS signaling from non-ETS signaling are based on the SLA for the NNI interface. Such markings may include a unique COS value or VLAN identifier at layer 2, and a unique DSCP or MPLS identifier at layer 3 based on the SLA for the NNI interface. Refer to Appendix II for a sample ETS Data Collection Template.

6.3.2 Media

The unique markings used at the IP and transport layers to differentiate ETS media traffic from non-ETS media traffic are based on the SLA for the NNI interface. Such markings may include a unique COS value or VLAN identifier at layer 2, and a unique DSCP or MPLS identifier at layer 3. Refer to Appendix II for a sample ETS Data Collection Template.

6.3.3 Addressing

The IP addressing utilized is assumed to be IPv4. However, IPv6 may be utilized provided that there is a mutual agreement between Service Providers.

7 Test Suite Plan

7.1 Introduction

This section provides a structured method for ETS testing of the IP NNI. The tests are organized based on the following general scenarios:

1. **Test Scenario 1** – The two interconnected service providers (Service Provider A and Service Provider B) are ATIS ETS compliant.

   This is the scenario where both of the interconnected carriers are ETS compliant according to ATIS standards. In this scenario, it is assumed that both carriers support NGN GETS/WPS voice calls/sessions and recognize and process ETS signaling information (i.e., SIP RPH) according to ATIS ETS standards. Also, in this scenario both service providers provide ETS authentication and authorization for originating calls before routing across the IP NNI.

2. **Test Scenario 2** – One of the interconnected service providers (Service Provider A) is ATIS ETS compliant while the other (Service Provider B) is not ATIS ETS compliant.

   This is the scenario where one of the interconnected carriers is ETS compliant according to ATIS standards and the other is not ETS compliant according to ATIS standards. In this scenario, it is assumed that the non-compliant carrier will transparently pass ETS signaling information (i.e., SIP RPH). This scenario also includes the case where Service Provider B does not perform ETS authentication and authorization, and the call/session is forwarded to Service Provider A for authentication and authorization.

7.2 ETS Voice Call Types

ATIS-1000049 provides the general principles and detailed call flows for NGN GETS-AN and GETS-FC voice calls. These calls utilize the following:

GETS-AN (Access Number) is a North American Numbering Plan (NANP) number designated for invoking GETS with Service User authentication (e.g., using a Personal Identification Number (PIN)) and a separately indicated Directory Number (DN) for the called party.

GETS-FC (Feature Code) is a feature code preceding a DN that is designated to invoke GETS using subscription-based authentication.

7.3 Testing Error Conditions

Several of the requirements listed in Appendix I define an NE's behavior in response to an error condition. Since it is difficult to cause a normally functioning NE to generate an error condition, the use of a SIP test set is necessary. SIP test sets allow the user to define the content of SIP messages and can be used to send SIP messages that contain error conditions. The SIP test set should be connected to the test configuration so that the correct SIP messages are sent to the NNI side of the border element.

7.4 Test Scenario 1

In this scenario, the two interconnected service providers (Service Provider A and Service Provider B) are ATIS ETS compliant.

7.4.1 Originated NGN GETS-AN and/or GETS-FC Calls/Sessions

This test scenario applies to originated NGN GETS-AN and /or GETS-FC calls/sessions. NGN GETS calls are originated by Service Provider A and routed over the IP NNI to Service Provider B. This includes tests to verify:

- Successful acceptance and completion of an originated call/session.
- ETS information in the originated SIP messages.
- ETS information in the response SIP messages.

- Unsuccessful completion of an originated call/session (error cases).
- Unique markings used at the IP and transport layers to differentiate ETS signaling from non-ETS signaling based on the SLA for the NNI interface.

7.4.2 Terminated NGN GETS-AN and/or GETS-FC Calls/Sessions

This test scenario applies to terminated NGN GETS-AN and /or GETS-FC calls/sessions. Service Provider A receives NGN GETS-AN calls over the IP NNI from Service Provider B. This includes tests to verify:

- Successful acceptance and completion of a terminated call/session.
- ETS information in the received SIP messages.
- ETS information in the response SIP messages.
- Unsuccessful completion of a terminated call/session (error cases).
- Unique markings used at the IP and transport layers to differentiate ETS signaling from non-ETS signaling based on the SLA for the NNI interface.

7.5 Test Scenario 2

In this scenario, one of the interconnected service providers (Service Provider A) is ATIS ETS compliant while the other (Service Provider B) is not ATIS ETS compliant.

7.5.1 Originated NGN GETS-AN & GETS-FC Calls/Sessions

This test scenario applies to originated NGN GETS-AN and GETS-FC calls/sessions by ATIS ETS compliant Service Provider A. Calls are authenticated and authorized by Service Provider A prior to routing over the IP NNI to Service Provider B. This includes tests to verify:

- Successful acceptance and completion of an originated call/session.
- ETS information in the originated SIP messages.
- ETS information in the response SIP messages.
- Unsuccessful completion of an originated call/session (error cases).
- Unique markings used at the IP and transport layers to differentiate ETS signaling from non-ETS signaling based on the SLA for the NNI interface.

7.5.2 Terminated NGN GETS-AN Calls/Sessions

This test scenario applies to terminated NGN GETS-AN calls/sessions by ATIS ETS compliant Service Provider A. Service Provider A receives NGN GETS-AN calls over the IP NNI from Service Provider B. Since Service Provider B is not ATIS ETS compliant, the received NGN GETS-AN calls/sessions are authenticated by Service Provider A which is ATIS ETS compliant. This approach is consistent with what is done in non- GETS Service Providers today. This includes tests to verify:

- Successful acceptance and completion of a terminated call/session.
- ETS information in the received SIP messages.
- ETS information in the response SIP messages.
- Unsuccessful completion of a terminated call/session (error cases).
- Unique markings used at the IP and transport layers to differentiate ETS signaling from non-ETS signaling based on the SLA for the NNI interface.

A GETS-FC invoked call/session can be initiated from a voice-capable User Equipment (UE) with a user subscription for GETS-FC. In the case of a mobile UE when roaming, the authentication may be through a visited Service Provider. The UE service profile is stored in the (ATIS ETS-compliant) home Service Provider network and includes the subscription for ETS. For fixed wireline networks, the originating Service Provider network is the home Service Provider network. When a mobile UE originates a GETS-FC invoked call/session in a visited network, end-to-end priority treatment may depend on the visited network recognizing the GETS-FC invocation and providing priority treatment, and corresponding contractual agreements between the visited and home network Service Providers. Wireline UEs cannot make GETS-FC calls from a non ATIS ETS compliant service provider since the Service Provider cannot provide the GETS-FC authentication. Mobile UEs can make GETS-FC calls from a non ATIS ETS compliant Service Provider provided that the non ATIS ETS compliant Service Provider has a contractual agreement with the ATIS ETS compliant Service Provider. Thus the scenario where GET-FC calls are originated in a non ATIS ETS compliant Service Provider is outside of the scope of standardization. Tests for terminated GETS-FC calls/sessions will not be included in this test specification.

8 ETS NNI Test Suite

8.1 Common Tasks

This section defines common tasks (test steps) that are used in the test procedures. The definition of common tasks provides for more concise test procedures since sequences of many test steps can simply be referenced by their task name and not repeated in their entirety for each test procedure.

8.1.1 Layer 2 & 3 Marking Verification Task

Service Provider A:

A. Ensure that the Layer 3 ETS signaling markings are configured appropriately for the Service Provider domain and for the NNI domain.
B. Ensure that the Layer 2 ETS signaling markings are configured appropriately for the Service Provider domain and for the NNI domain.
C. Ensure that the Layer 3 ETS bearer markings are configured appropriately for the Service Provider domain and for the NNI domain.
D. Ensure that the Layer 2 ETS bearer markings are configured appropriately for the Service Provider domain and for the NNI domain.

Service Provider B:

E. Ensure that the Layer 3 ETS signaling markings are configured appropriately for the Service Provider domain and for the NNI domain.
F. Ensure that the Layer 2 ETS signaling markings are configured appropriately for the Service Provider domain and for the NNI domain.
G. Ensure that the Layer 3 ETS bearer markings are configured appropriately for the Service Provider domain and for the NNI domain.
H. Ensure that the Layer 2 ETS bearer markings are configured appropriately for the Service Provider domain and for the NNI domain.

8.2 Test Scenario Commonality

Section 8.3 and Section 8.4 define test scenarios between ATIS ETS compliant and ATIS ETS non-compliant Service Providers. These test scenarios verify ATIS ETS requirements across the NNI. Each test scenario includes both NGN GETS-AN and GETS-FC calls. This allows for a concise test plan, since practically identical test procedures will not need to be repeated for each type of NGN GETS call. Any difference that is dependent on the call type is noted in the test procedure.

8.3 Test Scenario 1

8.3.1 Originated NGN GETS-AN and/or GETS-FC Calls/Sessions

8.3.1.1 Test Case 1-1: Basic ETS Call Completion

8.3.1.1.1 Purpose

Verify that Service Providers recognize and act upon ETS information to establish a priority call across the NNI.

8.3.1.1.2 Test Setup & Procedure

1. Complete the Layer 2 and 3 Marking Verification Task.
2. Generate an ETS call from the UE(A) in Service Provider A's network to UE(B) in Service Provider B's network.
3. Have UE(B) answer the call.
4. Have a voice conversation.
5. Have UE(A) hang up the call.
6. Capture the signaling and bearer traffic associated with the call.

8.3.1.1.3 Observable Results

The call should be established, voice traffic should occur between the endpoints, and the call should be torn down.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the bearer traffic will be captured and analyzed for the NNI leg of the call.

8.3.1.1.4 Pass/Fail Criteria

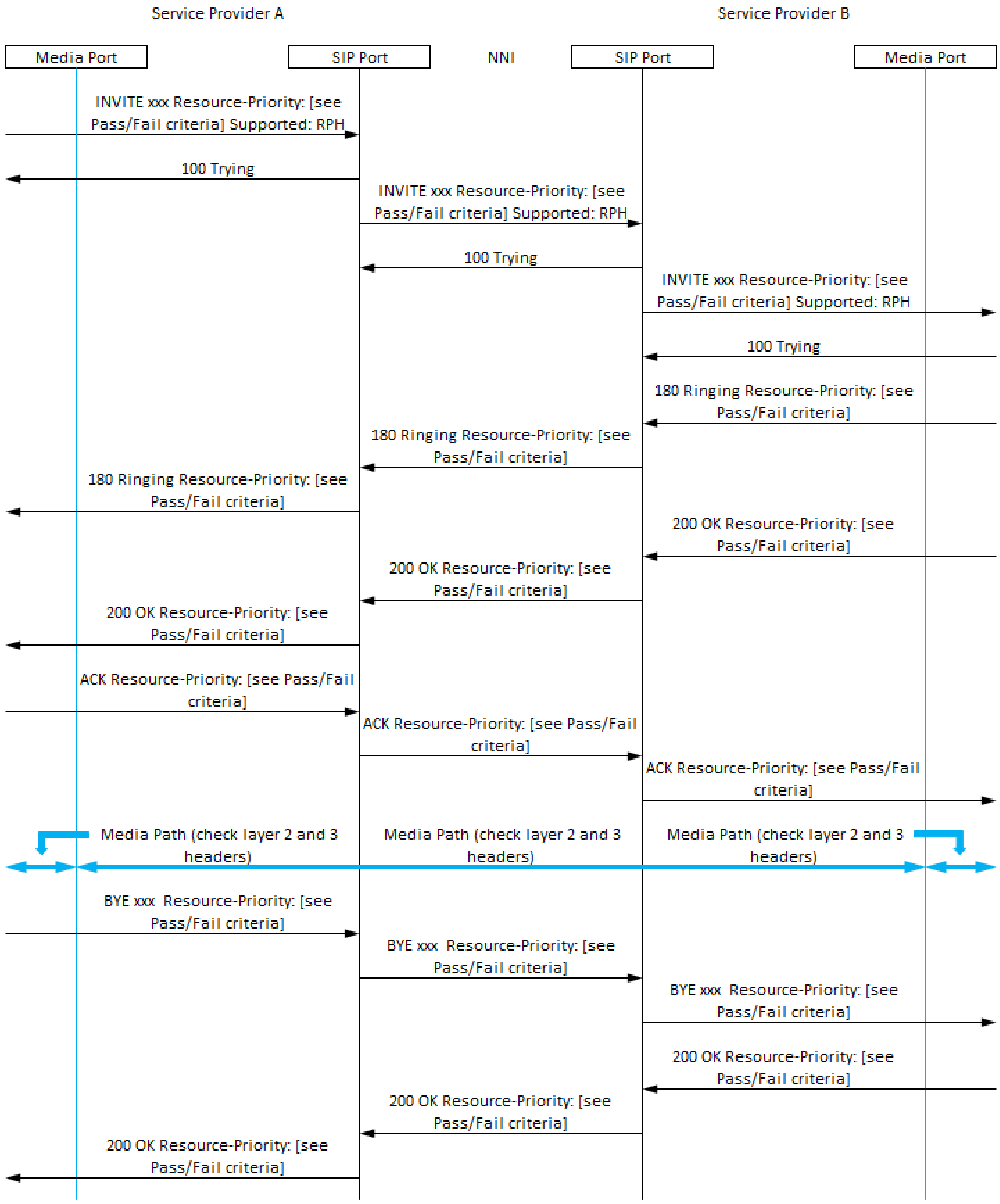
To pass this test case, the following criteria shall be met:

- The call should be successfully established and torn down. The SIP message formats and the layer 2 and layer 3 markings associated with the call should conform to the values identified for the test.
- The initial INVITE request should contain the Supported header field with the "resource-priority" option tag.
- *NGN GET-AN*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is UE (A)'s subscribed to priority level.
- *NGN GET-FC*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is UE (A)'s subscribed to priority level.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010	1a, 1b, 1c, 3, 4	A.1
ATIS-1000023.a	200, 400, 500, 800 (INVITE, ACK, BYE), 900 (180 Ringing, 200 OK), 1000, 2100, 2200, 2300, 2400, , B100, B200, B300	A.2
ATIS-1000011	10, 11	A.3
ATIS-1000020	12	A.3

8.3.1.1.5 Message Flows



8.3.1.1.6 Trace Captures

Capture the following traces:

- The signaling traffic across the NNI.
- The media traffic across the NNI.

8.3.1.1.7 Known Issues

None.

8.3.1.2 Test Case 1-2: ETS Call with INFO Message

The SIP INFO message is used to carry application level information between endpoints, using the SIP dialog signaling path. The SIP INFO message may be utilized by applications involved in either NGN GETS-AN or GETS-FC calls.

A number of applications, standardized and proprietary, make use of the INFO method as it was previously defined in RFC 2976. These include but are not limited to the following:

- The encapsulation of ISDN User Part (ISUP) in SIP message bodies;
- As a transport mechanism by the Media Server Control Markup Language (MSCML) protocol; and
- As a transport mechanism by the Media Server Markup Language (MSML) protocol.

8.3.1.2.1 Purpose

Verify that Service Providers provide priority treatment of an ETS call that utilizes the SIP INFO method.

8.3.1.2.2 Test Setup & Procedure

1. Complete the Layer 2 and 3 Marking Verification Task.
2. Generate an ETS call from UE(A) in Service Provider A's network to UE(B) in Service Provider B's network.
3. Have UE(B) answer the call.
4. Have a voice conversation.
5. Have UE(A) invoke an application that utilizes the SIP INFO method.
6. Have UE(A) hang up the call.
7. Capture the signaling traffic associated with the call.

8.3.1.2.3 Observable Results

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

8.3.1.2.4 Pass/Fail Criteria

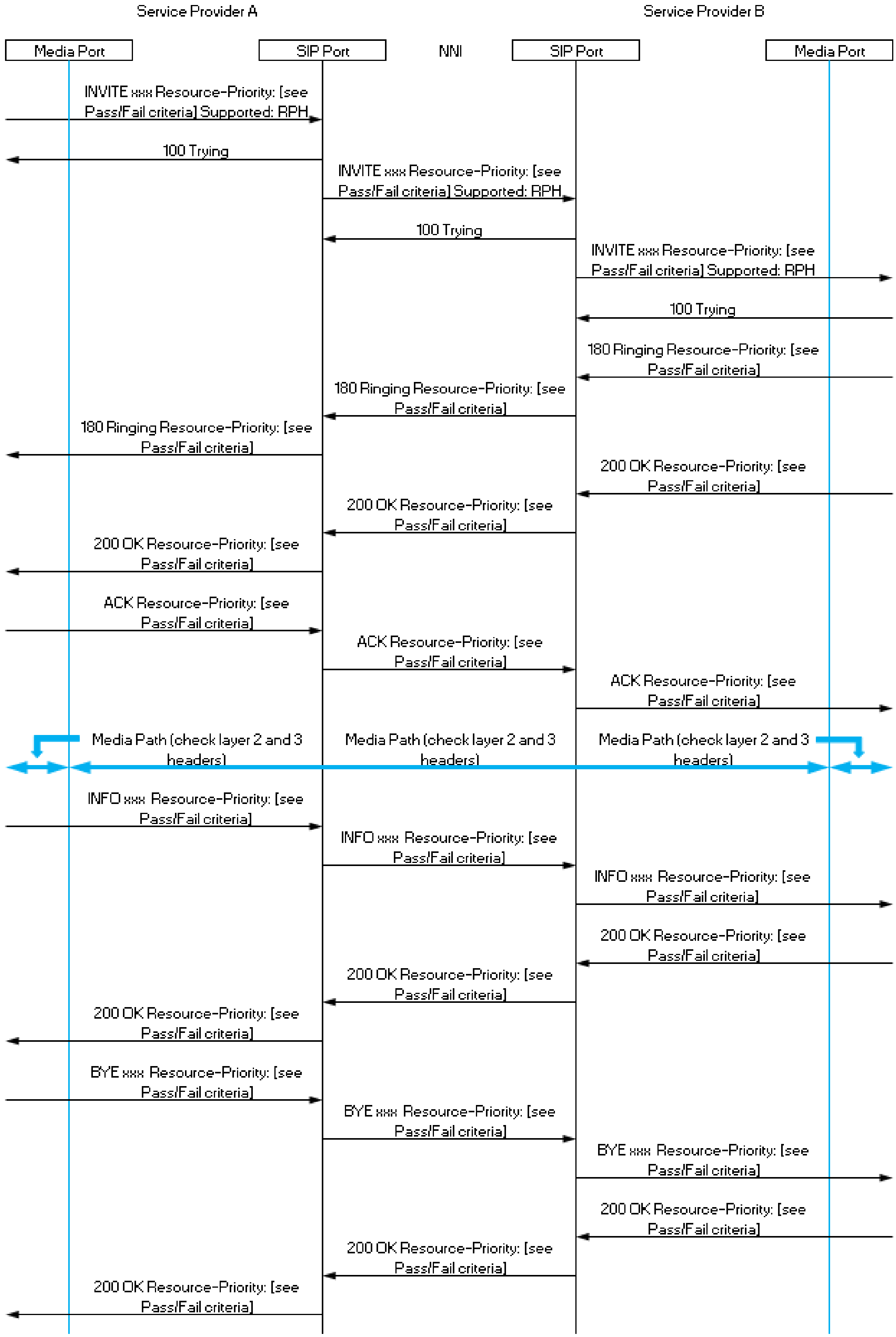
To pass this test case, the following criteria shall be met:

- The SIP message formats and the layer 2 and layer 3 markings associated with the SIP INFO method should conform to the values identified for the test.
- The initial INVITE request should contain the Supported header field with the "resource-priority" option tag.
- *NGN GET-AN*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is UE (A)'s subscribed to priority level.
- *NGN GET-FC*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is UE (A)'s subscribed to priority level.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010	1a, 1b, 1c, 1e, 3, 4	A.1
ATIS-1000023.a	200, 400, 500, 800 (INFO), 900 (180 Ringing, 200 OK), 1000, 2100, 2200, 2300, 2400, , B100, B200, B300	A.2
ATIS-1000011	10, 11, 12	A.3

8.3.1.2.5 Message Flows



8.3.1.2.6 Trace Captures

Capture the traces:

- The signaling traffic across the NNI.

8.3.1.2.7 Known Issues

None.

8.3.1.3 Test Case 1-3: ETS Call with Updated SDP offer – UPDATE Message

The SIP UPDATE method allows a client to update parameters of a session (such as the set of media streams and their codecs), but has no impact on the state of a dialog. It can be sent before the initial INVITE transaction has been completed. It is typically used to update session parameters within early dialogs.

8.3.1.3.1 Purpose

Verify that Service Providers provide priority treatment of an ETS call that utilizes the SIP UPDATE method.

8.3.1.3.2 Test Setup & Procedure

1. Complete the Layer 2 and 3 Marking Verification Task.
2. Configure UE(A) to prefer codec 1 but accept codec 2.
3. Configure UE(B) to prefer codec 2 but accept codec 1.
4. Generate an ETS call from UE(A) in Service Provider A’s network to UE(B) in Service Provider B’s network.
5. Have the phone in Service Provider B’s network answer the call.
6. Have a voice conversation.
7. Have the phone in Service Provider A’s network hang up.
8. Capture the signaling and bearer traffic associated with the call.

8.3.1.3.3 Observable Results

The call should be established, voice traffic should occur between the endpoints, and the call should be torn down.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the bearer traffic will be captured and analyzed for the NNI leg of the call.

8.3.1.3.4 Pass/Fail Criteria

To pass this test case, the following criteria shall be met:

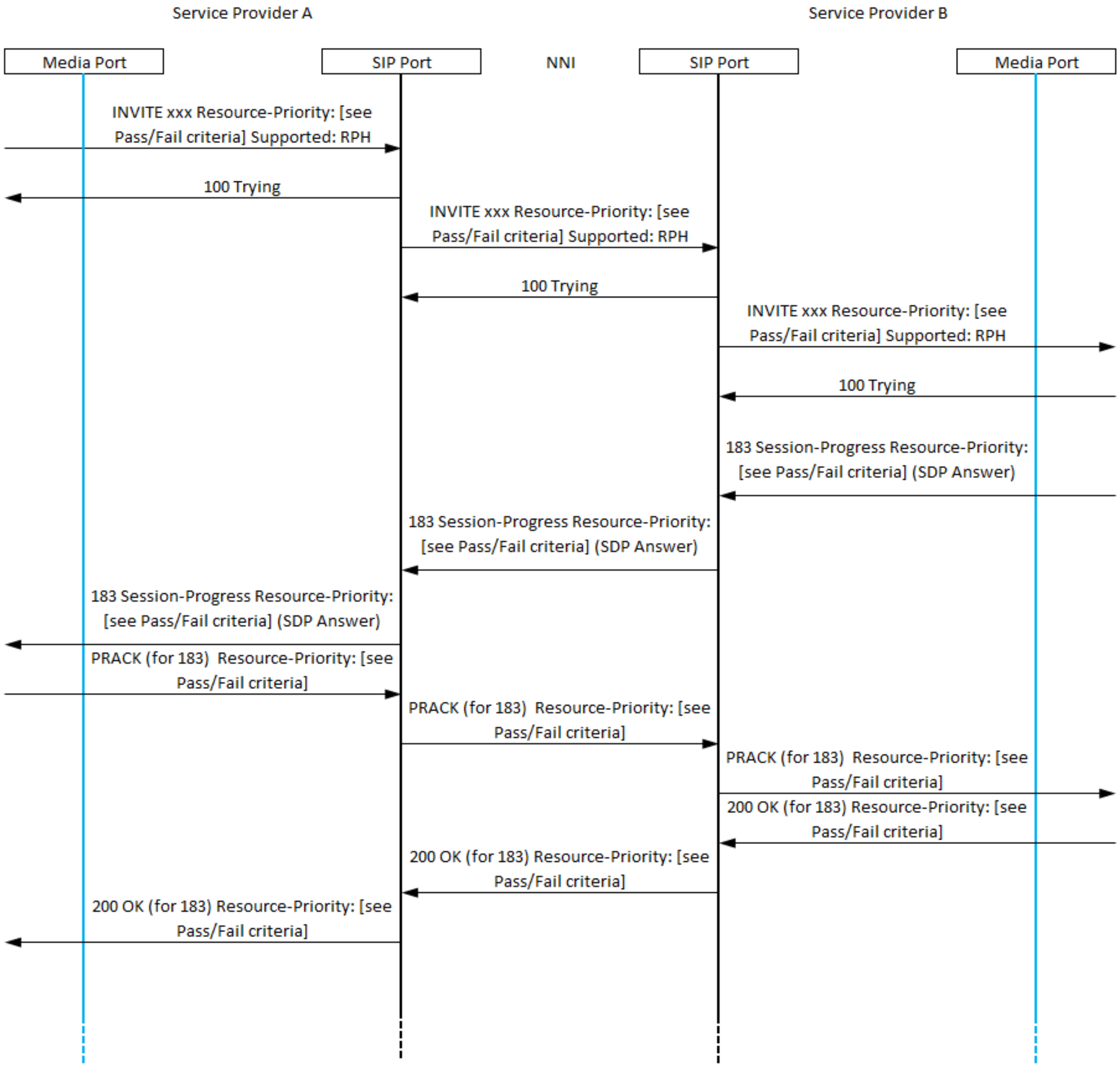
- The ETS call should be successfully established and torn down. The SIP message formats and the layer 2 and layer 3 markings associated with the call should conform to the values identified for the test.
- The initial INVITE request should contain the Supported header field with the “resource-priority” option tag.

- *NGN GET-AN*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is UE(A)'s subscribed to priority level.
- *NGN GET-FC*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is UE(A)'s subscribed to priority level.

This test verifies the following requirements:

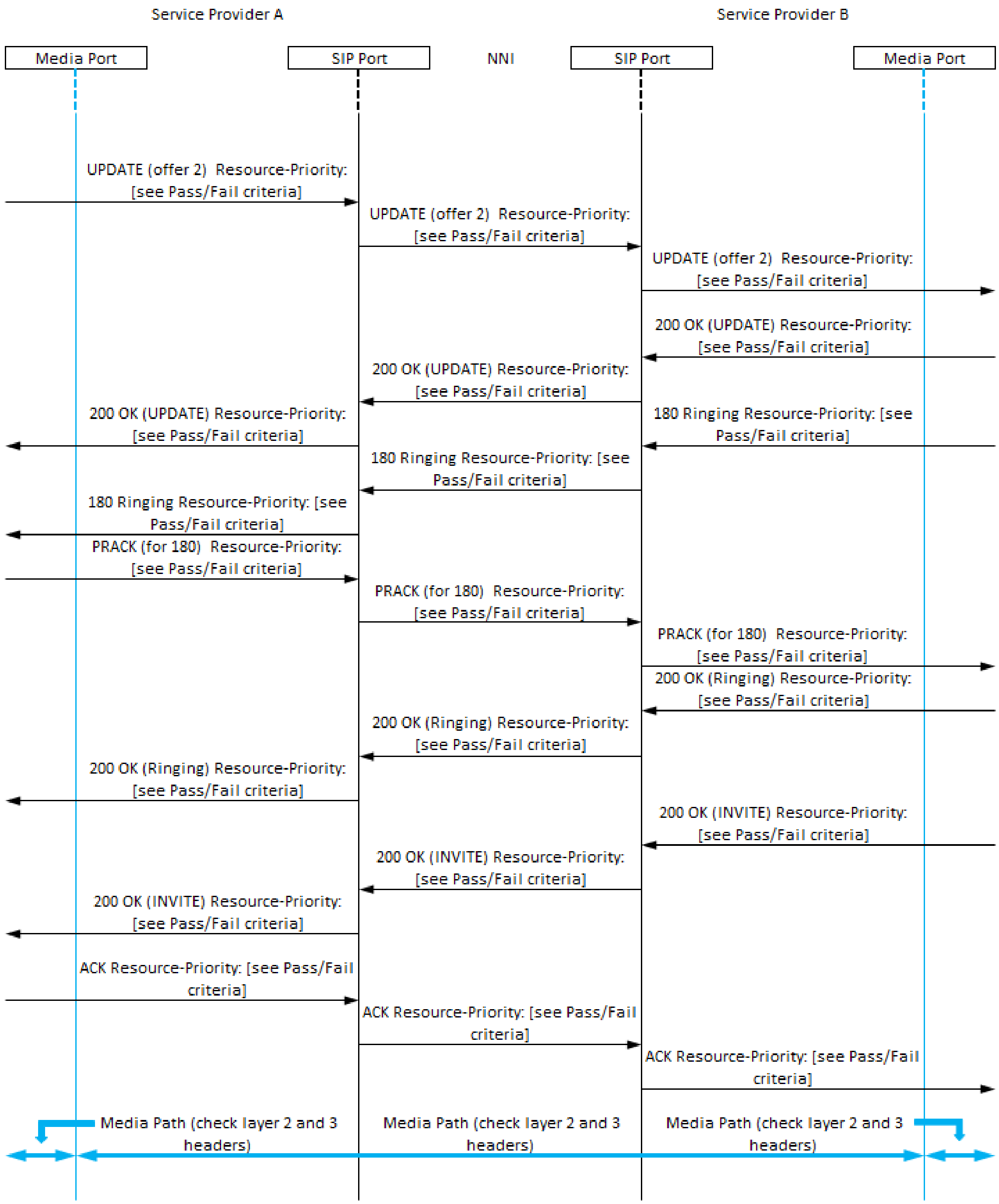
Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010	1a, 1b, 1c, 1i, 1n, 3, 4	A.1
ATIS-1000023.a	200, 400, 500, 800 (PRACK, UPDATE), 900 (180 Ringing, 183 Session Progress, 200 OK), 1000, 2100, 2200, 2300, 2400, B100, B200, B300	A.2
ATIS-1000011	10, 11, 12	A.3

8.3.1.3.5 Message Flows[3]



Message Flow Part 1

[3] Most applications can be configured to use reliable provisional responses in the range of 101 – 199. While the protocol does not require reliability for all provisional responses, it is more common that reliability be used for none or all, and not just some provisional responses. Thus the message flows for this test case show reliability for all provisional responses, but they may not be provided for all.



Message Flow Part 2

8.3.1.3.6 Trace Capture

Capture traces:

- The signaling traffic across the NNI.
- The media traffic across the NNI.

8.3.1.3.7 Known Issues

None.

8.3.1.4 Test Case 1-4: ETS Call Originated From Service Provider A – Ring No Answer

8.3.1.4.1 Purpose

Verify that Service Providers recognize and act upon ETS information when establishing a priority call across the NNI that is not answered. A CANCEL message is sent from the call originator.

8.3.1.4.2 Test Setup & Procedure

1. Complete the Layer 2 and 3 Marking Verification Task.
2. Generate an ETS call from the UE(A) in Service Provider A's network to UE(B) in Service Provider B's network.
3. Do not answer the call at UE(B).
4. Have UE(A) hang up the call.
5. Capture the signaling traffic associated with the call.

8.3.1.4.3 Observable Results

The call should not be established, no voice traffic should occur between the endpoints, and the call should be ended with a CANCEL message sent from UE(A).

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

8.3.1.4.4 Pass/Fail Criteria

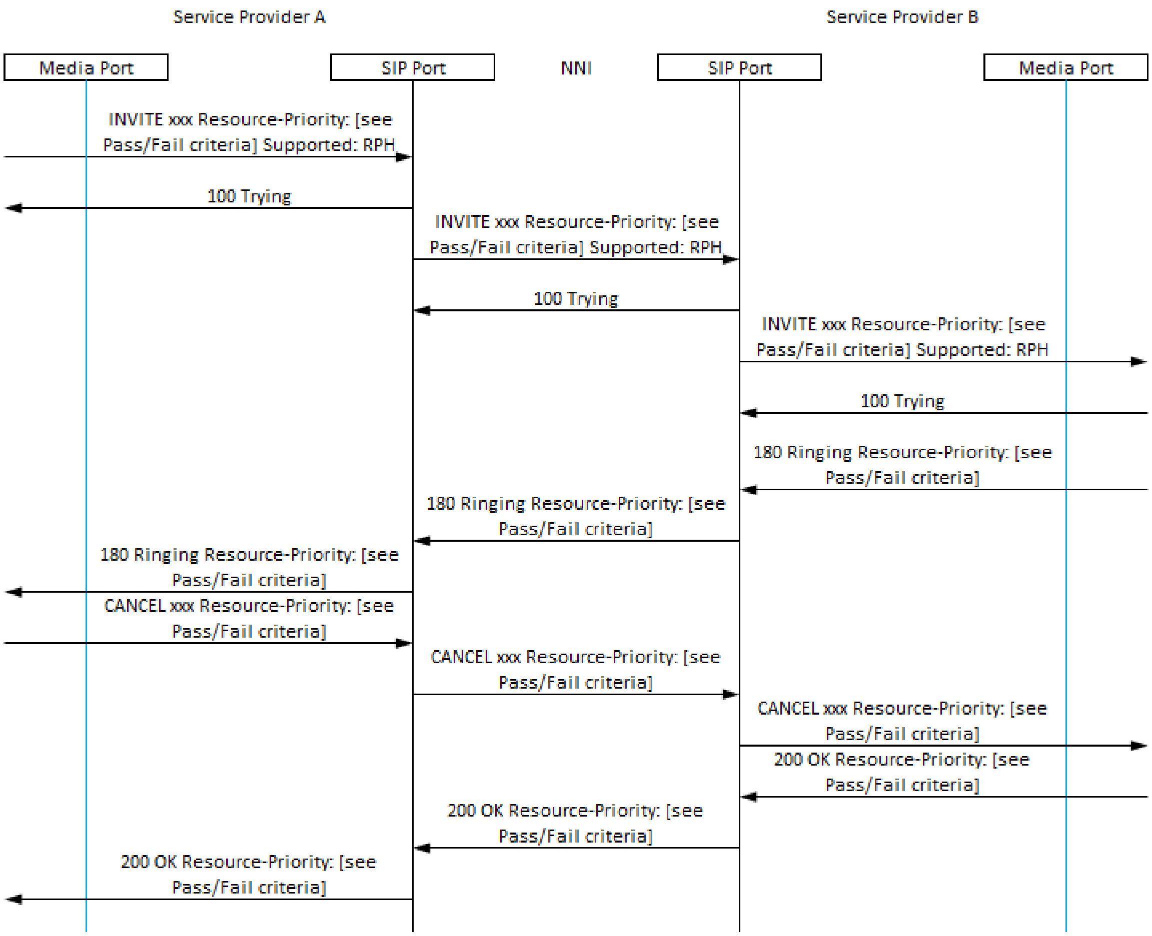
To pass this test case, the following criteria shall be met:

- The call should be successfully cancelled due to no answer then hang up. The SIP message formats and the layer 2 and layer 3 markings associated with the call should conform to the values identified for the test.
- The initial INVITE request should contain the Supported header field with the "resource-priority" option tag.
- *NGN GET-AN*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is UE (A)'s subscribed to priority level.
- *NGN GET-FC*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is UE (A)'s subscribed to priority level.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010	1a, 1d, 3, 4	A.1
ATIS-1000023.a	200, 400, 500, 800 (INVITE, CANCEL), 900 (180 Ringing, 200 OK), 1000, 2100, 2200, 2300, 2400, B100, B200, B300	A.2
ATIS-1000011	10, 11	A.3
ATIS-1000020	12	A.3

8.3.1.4.5 Message Flows



8.3.1.4.6 Trace Captures

Capture the following traces:

- The signaling traffic across the NNI.

8.3.1.4.7 Known Issues

None.

8.3.1.5 Test Case 1-5: Configurability of Options that support ETS Priority Functionality

8.3.1.5.1 Purpose

Verify that Service Provider network elements support the requirements for configuration of the functionality that supports ETS priority services.

8.3.1.5.2 Test Setup & Procedure

1. For each network element (NE) in the test configuration, obtain connectivity to the craft interface, console, or management system used to configure the NE.
2. To verify that the SIP RPH capability is configurable as either enabled or disabled and that the default is disabled. (Requirement 100):
    a. Reset the NE and note the value of the RPH capability.
    b. Configure the default ets value to be unique in the test configuration.
    c. Configure the RPH capability of the NE to disabled.
    d. Execute Test Case 1-1.
    e. Configure the RPH capability of the NE to enabled.
    f. Execute Test Case 1-1.
3. To verify that the use of the 'resource-priority' option tag with the 'Require' header field is configurable (i.e., enabled or disabled), with a default setting of disabled. (Requirement 1300):
    a. Reset the NE and note the value of the 'resource-priority' option tag with the 'Require' header field capability.
    b. Configure the RPH capability of the NE to enabled.
    c. Configure the 'resource-priority' option tag with the 'Require' header field capability to disabled.
    d. Execute Test Case 1-1.
    e. Configure the 'resource-priority' option tag with the 'Require' header field capability to enabled.
    f. Execute Test Case 1-1.
4. To verify that the NE is configurable on a per-NNI basis to either: (1) Use the ets resource value received across an IP NNI in requests it sends into the network; or (2) Reset the received ets resource value to the default resource value for requests sent into the network (Requirement 3100) AND to verify that the ets value inserted by the NE has a default value and that the default value is configurable. (Requirement B100):
    a. Reset the NE and note the default ets resource value.
    b. Configure the RPH capability of the NE to enabled.
    c. Configure the default ets resource value to be unique within the test configuration.
    d. Configure the NNI interfaces to use the ets resource value received across an IP NNI interface in requests it sends into the network.
    e. Execute Test Case 1-1.
    f. Configure the NNI interfaces to reset the received ets resource value to the default resource value for requests sent into the network.
    g. Execute Test Case 1-1.

5. To verify that the NE is configurable to accept or reject a SIP INVITE with the ets RPH and a normal (non-ETS-DN) destination number on a per interface basis, the default should be to reject the SIP INVITE (Requirement 3200, B400):
    a. Reset the NE and note the value of the reject SIP INVITE capability.
    b. Configure the RPH capability of the NE to enabled.
    c. Configure the NE to reject a SIP INVITE with the ets RPH and a normal (non-ETS-DN) destination number.
    d. Execute Test Case 1-1 for a GETS-AN call that contains a normal (non-ETS-DN) destination number.
    e. Configure the NE to accept a SIP INVITE with the ets RPH and a normal (non-ETS-DN) destination number.
    f. Execute Test Case 1-1 for a GETS-AN call that contains a normal (non-ETS-DN) destination number.

8.3.1.5.3 Observable Results

All NEs should have interfaces used to configure query parameters values.

The SIP message formats will be captured and analyzed for the NNI legs of the calls.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI legs of the calls.

8.3.1.5.4 Pass/Fail Criteria

To pass this test case, the following criteria shall be met:

Test Step 1:

a. All NEs should provide management interfaces used to configure and query parameter values.

Test Step 2:

a. The default value for the SIP RPH capability should be disabled.
b. The NE’s default ets value can be configured to a unique value for the test configuration.
c. The NE’s SIP RPH capability should be configured to disabled.
d. The NE propagates SIP messages between the UNI and NNI with the SIP RPH value unchanged.
e. The NE’s SIP RPH capability should be configured to enabled.
f. The NE propagates SIP messages between the UNI and NNI with the SIP RPH ets value mapped to its configured default value.

Test Step 3:

a. The default value for the 'resource-priority' option tag with the 'Require' header field capability should be disabled.
b. The NE’s SIP RPH capability should be configured to enabled.
c. The NE’s 'resource-priority' option tag with the 'Require' header field capability can be configured to disabled.
d. The SIP messages originated by the NE do not contain the Require header field with the 'resource-priority' option tag.

e. The NE’s 'resource-priority' option tag with the 'Require' header field capability can be configured to enabled.

f. The SIP messages originated by the NE contain the Require header field with the 'resource-priority' option tag.

Test Step 4:

a. The ets resource initializes to a default value. Note the value.

b. The NE’s SIP RPH capability can be configured to enabled.

c. The ets resource default value can be configured.

d. The NNI and UNI interfaces are configured to use the received ets resource value.

e. The SIP messages originated by the NE at the UNI and NNI contain the RPH with ets resource value set to the value in messages that the NE received.

f. The NNI and UNI interfaces are configured to use the default ets resource value.

g. The SIP messages originated by the NE at the UNI and NNI contain the RPH with ets resource value set to the default.

Test Step 5:

a. The SIP INVITE capability default value is to reject a SIP INVITE with the ets RPH and a normal (non-ETS-DN) destination number.

b. The NE’s SIP RPH capability can be configured to enabled.

c. The NE can be configured to reject a SIP INVITE with the ets RPH and a normal (non-ETS-DN) destination number.

d. The NE rejects the SIP INVITE that contains the ets RPH and a normal (non-ETS-DN) destination number, sending a 403 (Forbidden) response with two reason header fields: (1) a 417 (RPH header) code for SIP; and (2) a Reason Header Q.850 value of 21 (call rejected). Note that the 403 response should not contain the ets RPH header.

e. The NE can be configured to accept a SIP INVITE with the ets RPH and a normal (non-ETS-DN) destination number.

f. The NE accepts the call as a priority call.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010		A.1
ATIS-1000023.a	100, 300, 900, 1300, 3100, 3200, B100, B400	A.2
ATIS-1000011		A.3
ATIS-1000020		A.3

8.3.1.5.5 Message Flows

See Test Case 1-1.

8.3.1.5.6 Trace Captures

Capture the following traces:

- The signaling traffic across the NNI.

8.3.1.5.7 Known Issues

None.

8.3.1.6 Test Case 1-6: Require Header Use in the Initial ETS SIP Request During Error Conditions

8.3.1.6.1 Purpose

When Service Provider A receives a 417 (Unknown Resource Priority) response or a 420 (Bad Extension) response with an “Unsupported: resource-priority” to the initial SIP request with the 'Require' header field (including the “resource-priority” option tag) and the ets namespace, verify that it:

- Logs the request and response as an error condition;
- Attempts to send the request to the next VoIP NE in the route list; and
- If all attempts receive a 417 response, Service Provider A resends the request without the 'Require' header field, but with a 'Supported' header field with the 'resource-priority' option tag.

8.3.1.6.2 Test Setup & Procedure

1. Configure Service Provider A to send the Require header field.
2. Configure two entries in the NNI route list of the border element of Service provider A.
3. Connect and configure a SIP test set to send either a 417 or a 420 SIP response to the NNI interface of the border element when it receives an INVITE from Service Provider A.
4. Generate an ETS call from UE(A) in Service Provider A’s network to UE(B) in Service Provider B’s network.
5. Have the SIP test set send a 417 response to Service Provider A when it receives the first INVITE for the call. Check the log for any noted errors.
6. Have the SIP test set send a 417 response to Service Provider A when it receives the second INVITE for the call. Check the log for any noted errors.
7. Have UE(A) hang up the call.
8. Generate an ETS call from UE(A) in Service Provider A’s network to UE(B) in Service Provider B’s network.
9. Have the SIP test set send a 420 response to Service Provider A when it receives the first INVITE for the call. Check the log for any noted errors.
10. Have the SIP test set send a 420 response to Service Provider A when it receives the second INVITE for the call. Check the log for any noted errors.
11. Have UE(A) hang up the call.
12. Capture the signaling traffic associated with the call.

8.3.1.6.3 Observable Results

The calls will not be established.

The log file should be viewable.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

8.3.1.6.4 Pass/Fail Criteria

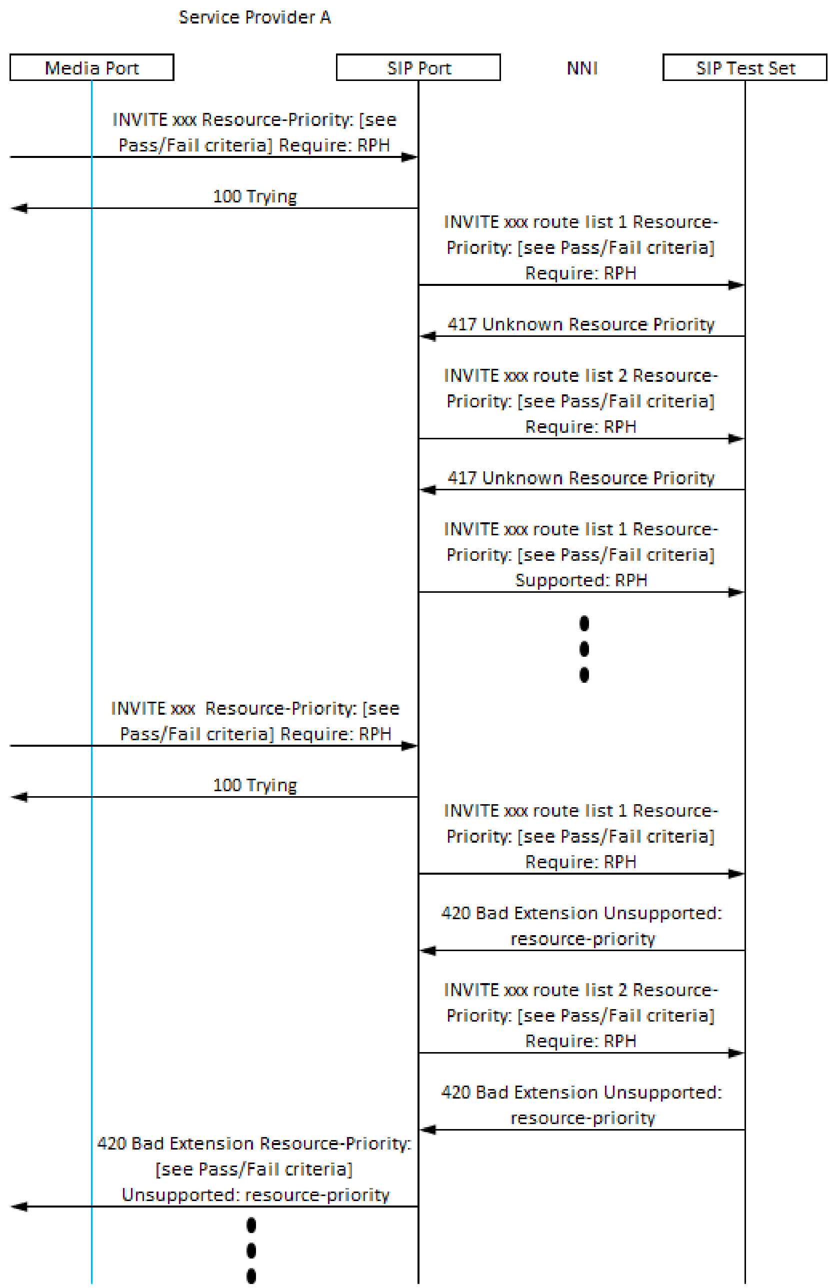
To pass this test case, the following criteria shall be met:

- *Test Step 4*: Service Provider A should send a SIP INVITE with RPH and 'Require' header field that includes the resource-priority option tag to the first entry in the route list.
- *Test Step 5*: Service Provider A should send a second SIP INVITE with RPH and Require header field that includes the resource-priority option tag to the second entry in the route list. Service Provider A should log the request and response to the first SIP INVITE as an error condition.
- *Test Step 6*: Service Provider A should log the request and response to the second SIP INVITE as an error condition.
- *Test Step 8*: Service Provider A should send a SIP INVITE with RPH and 'Require' header field that includes the resource-priority option tag to the first entry in the route list.
- *Test Step 9*: Service Provider A should send a second SIP INVITE with RPH and Require header field that includes the resource-priority option tag to the second entry in the route list. Service Provider A should log the request and response to the first SIP INVITE as an error condition.
- *Test Step 10*: Service Provider A should log the request and response to the second SIP INVITE as an error condition and forward the 420 response with the Unsupported header unchanged toward UE(A).
- *NGN GET-AN*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is UE (A)'s subscribed to priority level.
- *NGN GET-FC*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is UE (B)'s subscribed to priority level.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010		A.1
ATIS-1000023.a	1200, 3000	A.2
ATIS-1000011		A.3
ATIS-1000020		A.3

8.3.1.6.5 Message Flows



8.3.1.6.6 Trace Captures

Capture the following traces:

- The signaling traffic across the NNI.

8.3.1.6.7 Known Issues

None.

8.3.1.7 Test Case 1-7: Resource Priority Header Use in ETS SIP Response Messages

8.3.1.7.1 Purpose

Verify that Service Provider A properly formats the Resource Priority Header in SIP responses that it sends. (Requirement 900)

8.3.1.7.2 Test Setup & Procedure

1. Connect and configure a SIP test set to send either 3xx, 5xx, or 6xx responses to the NNI interface of Service Provider A when it receives an INVITE from Service Provider A.
2. Generate an ETS call from UE(A) in Service Provider A's network to UE(B) in Service Provider B's network.
3. Have the SIP test set send a 303 Temporarily Moved response to Service Provider A when it receives the INVITE for the call.
4. If necessary, have UE(A) hang up the call.
5. Generate an ETS call from UE(A) in Service Provider A's network to UE(B) in Service Provider B's network.
6. Have the SIP test set send a 501 Not Implemented response to Service Provider A when it receives the INVITE for the call.
7. If necessary, have UE(A) hang up the call.
8. Generate an ETS call from UE(A) in Service Provider A's network to UE(B) in Service Provider B's network.
9. Have the SIP test set send a 603 Decline response to Service Provider A when it receives the INVITE for the call.
10. If necessary, have UE(A) hang up the call.
11. Capture the signaling traffic associated with the calls at the NNI.

8.3.1.7.3 Observable Results

The calls will not be established.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI legs of the call.

8.3.1.7.4 Pass/Fail Criteria

To pass this test case, the following criteria shall be met:

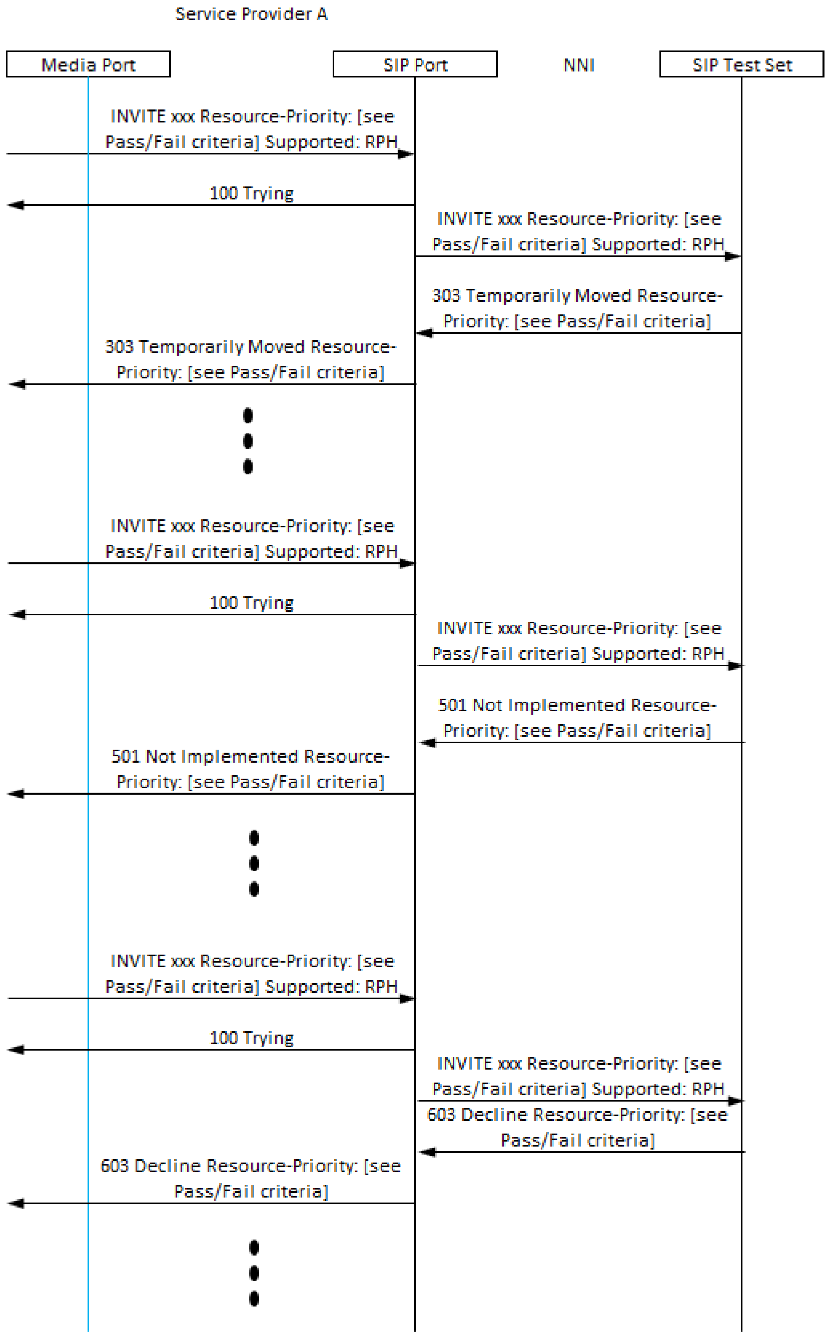
- *Test Step 2*: Service Provider A should send a SIP INVITE with RPH and Supported header field that includes the resource-priority option tag.
- *Test Step 3*: Service Provider A should receive the 303 response from the SIP test set and send the properly formatted 303 response towards the originator on the UNI interface.
- *Test Step 5*: Service Provider A should send a SIP INVITE with RPH and Supported header field that includes the resource-priority option tag.
- *Test Step 6*: Service Provider A should receive the 501 response from the SIP test set and send the properly formatted 501 response towards the originator on the UNI interface.

- *Test Step 8*: Service Provider A should send a SIP INVITE with RPH and Supported header field that includes the resource-priority option tag.
- *Test Step 9*: Service Provider A should receive the 603 response from the SIP test set and send the properly formatted 603 response towards the originator on the UNI interface.
- *NGN GET-AN*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is the UE's subscribed to priority level.
- *NGN GET-FC*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is the UE's subscribed to priority level.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010		A.1
ATIS-1000023.a	900, 2400 (3xx, 5xx, 6xx)	A.2
ATIS-1000011		A.3
ATIS-1000020		A.3

8.3.1.7.5 Message Flows



8.3.1.7.6 Trace Captures

Capture the following traces:

- The signaling traffic across the NNI.

8.3.1.7.7 Known Issues

None.

8.3.1.8 Test Case 1-8: Receipt of a Bad Request Response With 417 Reason Code

8.3.1.8.1 Purpose

When Service Provider A receives a 400 (Bad Request) response with a 417 code in the Reason header field, verify that the border element can be configured to:

- Reject the call; or
- Resend the call without the ets and wps namespaces, preserving the other namespaces in the RPH; or
- Resend the call with a single copy of ets.DF, removing the wps namespace if present, and preserving the other namespaces in the RPH (default action); and
- Log the request and response as an error condition.

8.3.1.8.2 Test Setup & Procedure

1. To verify that the border element behavior is configurable and that by default it resends the call (INVITE) with a single copy of ets.DF, removing the wps namespace if present, and preserving the other namespaces in the RPH after receiving a 400 (Bad Request) response with a 417 code in the Reason header field:
    a. Reset the border element and note the value of the default behavior for this condition.
    b. Configure the RPH capability of the border element to enabled.
    c. Connect and configure a SIP test set to send a 400 (Bad Request) response with a 417 code in the Reason header field to the NNI interface of the border element when it receives an INVITE from Service Provider A.
    d. Generate an ETS call from UE(A) in Service Provider A's network to UE(B) in Service Provider B's network.
    e. Check the log for any noted errors.
2. To verify that the border element behavior is configurable and that it can be configured to reject the call after receiving a 400 (Bad Request) response with a 417 code in the Reason header field:
    a. Configure the border element to reject the call after receiving a 400 (Bad Request) response with a 417 code in the Reason header field.
    b. Configure the RPH capability of the NE to enabled.
    c. Connect and configure a SIP test set to send a 400 (Bad Request) response with a 417 code in the Reason header field to the NNI interface of the border element when it receives an INVITE from Service Provider A.
    d. Generate an ETS call from UE(A) in Service Provider A's network to UE(B) in Service Provider B's network.
    e. Check the log for any noted errors.
3. To verify that the border element behavior is configurable and that it can be configured to resend the call without the ets and wps namespaces, preserving the other namespaces in the RPH after receiving a 400 (Bad Request) response with a 417 code in the Reason header field:
    a. Configure the border element to resend the call without the ets and wps namespaces, preserving the other namespaces in the RPH after receiving a 400 (Bad Request) response with a 417 code in the Reason header field.
    b. Configure the RPH capability of the NE to enabled.
    c. Connect and configure a SIP test set to send a 400 (Bad Request) response with a 417 code in the Reason header field to the NNI interface of the border element when it receives an INVITE from Service Provider A.
    d. Generate an ETS call from UE(A) in Service Provider A's network to UE(B) in Service Provider B's network.

   e. Check the log for any noted errors.

4. Capture the signaling traffic associated with the call.

8.3.1.8.3 Observable Results

The call for step 2 will not be established.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

8.3.1.8.4 Pass/Fail Criteria

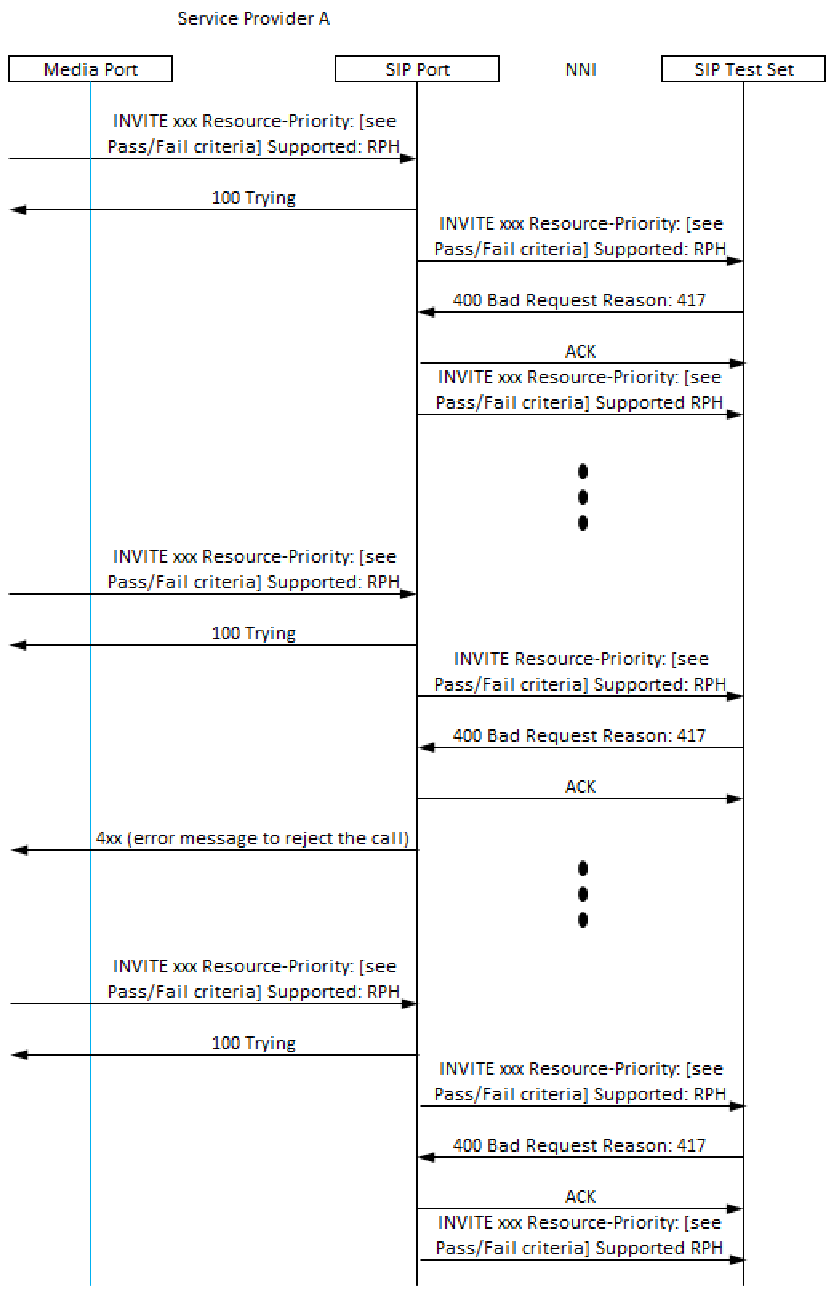
To pass this test case, the following criteria shall be met:

- *Test Step 1a*: After reset, the border element for Service Provider A should indicate that it is configured to resend the call (INVITE) with a single copy of ets.DF, removing the wps namespace if present, and preserving the other namespaces in the RPH.
- *Test Step 1d*: After Service Provider A sends the INVITE to the NNI and receives a 400 (Bad Request) response with a 417 code in the Reason header field, it should resend the call (INVITE) with a single copy of ets.DF, removing the wps namespace if present, and preserving the other namespaces in the RPH.
- *Step 1e*: Service Provider A should log the request and response as an error condition.
- *Test Step 2a*: The border element of Service Provider A should be configured to reject the call.
- *Test Step 2d*: After Service Provider A sends the INVITE to the NNI and receives a 400 (Bad Request) response with a 417 code in the Reason header field, it should reject the call by sending a 4xx response message towards UE(A).
- *Test Step 2e*: Service Provider A should log the request and response as an error condition.
- *Test Step 3a*: After reset, the border element for Service Provider A should indicate that it is configured to resend the call without the ets and wps namespaces, preserving the other namespaces in the RPH.
- *Test Step 3d*: After Service Provider A sends the INVITE to the NNI and receives a 400 (Bad Request) response with a 417 code in the Reason header field, it should resend the call without the ets and wps namespaces, preserving the other namespaces in the RPH.
- *Test Step 3e*: Service Provider A should log the request and response as an error condition.
- *NGN GET-AN*: SIP messages should contain the RPH and should have the RPH set as indicated in the test steps.
- *NGN GET-FC*: SIP messages should contain the RPH and should have the RPH set as indicated in the test steps.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010		A.1
ATIS-1000023.a	1900, 2000	A.2
ATIS-1000011		A.3
ATIS-1000020		A.3

8.3.1.8.5 Message Flows



8.3.1.8.6 Trace Captures

Capture the following traces:

- The signaling traffic across the NNI.

8.3.1.8.7 Known Issues

None.

8.3.1.9 Test Case 1-9: Receipt of a 200 OK Response Message Containing an ets RPH for a Non-Recognized ETS Call/Session

8.3.1.9.1 Purpose

When Service Provider A receives a 200 OK Response message containing an ets RPH for a non-recognized ETS call/session (i.e., the INVITE did not have an ets namespace or an ETS-DN), verify that Service Provider A:

- Logs the message as an error condition;
- Uses neither the ets nor wps namespaces in messages and responses associated with this session; and
- Processes the messages and responses as for a normal call.

8.3.1.9.2 Test Setup & Procedure

1. Connect and configure a SIP test set to act as Service Provider B/UE(B) and accept a non-ETS call with UE(A) and then send an RTP media stream. During the call setup process, configure the SIP test set to send a 200 OK message to Service Provider A that contains an RPH for a non-recognized ETS call/session.
2. Generate a non-ETS call from UE(A) in Service Provider A's network to the SIP test set (UE(B) in Service Provider B's network).
3. Have the SIP test set answer the call.
4. Have a voice conversation.
5. Have UE(A) hang up the call.
6. Query the log file for Service Provider A.
7. Capture the signaling and bearer traffic associated with the call.

8.3.1.9.3 Observable Results

The call should be established, voice traffic should occur between the endpoints, and the call should be torn down.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the bearer traffic will be captured and analyzed for the NNI leg of the call.

8.3.1.9.4 Pass/Fail Criteria

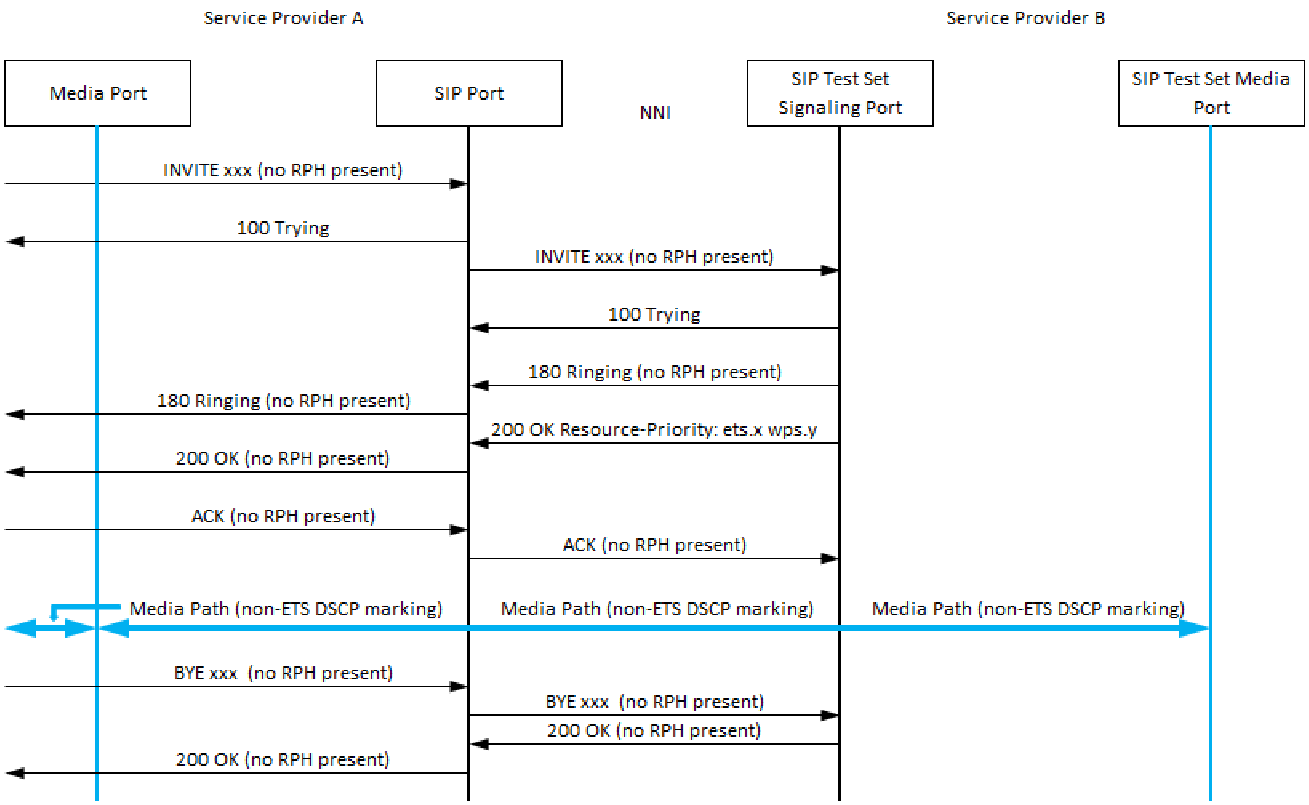
To pass this test case, the following criteria shall be met:

- The call should be successfully established and torn down. The SIP message formats and the layer 2 and layer 3 markings associated with the call should conform to the values identified for the test.
- All SIP messages should not contain the SIP RPH, except the 200 OK Response message sent by the SIP test set.
- The RTP media packets should have DSCP markings indicating non-ETS media.
- Service Provider A should indicate in its log file that a non-recognized ETS call/session error occurred.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010		A.1
ATIS-1000023.a	2500	A.2
ATIS-1000011		A.3

8.3.1.9.5 Message Flows



8.3.1.9.6 Trace Capture

Capture traces:

- The signaling traffic across the NNI.
- The media traffic across the NNI.

8.3.1.9.7 Known Issues

None.

8.3.1.10 Test Case 1-10: Receipt of a 486 Busy Here Response Message for an ETS Call/Session

8.3.1.10.1 Purpose

When Service Provider A initiates an ETS call and receives a 486 (Busy Here) response on all branches, as identified by the branch parameter in the Via Header, and has exhausted all available call treatments, verify that Service Provider A:

- Returns a 600 (Busy Everywhere) response to the caller; and
- Includes a Reason Header Q.850 value of 17 (user busy) in the response.

8.3.1.10.2 Test Setup & Procedure

1. Complete the Layer 2 and 3 Marking Verification Task.
2. Connect and configure a SIP test set to send a 486 (Busy Here) to the NNI interface of the border element when it receives an INVITE from Service Provider A.
3. Generate an ETS call from UE(A) in Service Provider A's network to UE(B) in Service Provider B's network.
4. Capture the signaling traffic at the NNI associated with the call.

8.3.1.10.3 Observable Results

The call should not be established.

The SIP message formats for the call will be captured and analyzed for the NNI legs of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

8.3.1.10.4 Pass/Fail Criteria

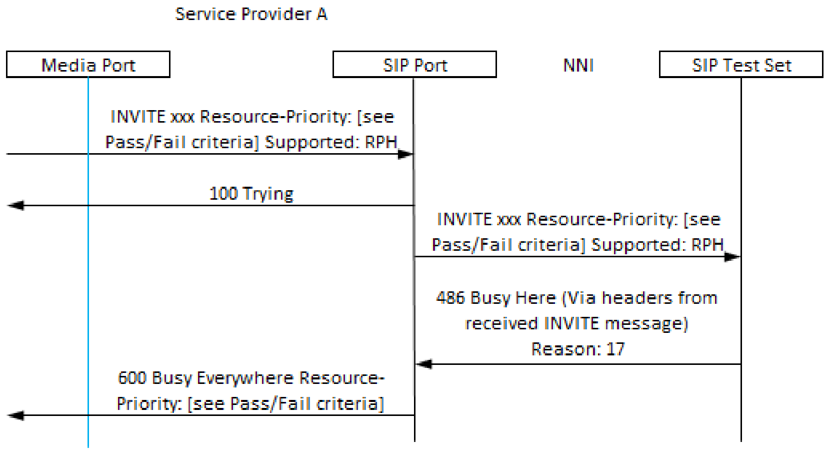
To pass this test case, the following criteria shall be met:

- The call should not be established.
- Service Provider A should return a 600 (Busy Everywhere) response to UE(A) upon receiving a 486 (Busy Here) response to the INVITE message that it sent to the NNI.
- The messages sent by Service Provider A should contain the Resource Priority Header.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010		A.1
ATIS-1000023.a	2900	A.2
ATIS-1000011		A.3

8.3.1.10.5 Message Flows



8.3.1.10.6 Trace Capture

Capture traces:

- The signaling traffic across the NNI.

8.3.1.10.7 Known Issues

None.

8.3.1.11 Test Case 1-11: ETS Call Forward Unconditional (CFU)

8.3.1.11.1 Purpose

Verify that ATIS ETS compliant Service Providers recognize and act upon ETS information to establish priority call forwarding across the NNI.

User A is in the Service Provider A domain. Users B1 and B2 are in the Service Provider B domain. User B1 configures CFU to User B2.

User A places a call to User B1. Service Provider B forwards the call to User B2.

8.3.1.11.2 Test Setup & Procedure

1. Complete the Layer 2 and 3 Marking Verification Task.
2. Configure UE(B1) to have calls to it unconditionally forwarded to UE(B2).
3. Generate an ETS call from the UE(A) in Service Provider A's network to UE(B1) in Service Provider B's network.
4. The call should be forwarded to UE(B2).
5. Have UE(B2) answer the call.
6. Have a voice conversation.
7. Have UE(A) hang up the call.
8. Capture the signaling and bearer traffic associated with the call.

8.3.1.11.3 Observable Results

The call should be established, voice traffic should occur between the endpoints, and the call should be torn down.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the bearer traffic will be captured and analyzed for the NNI leg of the call.

8.3.1.11.4 Pass/Fail Criteria

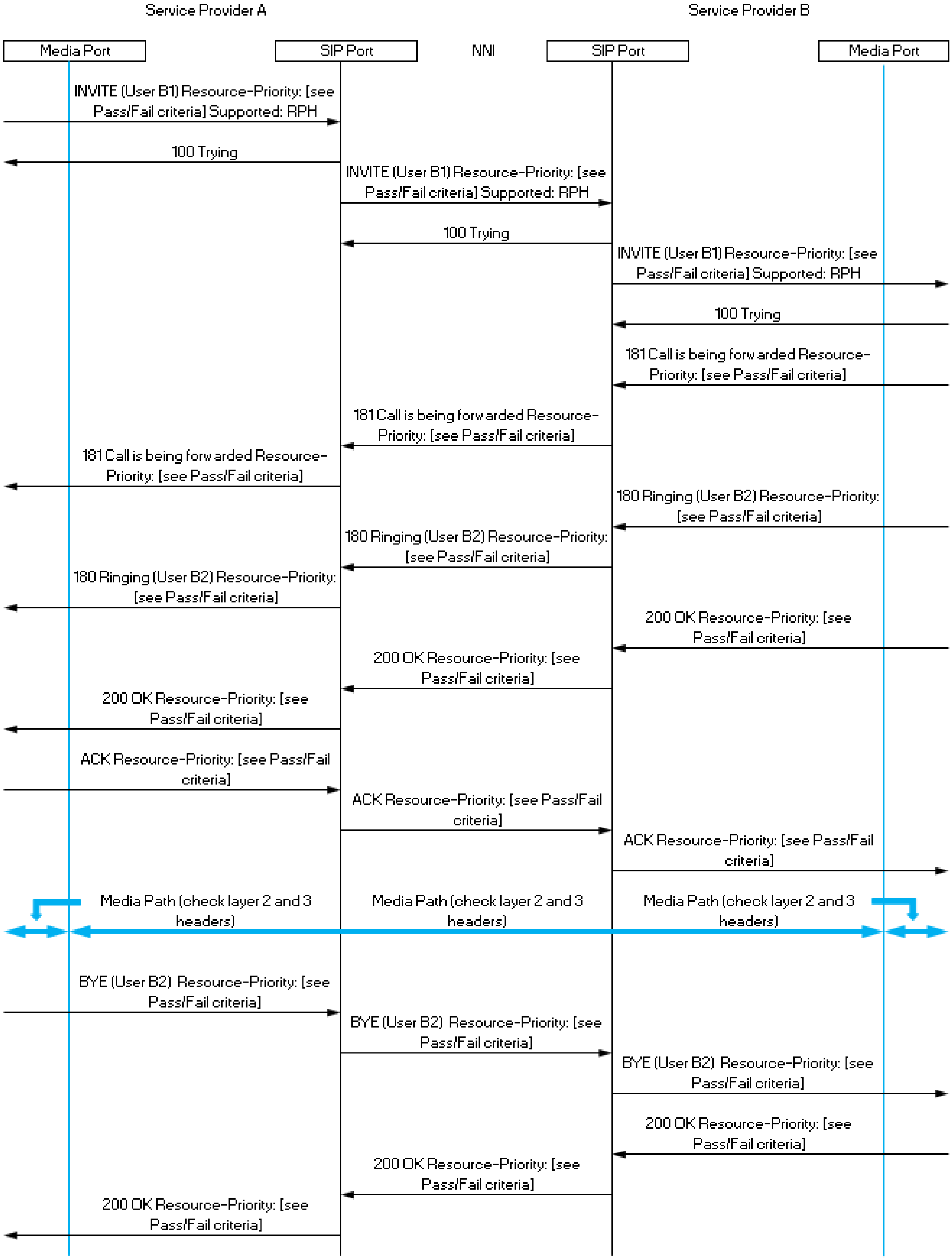
To pass this test case, the following criteria shall be met:

- The call should be successfully forwarded to UE(B2), established, and torn down. The SIP message formats and the layer 2 and layer 3 markings associated with the call should conform to the values identified for the test.
- The initial INVITE request should contain the Supported header field with the “resource-priority” option tag.
- *NGN GET-AN*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is the UE’s subscribed to priority level.
- *NGN GET-FC*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is the UE’s subscribed to priority level.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010	1a, 1b, 1c, 3, 4	A.1
ATIS-1000023.a	200, 400, 500, , 800 (INVITE, ACK, BYE), 900 (180 Ringing, 181 Call is being forwarded, 200 OK), 1000, 2100, 2200, 2300, 2400, B100, B200, B300	A.2
ATIS-1000011	10, 11	A.3
ATIS-1000020	12	A.3

8.3.1.11.5 Message Flows



8.3.1.11.6 Trace Captures

Capture the following traces:

- The signaling traffic across the NNI.
- The media traffic across the NNI.

8.3.1.11.7 Known Issues

None.

8.3.2 Terminated NGN GETS-AN and/or GETS-FC Calls/Sessions

8.3.2.1 Test Case 2-1: Basic ETS Call Completion

8.3.2.1.1 Purpose

Verify that Service Providers recognize and act upon ETS information to accept a priority call across the NNI.

8.3.2.1.2 Test Setup & Procedure

1. Complete the Layer 2 and 3 Marking Verification Task.
2. Generate an ETS call from the UE(B) in Service Provider B's network to UE(A) in Service Provider A's network.
3. Have UE(A) answer the call.
4. Have a voice conversation.
5. Have UE(B) hang up the call.
6. Capture the signaling and bearer traffic associated with the call.

8.3.2.1.3 Observable Results

The call should be established, voice traffic should occur between the endpoints, and the call should be torn down.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the bearer traffic will be captured and analyzed for the NNI leg of the call.

8.3.2.1.4 Pass/Fail Criteria

To pass this test case, the following criteria shall be met:

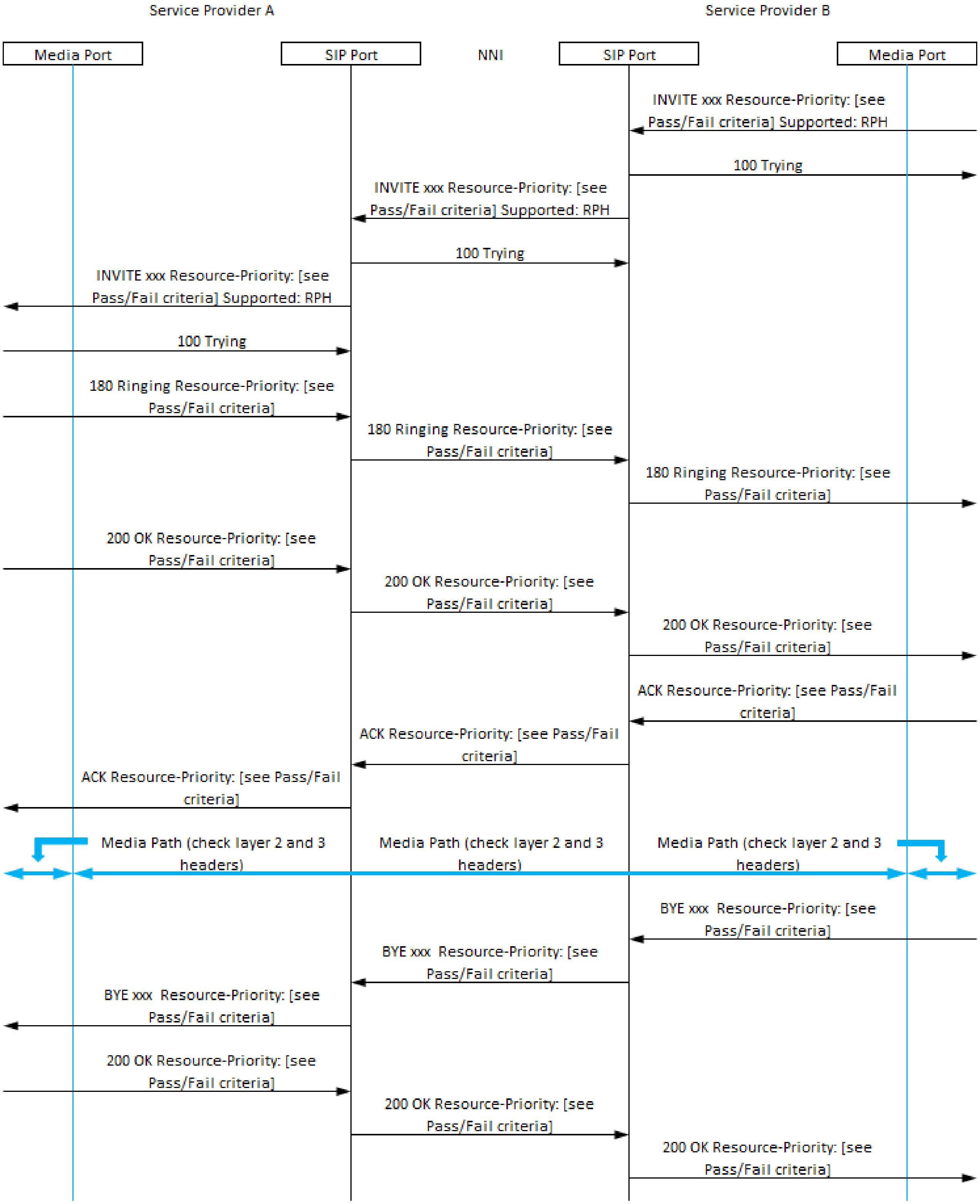
- The call should be successfully established and torn down. The SIP message formats and the layer 2 and layer 3 markings associated with the call should conform to the values identified for the test.
- The initial INVITE request should contain the Supported header field with the "resource-priority" option tag.
- *NGN GET-AN*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is UE (A)'s subscribed to priority level.

- *NGN GET-FC*: SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is UE (A)'s subscribed to priority level.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010	1a, 1b, 1c, 3, 4	A.1
ATIS-1000023.a	200, 400, 500, , 800 (INVITE, ACK, BYE), 900 (180 Ringing, 200 OK), 1000, 2100, 2200, 2300, 2400, B100, B200, B300	A.2
ATIS-1000011	10, 11	A.3
ATIS-1000020	12	A.3

8.3.2.1.5 Message Flows



8.3.2.1.6 Trace Capture

Capture traces:

- The signaling traffic across the NNI.
- The media traffic across the NNI.

8.3.2.1.7 Known Issues

None.

8.3.2.2 Test Case 2-2: Validation of RPH Settings in ETS SIP Messages Received

8.3.2.2.1 Purpose

Verify that Service Providers recognize and act upon received SIP requests that contain format errors in the Resource Priority Header.

8.3.2.2.2 Test Setup & Procedure

1. Connect and configure a SIP test set to send SIP INVITE messages with the RPH field formatted as described in the steps below to the NNI interface of Service Provider A.
2. Have the SIP test set send an INVITE request to Service Provider A that contains an RPH with a wps namespace and without an ets namespace. Check the log for any noted errors. (Requirements 500, 1800)
3. Have the SIP test set send an INVITE request to Service Provider A that contains an RPH with multiple instances of the ets namespace (e.g., Resource-Priority: ets.0, ets.2). Check the log for any noted errors. (Requirement 1400)
4. Have the SIP test set send an INVITE request to Service Provider A that contains an RPH with multiple instances of the wps namespace (e.g., Resource-Priority: ets.0, wps.2, wps.4). Check the log for any noted errors. (Requirement 1500)
5. Have the SIP test set send an INVITE request to Service Provider A that contains an RPH with an invalid ets resource value (e.g., Resource-Priority: ets.7). Check the log for any noted errors. (Requirement 1600)
6. Have the SIP test set send an INVITE request to Service Provider A that contains an RPH with an invalid wps resource value (e.g., Resource-Priority: ets.0, wps.9). Check the log for any noted errors. (Requirement 1700)
7. Capture the signaling traffic associated with the message exchange.

8.3.2.2.3 Observable Results

The calls will not be established.

The log file should be viewable.

The SIP message formats will be captured and analyzed at the NNI.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed at the NNI.

8.3.2.2.4 Pass/Fail Criteria

To pass this test case, the following criteria shall be met:

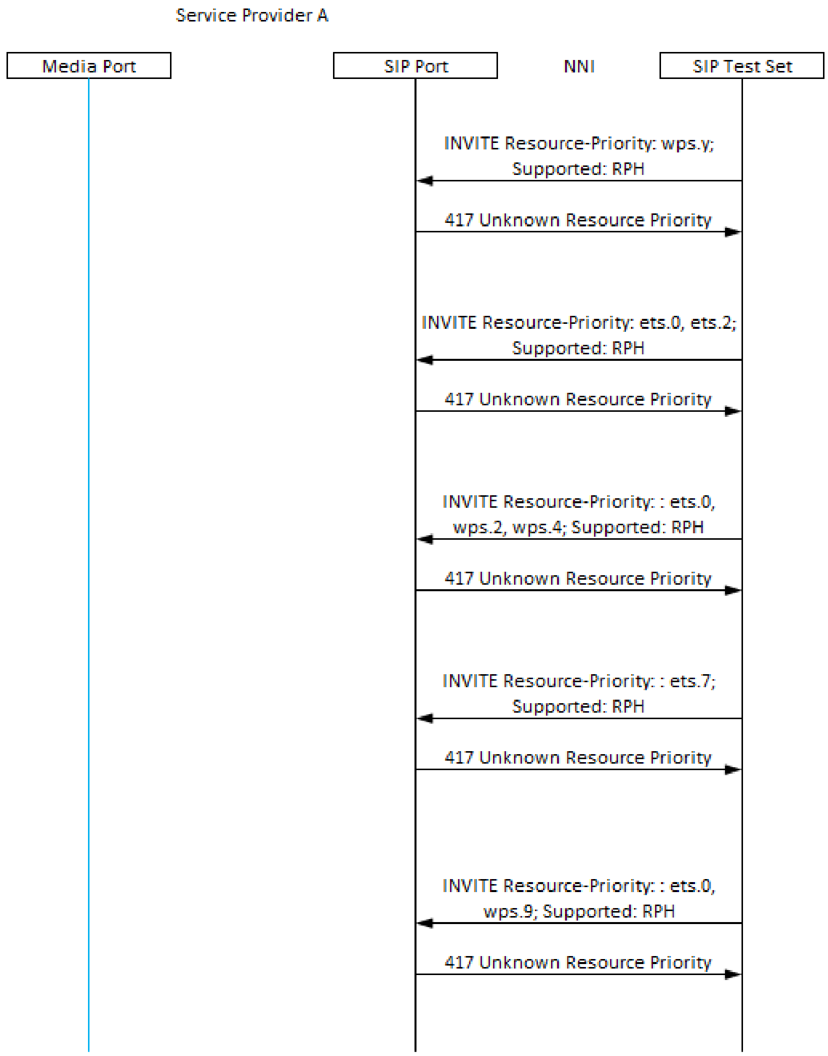
- *Test Step 2*: Service Provider A should send a SIP 400 (Bad Request) response with a 417 code in the Reason header field in response to a SIP INVITE with SIP request with an RPH that contains a wps namespace and no ets namespace. Service Provider A should log the request and response as an error condition.

- *Test Step 3*: Service Provider A should send a SIP 400 (Bad Request) response with a 417 code in the Reason header field in response to a SIP INVITE with SIP request with an RPH that contains multiple instances of the ets namespace. Service Provider A should log the request and response as an error condition.
- *Test Step 4*: Service Provider A should send a SIP 400 (Bad Request) response with a 417 code in the Reason header field in response to a SIP INVITE with SIP request with an RPH that contains multiple instances of the wps namespace. Service Provider A should log the request and response as an error condition.
- *Test Step 5*: Service Provider A should send a SIP 400 (Bad Request) response with a 417 code in the Reason header field in response to a SIP INVITE with SIP request with an RPH that contains an invalid ets resource value. Service Provider A should log the request and response as an error condition.
- *Test Step 6*: Service Provider A should send a SIP 400 (Bad Request) response with a 417 code in the Reason header field in response to a SIP INVITE with SIP request with an RPH that contains an invalid wps resource value. Service Provider A should log the request and response as an error condition.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010		A.1
ATIS-1000023.a	500, 600, 1400, 1500, 1600, 1700, 1800	A.2
ATIS-1000011		A.3
ATIS-1000020		A.3

8.3.2.2.5 Message Flows



8.3.2.2.6 Trace Captures

Capture the following traces:

- The signaling traffic across the NNI.

8.3.2.2.7 Known Issues

None.

8.3.2.3 Test Case 2-3: Receipt of an ACK Message Containing an ets RPH for a Non-Recognized ETS Call/Session

8.3.2.3.1 Purpose

When Service Provider A receives an ACK message containing an ets RPH for a non-recognized ETS call/session (i.e., the INVITE did not have an ets namespace or an ETS-DN), verify that Service Provider A:

- Logs the message as an error condition;
- Uses neither the ets nor wps namespaces in messages and responses associated with this session; and

- processes the messages and responses as for a normal call.

8.3.2.3.2 Test Setup & Procedure

1. Connect and configure a SIP test set to act as Service Provider B/UE(B) and setup a non-ETS call with UE(A) and then send an RTP media stream. During the call setup process configure the SIP test set to send an ACK message to Service Provider A that contains an RPH for a non-recognized ETS call/session.
2. Generate an non-ETS call from the SIP test set [UE(B) in Service Provider B's network] to UE(A) in Service Provider A's network.
3. Have UE(A) answer the call.
4. Have a voice conversation.
5. Have UE(B) hang up the call.
6. Query the log file for Service Provider A.
7. Capture the signaling and bearer traffic associated with the call.

8.3.2.3.3 Observable Results

The call should be established, voice traffic should occur between the endpoints, and the call should be torn down.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the bearer traffic will be captured and analyzed for the NNI of the call.

8.3.2.3.4 Pass/Fail Criteria

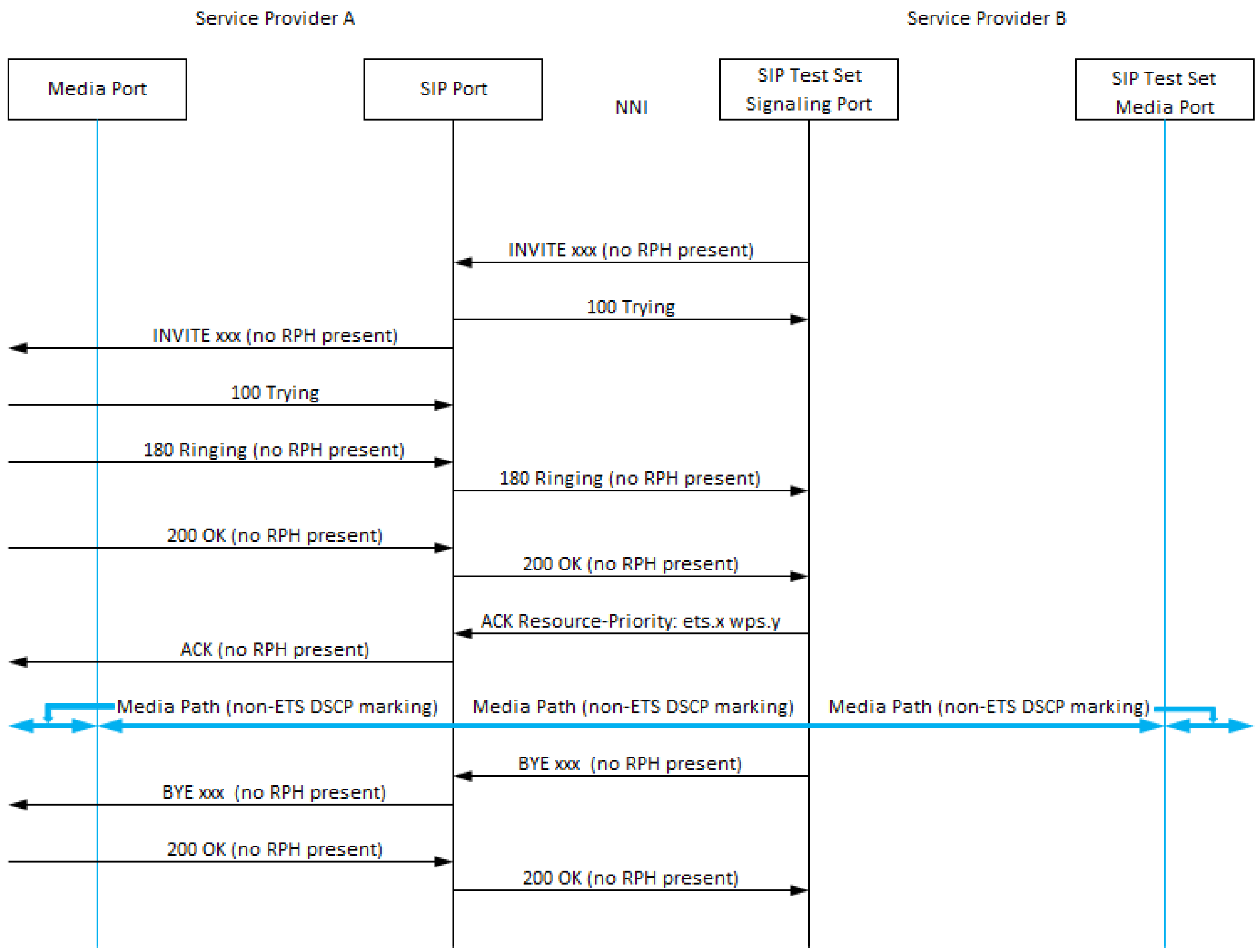
To pass this test case, the following criteria shall be met:

- The call should be successfully established and torn down. The SIP message formats and the layer 2 and layer 3 markings associated with the call should conform to the values identified for the test.
- All SIP messages should not contain the SIP RPH, except the ACK message sent by the SIP test set.
- The RTP media packets should have DSCP markings indicating non-ETS media.
- Service Provider A should indicate in its log file that a non-recognized ETS call/session error occurred.

This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010		A.1
ATIS-1000023.a	2500	A.2
ATIS-1000011		A.3
ATIS-1000020		A.3

8.3.2.3.5 Message Flows



8.3.2.3.6 Trace Capture

Capture traces:

- The signaling traffic across the NNI.
- The media traffic across the NNI.

8.3.2.3.7 Known Issues

None.

8.3.2.4 Test Case 2-4: Receipt of an UPDATE Message Containing an ets RPH for a Non-Recognized ETS Call/Session

8.3.2.4.1 Purpose

When Service Provider A receives an UPDATE message containing an ets RPH for a non-recognized ETS call/session (i.e., the INVITE did not have an ets namespace or an ETS-DN), verify that Service Provider A:

- Logs the message as an error condition;
- Uses neither the ets nor wps namespaces in messages and responses associated with this session; and

- processes the messages and responses as for a normal call.

8.3.2.4.2 Test Setup & Procedure

1. Connect and configure a SIP test set to act as Service Provider B/UE(B) and setup a non-ETS call with UE(A) and then send an RTP media stream. During the call setup process, configure the SIP test set to send an UPDATE message to Service Provider A that contains an RPH for a non-recognized ETS call/session.
2. Configure the SIP test set (UE(B)) to prefer codec 1 but accept codec 2.
3. Configure UE(A) to prefer codec 2 but accept codec 1.
4. Generate an non-ETS call from the SIP test set (UE(B) in Service Provider B's network) to UE(A) in Service Provider A's network.
5. Have UE(A) answer the call.
6. Query the log file for Service Provider A.
7. Capture the signaling and bearer traffic associated with the call.

8.3.2.4.3 Observable Results

The call should be established, voice traffic should occur between the endpoints, and the call should be torn down.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the bearer traffic will be captured and analyzed for the NNI leg of the call.

8.3.2.4.4 Pass/Fail Criteria

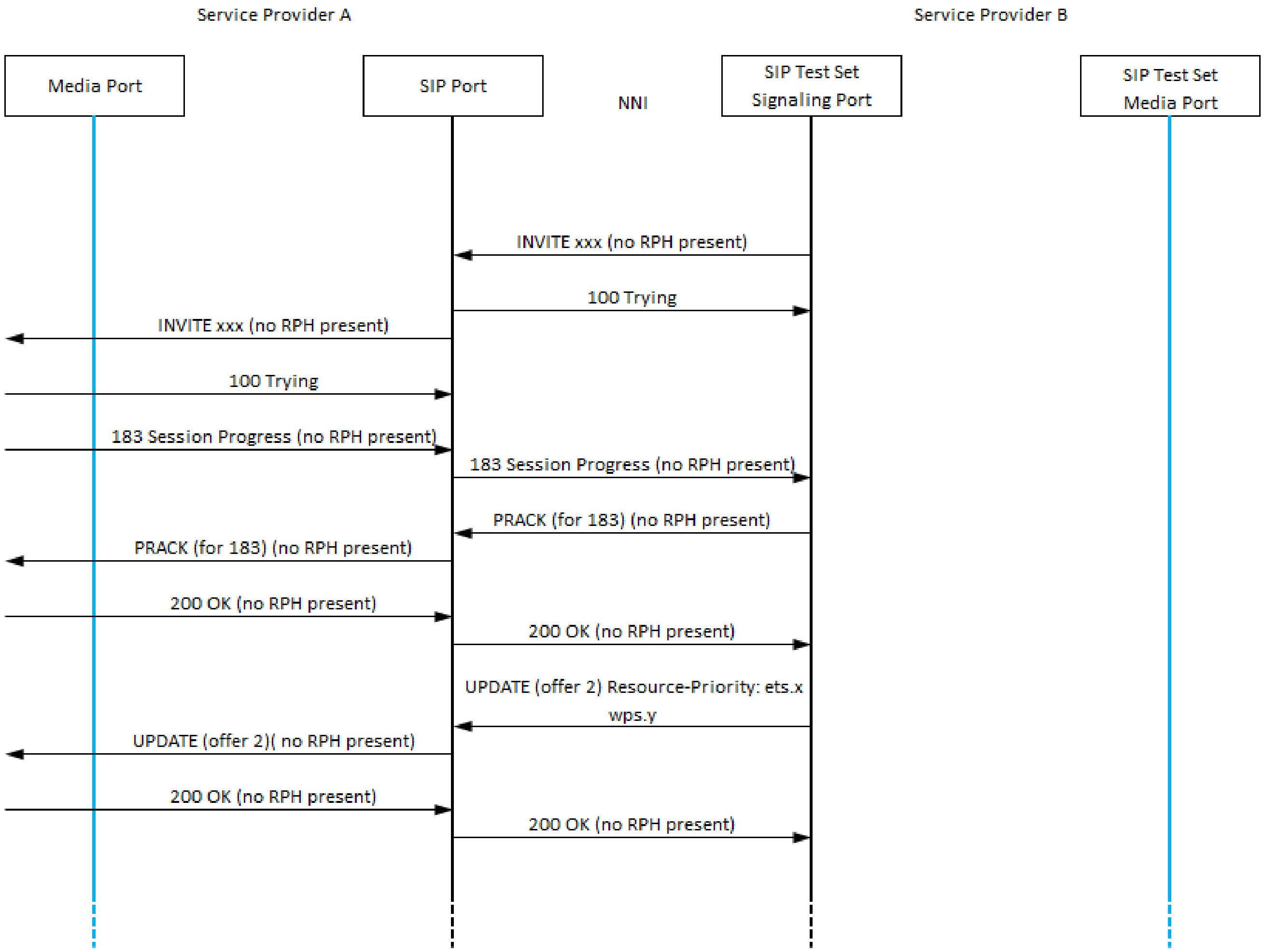
To pass this test case, the following criteria shall be met:

- The call should be successfully established and torn down. The SIP message formats and the layer 2 and layer 3 markings associated with the call should conform to the values identified for the test.
- All SIP messages should not contain the SIP RPH, except the UPDATE message sent by the SIP test set.
- The RTP media packets should have DSCP markings indicating non-ETS media.
- Service Provider A should indicate in its log file that a non-recognized ETS call/session error occurred.

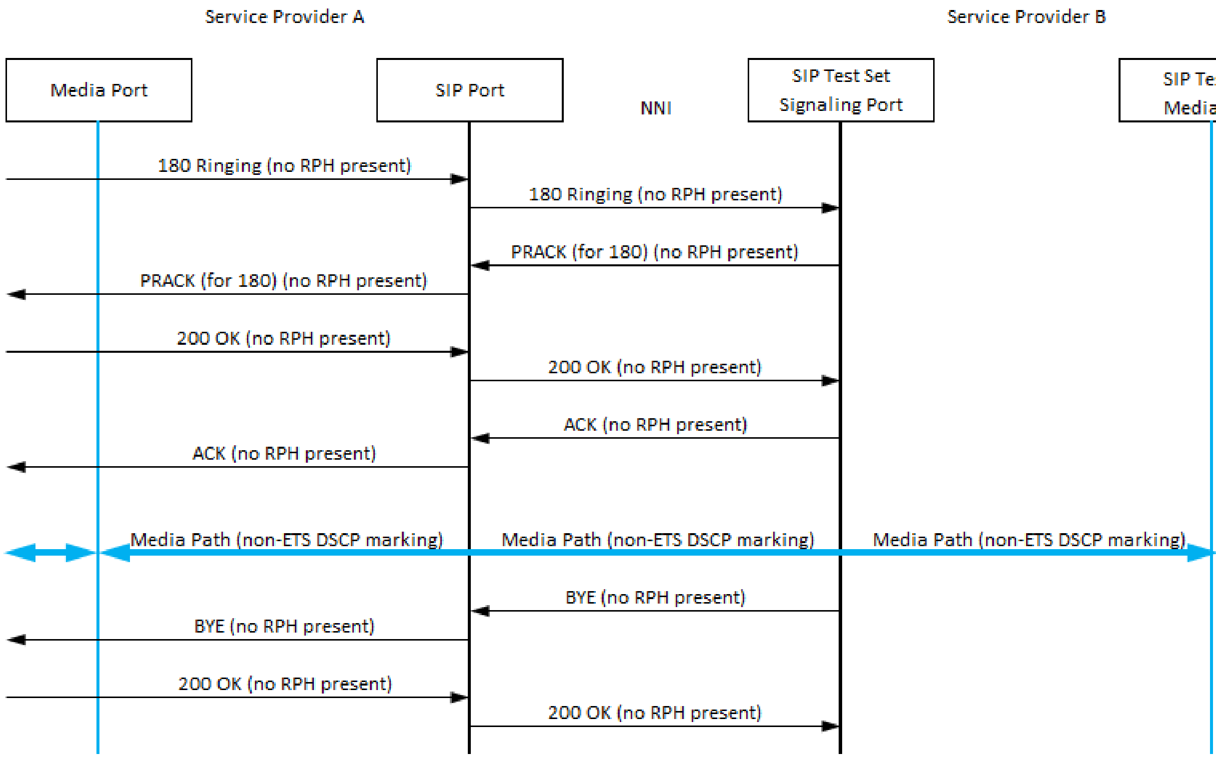
This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010		A.1
ATIS-1000023.a	2500	A.2
ATIS-1000011		A.3

8.3.2.4.5 Message Flows



Message Flow Part 1



Message Flow Part 2

8.3.2.4.6 Trace Capture

Capture traces:

- The signaling traffic across the NNI.
- The media traffic across the NNI.

8.3.2.4.7 Known Issues

None.

8.3.2.5 Test Case 2-5: Validation of RPH Settings in ETS SIP Messages Received Based on Require Resource Priority Option Tag

8.3.2.5.1 Purpose

Verify that Service Providers recognize and act upon received SIP requests that contain format errors in the Resource Priority Header based upon the Require Resource Priority Option Tag in the received message.

8.3.2.5.2 Test Setup & Procedure

1. Connect and configure a SIP test set to send SIP INVITE messages with the RPH field formatted as described in the steps below to the NNI interface of Service Provider A. (Requirement 2600-A1)
2. Configure Service Provider A to support the SIP RPH extension.
3. Have the SIP test set send an INVITE request to Service Provider A that contains an RPH with unrecognizable values in the request (xyz.2 qwr.2). The Require resource-priority option tag is not included in the message.

4. Have the SIP test set hang up the call.
5. Configure Service Provider A to support the SIP RPH extension.
6. Configure Service Provider A to send the 'Accept-Resource-Priority' header field with an Unknown Resource-Priority (417) response when it receives a request that contains RPH resource values that it does not understand. (Requirement 2600-A2A)
7. Have the SIP test set send an INVITE request to Service Provider A that contains an RPH with unrecognizable values in the request (xyz.2 qwr.2). The Require resource-priority option tag is set to Require: resource-priority.
8. Reset the Service Provider A NE. Query the value of the 'Accept-Resource-Priority' header field with an Unknown Resource-Priority (417) response parameter at Service Provider A. (Requirement 2600-A2B)
9. Have the SIP test set send an INVITE request to Service Provider A that contains an RPH with unrecognizable values in the request (xyz.2 qwr.2). The Require resource-priority option tag is set to Require: resource-priority.
10. Record the response of Service Provider A.
11. Configure Service Provider A to not support the SIP RPH extension. (Requirement 2600-B1)
12. Have the SIP test set send an INVITE request to Service Provider A that contains an RPH with unrecognizable values in the request (xyz.2 qwr.2). The Require resource-priority option tag is set to Require: resource-priority.
13. Configure Service Provider A to support the SIP RPH extension. (Requirement 2600-B2)
14. Have the SIP test set send an INVITE request to Service Provider A that contains an RPH with unrecognizable values in the request (xyz.2 qwr.2). The Require resource-priority option tag is set to Require: resource-priority.
15. Capture the signaling traffic associated with the message exchanges.

8.3.2.5.3 Observable Results

The call in step 3 should be completed. The other calls should not be established.

The NE configuration parameters should be viewable.

The SIP message formats will be captured and analyzed at the NNI.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed at the NNI.

8.3.2.5.4 Pass/Fail Criteria

To pass this test case, the following criteria shall be met:

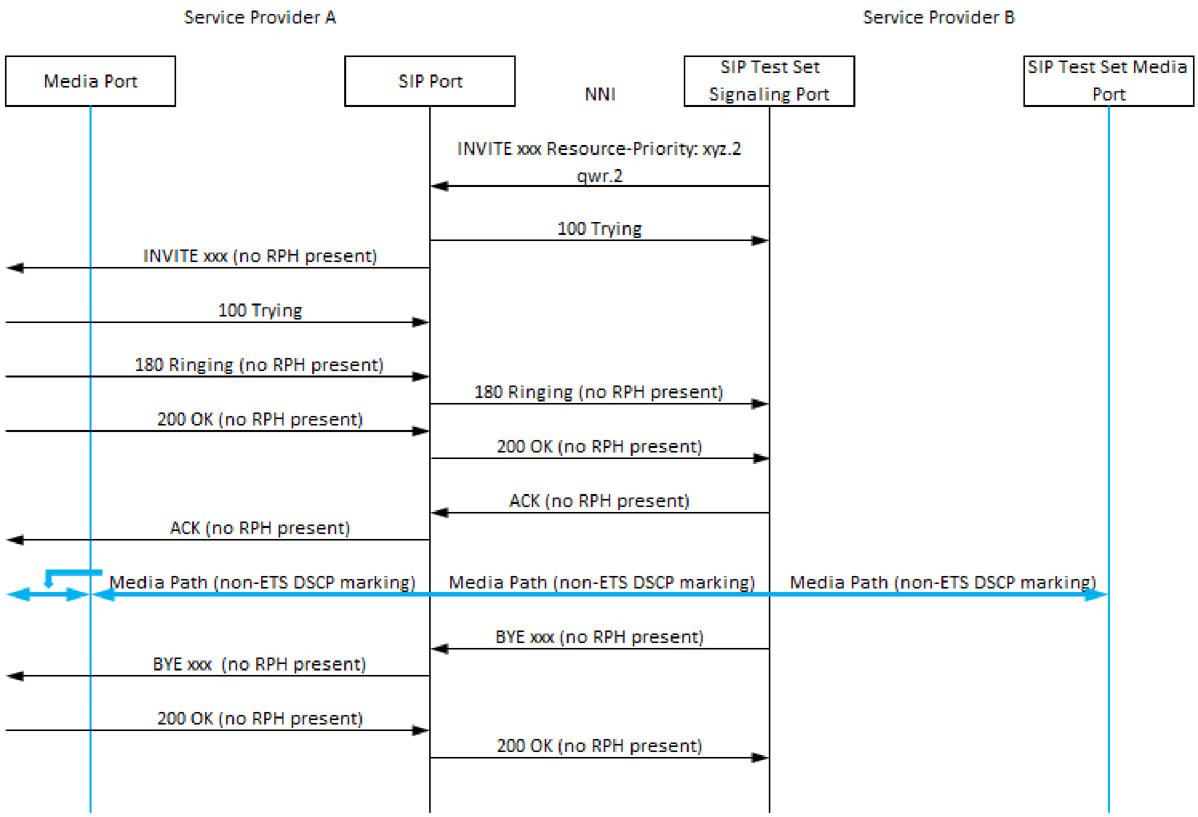
- *Test Step 3*: Without the option tag, Service Provider A should treat the request as if it contained no 'Resource-Priority' header field and processes the request as a normal call/session.
- *Test Step 7*: With the option tag, Service Provider A should reject the request with a 417 (Unknown Resource-Priority) response code and include the 'Accept-Resource-Priority' header field in the message.
- *Test Step 8*: The 'Accept-Resource-Priority' header field with an Unknown Resource-Priority (417) response parameter of Service provider A should be reset to its default value of disabled.
- *Test Step 9*: Since it is not clear how Service Provider A should respond when the 'Accept-Resource-Priority' header field with an Unknown Resource-Priority (417) response parameter is disabled, note the response of Service Provider A.
- *Test Step 12*: Service Provider A should respond with a 420 (Bad Extension) and list "resource-priority" in the 'Unsupported' header field included in the response.

- *Test Step 14*: Service Provider A should reject the request with a 417 (Unknown Resource-Priority) response code.

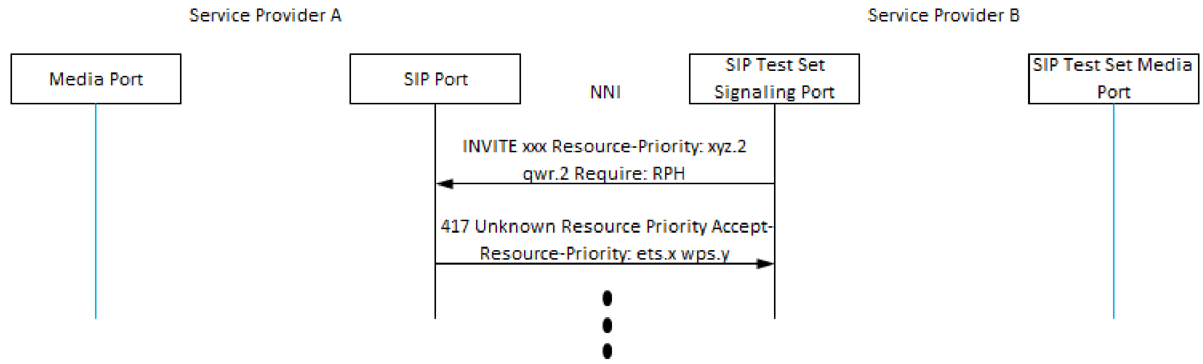
This test verifies the following requirements:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010		A.1
ATIS-1000023.a	700, 2600	A.2
ATIS-1000011		A.3
ATIS-1000020		A.3

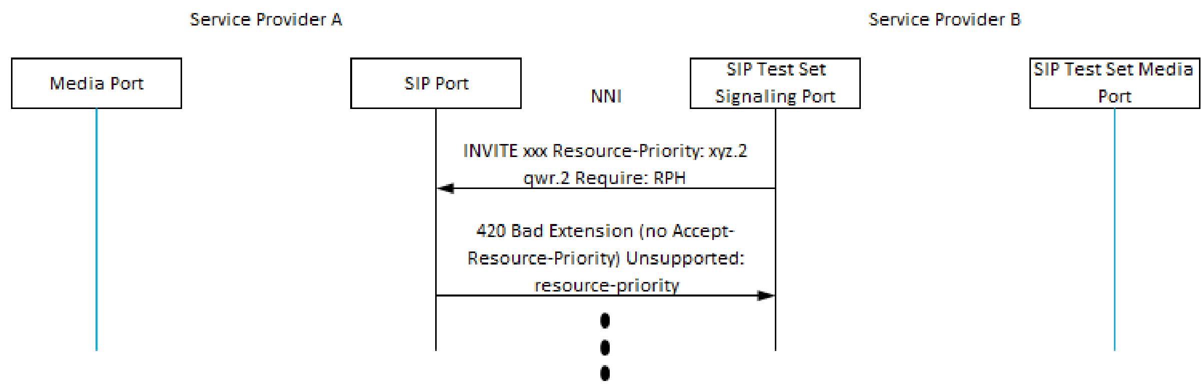
8.3.2.5.5 Message Flows



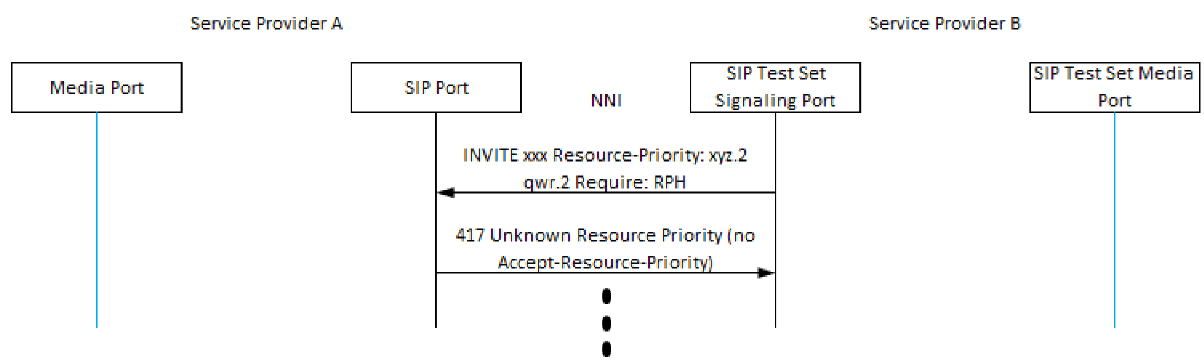
Message Flow - Requirement 2600-A1



Message Flow - Requirement 2600-A2A, 700



Message Flow - Requirement 2600-B1



Message Flow - Requirement 2600-B2

8.3.2.5.6 Trace Captures

Capture the following traces:

- The signaling traffic across the NNI.

8.3.2.5.7 Known Issues

None.

8.4 *Test Scenario 2*

8.4.1 Originated NGN GETS-AN and/or GETS-FC Calls/Sessions

8.4.1.1 Test Case 3-1: Basic ETS Call Completion

8.4.1.1.1 Purpose

Verify that when Service Provider A is ATIS ETS compliant and Service Provider B is not ATIS ETS compliant that:

- The ATIS ETS compliant Service Provider recognizes and acts upon ETS information to establish a priority call across the NNI; and
- The non ATIS ETS compliant Service Provider accepts ETS information transparently from the NNI and allows the GETS call to be established.

8.4.1.1.2 Test Setup & Procedure

1. Complete the Layer 2 and 3 Marking Verification Task – i.e., ETS markings for Service Provider A but normal, non-ETS markings for Service Provider B.
2. Generate an ETS call from the UE(A) in Service Provider A's network to UE(B) in Service Provider B's network.
3. Have UE(B) answer the call.
4. Have a voice conversation.
5. Have UE(A) hang up the call.
6. Capture the signaling and bearer traffic associated with the call.

8.4.1.1.3 Observable Results

The call should be established, voice traffic should occur between the endpoints, and the call should be torn down.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the bearer traffic will be captured and analyzed for the NNI leg of the call.

8.4.1.1.4 Pass/Fail Criteria

To pass this test case, the following criteria shall be met:

- The call should be successfully established and torn down. The SIP message formats and the layer 2 and layer 3 markings associated with the call should conform to the values identified for the test. That is, the messages associated with the GETS call sent by the Service Provider A network should receive layer 2 and layer 3 markings that indicate priority treatment. The messages associated with the GETS call sent by the Service Provider B network should receive layer 2 and layer 3 markings that indicate normal, non-priority treatment.
- The initial INVITE request should contain the Supported header field with the "resource-priority" option tag.
- *NGN GET-AN*: Service Provider A SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is the UE's subscribed to priority level. Service Provider B SIP messages forwarded from Service Provider A toward the UE in Service Provider B should have the RPH field unchanged. SIP messages originated from Service provider B should not contain the RPH.
- *NGN GET-FC*: Service Provider A SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is the UE's subscribed to priority level. Service Provider B SIP

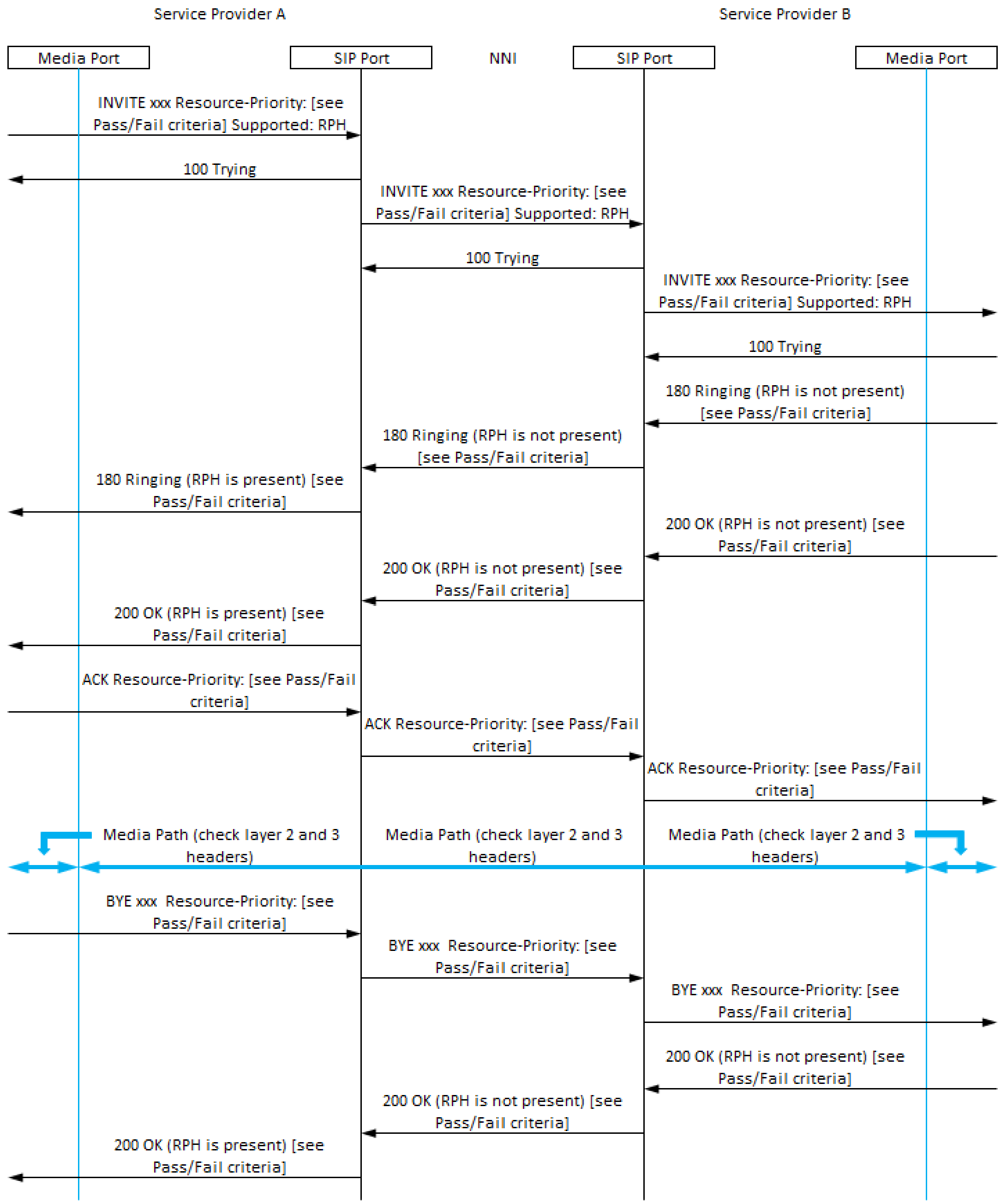
messages forwarded from Service Provider A toward the UE in Service Provider B should have the RPH field unchanged. SIP messages originated from Service provider B should not contain the RPH.

This test verifies the following requirements for Service Provider A:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010	1a, 1b, 1c, 3*, 4	A.1
ATIS-1000023.a	200*, 400, 500, 800 (INVITE, ACK, BYE), 1000, 2100*, 2200*, 2300*, 2400*, B100, B200*, B300	A.2
ATIS-1000011	10, 11	A.3
ATIS-1000020	12	A.3

* NOTE: These requirements can only be verified if packets are probed at reference points “B” and “C”.

8.4.1.1.5 Message Flows



8.4.1.1.6 Trace Captures

Capture the following traces:

- The signaling traffic across the NNI.
- The media traffic across the NNI.

8.4.1.1.7 Known Issues

None.

8.4.1.2 Test Case 3-2: ETS Call Forward Unconditional (CFU)

8.4.1.2.1 Purpose

Verify that when Service Provider A is ATIS ETS compliant and Service Provider B is not ATIS ETS compliant that:

- The ATIS ETS compliant Service Provider recognizes and acts upon ETS information to establish a priority call across the NNI; and
- The non ATIS ETS compliant Service Provider accepts ETS information transparently from the NNI and allows the GETS call to be established.

User A is in the Service Provider A domain. Users B1 and B2 are in the Service Provider B domain. User B1 configures CFU to User B2.

User A places a call to User B1. Service Provider B forwards the call to User B2.

8.4.1.2.2 Test Setup & Procedure

1. Complete the Layer 2 and 3 Marking Verification Task – i.e., ETS markings for Service Provider A but normal, non-ETS markings for Service Provider B.
2. Configure UE(B1) to have calls to it unconditionally forwarded to UE(B2).
3. Generate an ETS call from the UE(A) in Service Provider A’s network to UE(B1) in Service Provider B’s network.
4. The call should be forwarded to UE(B2)
5. Have UE(B2) answer the call.
6. Have a voice conversation.
7. Have UE(A) hang up the call.
8. Capture the signaling and bearer traffic associated with the call.

8.4.1.2.3 Observable Results

The call should be established, voice traffic should occur between the endpoints, and the call should be torn down.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the bearer traffic will be captured and analyzed for the NNI leg of the call.

8.4.1.2.4 Pass/Fail Criteria

To pass this test case, the following criteria shall be met:

- The call should be successfully established and torn down. The SIP message formats and the layer 2 and layer 3 markings associated with the call should conform to the values identified for the test. That is, the messages associated with the GETS call sent by the Service Provider A network should receive layer 2 and layer 3 markings that indicate priority treatment. The messages associated with the GETS call sent by the Service Provider B network should receive layer 2 and layer 3 markings that indicate normal, non-priority treatment.

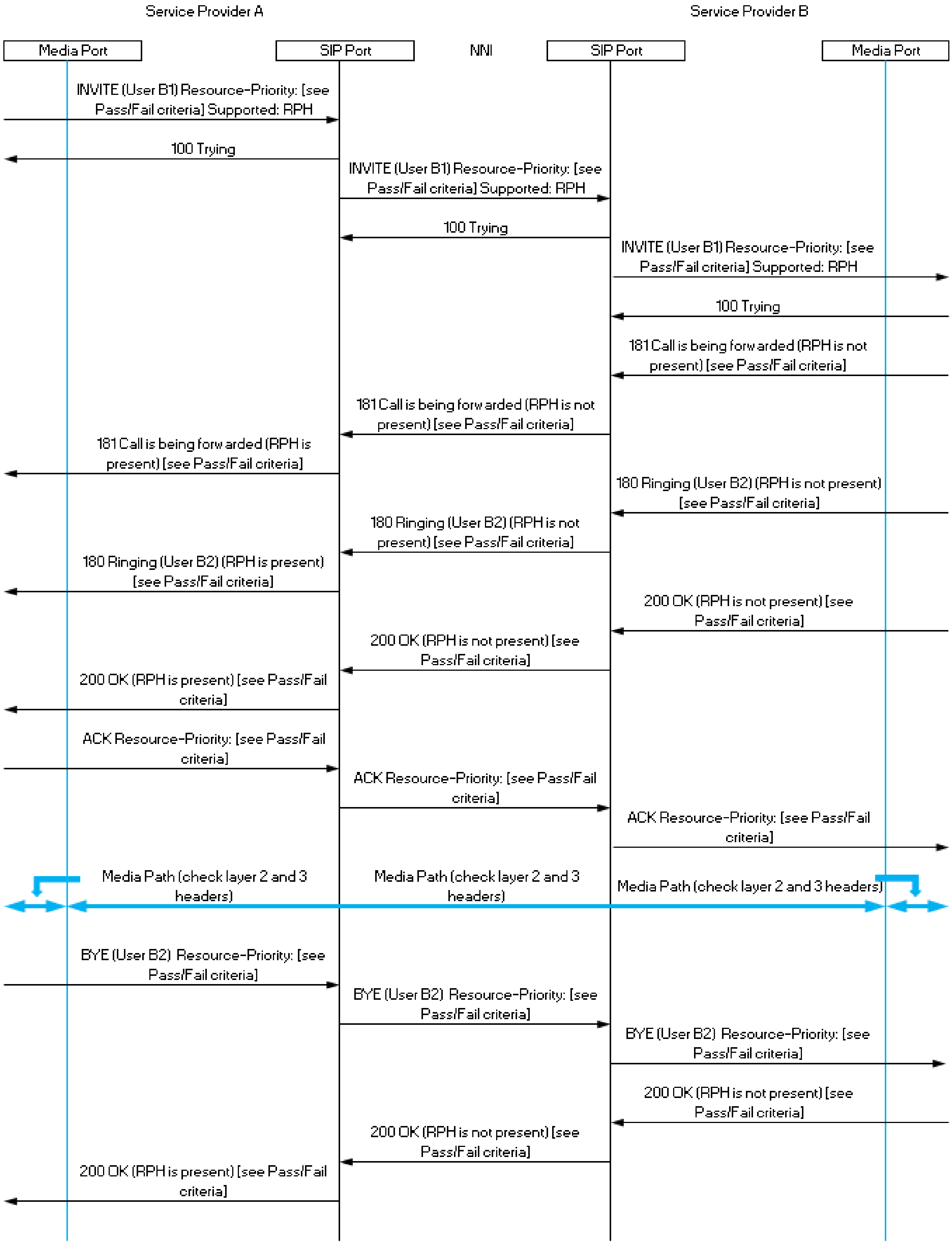
- The initial INVITE request should contain the Supported header field with the "resource-priority" option tag.
- *NGN GET-AN*: Service Provider A SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is the UE's subscribed to priority level. Service Provider B SIP messages forwarded from Service Provider A toward the UE in Service Provider B should have the RPH field unchanged. SIP messages originated from Service provider B should not contain the RPH.
- *NGN GET-FC*: Service Provider A SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.0, wps.y, where y is the UE's subscribed to priority level. Service Provider B SIP messages forwarded from Service Provider A toward the UE in Service Provider B should have the RPH field unchanged. SIP messages originated from Service provider B should not contain the RPH.

This test verifies the following requirements for Service Provider A:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010	1a, 1b, 1c, 3*, 4	A.1
ATIS-1000023.a	200*, 400, 500, 800 (INVITE, ACK, BYE), 1000, 2100*, 2200*, 2300*, 2400*, B100, B200*, B300	A.2
ATIS-1000011	10, 11	A.3
ATIS-1000020	12	A.3

*NOTE: These requirements can only be verified if packets are probed at reference points "B" and "C".

8.4.1.2.5 Message Flows



8.4.1.2.6 Trace Captures

Capture the following traces:

- The signaling traffic across the NNI.
- The media traffic across the NNI.

8.4.1.2.7 Known Issues

None.

8.4.2 Terminated NGN GETS-AN Calls/Sessions

8.4.2.1 Test Case 4-1: Basic ETS Call Completion

8.4.2.1.1 Purpose

Verify that when Service Provider A is ATIS ETS compliant and Service Provider B is not ATIS ETS compliant that:

- The non ATIS ETS compliant Service Provider establishes a NGN GETS-AN call from a UE across the NNI;
- The non ATIS ETS compliant Service Provider accepts ETS information transparently from the NNI and allows the NGN GETS call to be established; and
- The ATIS ETS compliant Service Provider recognizes and acts upon ETS information to accept a priority call across the NNI.

8.4.2.1.2 Test Setup & Procedure

1. Complete the Layer 2 and 3 Marking Verification Task – i.e., ETS markings for Service Provider A but normal, non-ETS markings for Service Provider B.
2. Generate an ETS call from the UE(B) in Service Provider B’s network to UE(A) in Service Provider A’s network.
3. Have UE(A) answer the call.
4. Have a voice conversation.
5. Have UE(B) hang up the call.
6. Capture the signaling and bearer traffic associated with the call.

8.4.2.1.3 Observable Results

The call should be established, voice traffic should occur between the endpoints, and the call should be torn down.

The SIP message formats for the call will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the signaling messages will be captured and analyzed for the NNI leg of the call.

The Layer 2 and Layer 3 markings for the bearer traffic will be captured and analyzed for the NNI of the call.

8.4.2.1.4 Pass/Fail Criteria

To pass this test case, the following criteria shall be met:

- The call should be successfully established and torn down. The SIP message formats and the layer 2 and layer 3 markings associated with the call should conform to the values identified for the test. That is, the messages associated with the GETS call sent by the Service Provider A network should receive layer 2 and layer 3 markings that indicate priority treatment. The messages associated with the GETS call sent by the Service Provider B network should receive layer 2 and layer 3 markings that indicate normal, non-priority treatment.

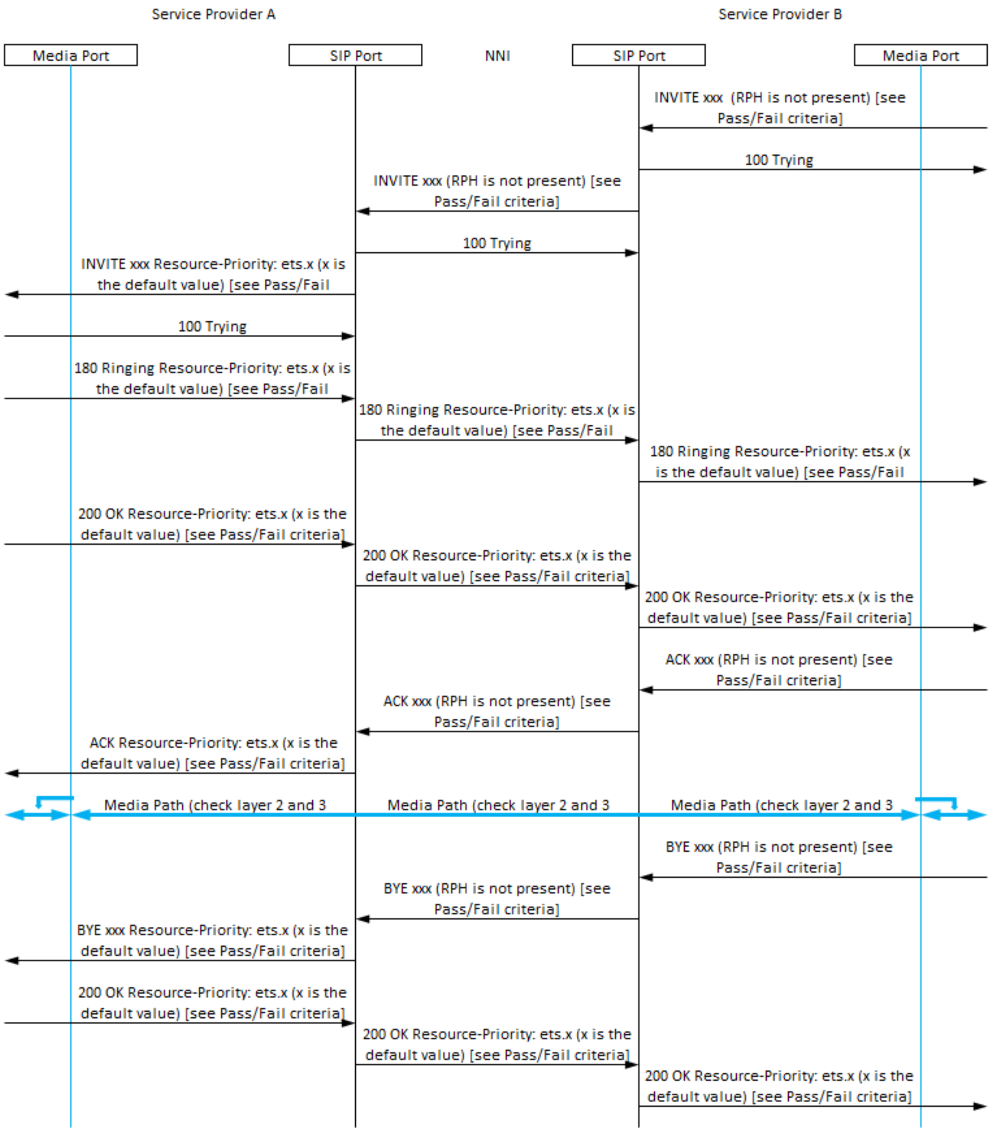
- *NGN GETS-AN*: Service Provider A SIP messages should contain the RPH and should have the RPH set to Resource-Priority: ets.x, where x is the default value (e.g. ets.0). Service Provider B SIP messages forwarded from Service Provider A toward the UE in Service Provider B should have the RPH field unchanged. SIP messages originated from Service provider B should not contain the RPH.

This test verifies the following requirements for Service Provider A:

Requirement Document	Requirement Number	Refer to Appendix
ATIS-1000010	3*, 4	A.1
ATIS-1000023.a	200*, 400, 500, 900 (180 Ringing, 200 OK), 2100*, 2200*, 2300*, 2400*, B100, B200*, B300	A.2
ATIS-1000011	10, 11	A.3
ATIS-1000020	12	A.3

*NOTE: These requirements can only be verified if packets are probed at reference points “B” and “C”.

8.4.2.1.5 Message Flows



8.4.2.1.6 Trace Capture

Capture traces:

- The signaling traffic across the NNI.
- The media traffic across the NNI.

8.4.2.1.7 Known Issues

None.

Appendix A
(Informative)

9 A Requirements to be Tested for ATIS-based ETS

This Appendix identifies the requirements applicable for IP NNI that are to be tested for ATIS-based ETS.

A.1 [ATIS-1000010]

The following are requirements in [ATIS-1000010] that should be tested for ETS support across IP Network-to-Network Interconnection.

#	Requirement	Reference section	Reference Test
1	The following SIP messages SHALL contain an RPH for recognized ETS calls/sessions:	[ATIS-1000010 Section 5.2.2]	
1a	• INVITE [RFC 3261]		1-1, 1-2, 1-11, 1-3, 1-4, 2-1, 3-1, 3-2
1b	• ACK [RFC 3261]		1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1, 3-2
1c	• BYE [RFC 3261]		1-1, 1-2, 1-11, 2-1, 3-1, 3-2
1d	• CANCEL [RFC 3261]		1-4
1e	• INFO [RFC 2976]		1-2
1f	• MESSAGE [RFC 3428]		(Note 1)
1g	• NOTIFY [RFC 3265]		(Note 1)
1h	• OPTIONS [RFC 3261]		(Note 2)
1i	• PRACK [RFC 3262]		1-3
1j	• PUBLISH [RFC 3903]		(Note 1)
1k	• REFER [RFC 3515]		(Note 1)
1l	• REGISTER [RFC 3261]		(Note 3)
1m	• SUBSCRIBE [RFC 3265]		(Note 1)
1n	• UPDATE [RFC 3311]		1-3
2	The RPH shall also be contained in 1xx, 2xx, 3xx, 4xx, 5xx, and 6xx responses associated with recognized ETS calls/sessions, with the exception of 401, “unauthorized”.	[ATIS-1000010 Section 5.2.2]	(Note 4)

#	Requirement	Reference section	Reference Test
3	The following actions are taken at the IP-IP Session Border Control function (border CCFE and BFE of IP Core 2): a. The call is identified as an ETS call, resulting in priority call processing, by the presence of an ETS-DN in R-URI and/or RPH with ets namespace. b. If there is not a trust relationship between IP core 1 and IP core 2, validation of the identity of the far end sending network occurs prior to proceeding with priority call processing. c. Based on policy: • If no RPH is present, an RPHmay be populated with an ets namespace, with a priority level value of Default (DF). • If an RPH is present with an ets namespace, the priority level value may be reset to the DF. d. The packets are priority marked, as defined in [ATIS-1000010 Section 8], and transmitted toward the IP backbone, resulting in the packets receiving the highest priority treatment on access to the IP backbone and in the IP backbone.	[ATIS-1000010 Section 5.4.2.3]	1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1*, 3-2*, 4.1*
4	The presence of an ets namespace in the RPH will result in priority handling which includes priority packet marking resulting in the packets having the highest access to the IP backbone, and highest priority route in the IP backbone.	[ATIS-1000010 Section 8]	1-1, 1-2, 1-3, 1,4, 1-11, 2-1, 3-1, 3-2, 4-1

NOTE 1: MESSAGE, NOTIFY, PUBLISH, REFER, and SUBSCRIBE SIP messages are not used for basic voice services. They are not tested in this issue of the document.

NOTE 2: SIP Options out of dialog is not used on the NNI.

NOTE 3: SIP registration occurs before GETS authentication; therefore, ETS requirements for RPH support in REGISTER messages are not applicable.

NOTE 4: This requirement is inconsistent with <VoIP-GEN-SIP-00900> from ATIS-100023. For the purposes of this document, the requirements in <VoIP-GEN-SIP-00900> are applicable.

*NOTE: For this test case, these requirements can only be verified if packets are probed at reference points “B” and “C”.

A.2 [ATIS-1000023] and [ATIS-1000023.a]

The following are requirements specified in [ATIS-1000023] Section 6.1 and [ATIS-1000023.a] to be tested for ETS across IP Network-to-Network Interconnection:

#	Requirement	Reference Test
	The following related to the general handling of SIP with RPH headers as specified in [ATIS-100023 Section 6.1] and [ATIS-1000023.a] are applicable:	
100	<VoIP-GEN-SIP-00100>: The SIP RPH capability shall be configurable as either enabled or disabled. The default is disabled.	1-5
200	<VoIP-GEN-SIP-00200>: An enabled SIP RPH capable VoIP NE (RPH VoIP NE) shall receive and act upon the SIP RPH header as specified in the NE specific requirements for that NE.	1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1*, 3-2*, 4-1*
300	<VoIP-GEN-SIP-00300>: If a VoIP NE does not understand or process (e.g., the SIP RPH capability is disabled) the RPH field in a request or response, the VoIP NE shall ignore that header field, continue processing the message, and propagate the RPH unchanged.	1-5

<table>
<tr><th>#</th><th colspan="2">Requirement</th><th>Reference Test</th></tr>
<tr><td>400</td><td colspan="2"><VoIP-GEN-SIP-00400>: An enabled SIP RPH capable VoIP NE shall format the Resource Priority Header field as follows:
Resource-Priority: namespace1.value1, namespace2.value2, …
or
Resource-Priority: namespace1.value1
Resource-Priority: namespace2.value2
...
or
Resource-Priority: namespace1.value1, namespace3.value3
Resource-Priority: namespace2.value2, ...
...</td><td>1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1, 3-2</td></tr>
<tr><td>500</td><td colspan="2"><VoIP-GEN-SIP-00500>: A particular namespace shall NOT appear more than once in the same SIP message.</td><td>1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 2-2, 3-1, 3-2</td></tr>
<tr><td>600</td><td colspan="2"><VoIP-GEN-SIP-00600>: For the ETS service, an ets namespace shall be present, with or without a wps namespace. The presence of a wps namespace without an ets namespace shall be processed as an error.</td><td>2-2</td></tr>
<tr><td>700</td><td colspan="2"><VoIP-GEN-SIP-00700>: An enabled SIP RPH capable VoIP NE shall be able to generate the Accept-Resource-Priority header. The Accept-Resource-Priority field shall have the form:
Accept-Resource-Priority: namespace1.value1, namespace1.value2, …
NOTE: The 'Accept-Resource-Priority' response header field enumerates the resource values (r-values) a SIP user agent server is willing to process.</td><td>2-5</td></tr>
<tr><td>800</td><td colspan="2"><VoIP-GEN-SIP-00800>: For recognized ETS calls, an enabled SIP RPH capable VoIP NE shall insert the RPH into the following SIP messages: INVITE, ACK, BYE, CANCEL, INFO, PRACK, REFER, UPDATE.</td><td>1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1, 3-2
(Note 1)</td></tr>
<tr><td rowspan="6">900</td><td rowspan="6"><VoIP-GEN-SIP-00900>: For recognized ETS calls, an enabled SIP RPH capable VoIP NE shall insert the RPH in 1xx, 2xx, 3xx, 4xx, 5xx, and 6xx responses it sends, with the exception of 100 (“trying”) responses and a 403 (“forbidden”) message as specified in < VoIP-GEN-SIP-00130>. For messages associated with error conditions (e.g., 400 error messages with a 417 reason code, 417 messages, and 420 messages), the RPH shall carry only the ets.x. The RPH shall be inserted even if the received response from an upstream network element may not include an RPH.</td><td>1xx</td><td>1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 4-1</td></tr>
<tr><td>2xx</td><td>1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 4-1</td></tr>
<tr><td>3xx</td><td>1-7</td></tr>
<tr><td>4xx</td><td>1-5</td></tr>
<tr><td>5xx</td><td>1-7</td></tr>
<tr><td>6xx</td><td>1-7</td></tr>
<tr><td>1000</td><td colspan="2"><VoIP-GEN-SIP-01000> [ATIS-1000023.a]: An enabled SIP RPH capable VoIP NE shall send the 'Supported' header field with the 'resource-priority' option tag in an initial SIP request.
Due to potential interoperability problems it is not recommended to send the 'Required' header field with the 'resource-priority' option tag.</td><td>1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1, 3-2</td></tr>
<tr><td>1100</td><td colspan="2"><VoIP-GEN-SIP-01100>: A VoIP NE shall be able to receive a 182 (Queued) response from a VoIP NE that is currently at capacity, but that has put the original request into a queue.</td><td>(Note 2)</td></tr>
</table>

#	Requirement	Reference Test
1200	<VoIP-GEN-SIP-01200>: When an enabled SIP RPH capable VoIP NE receives a 417 (Unknown Resource Priority) response or a 420 (Bad Extension) response with an “Unsupported: resource-priority” to the initial SIP request with the 'Require' header field (including the “resource-priority” option tag) and the ets namespace, the enabled SIP RPH capable VoIP NE shall: 1. Log the request and response as an error condition: 2. Attempt to send the request to the next VoIP NE in the route list; and 3. If all attempts receive a 417 response, the enabled SIP RPH capable VoIP NE shall resend the request without the 'Require' header field, but with a 'Supported' header field with the 'resource-priority' option tag. NOTE: This requirement should be clarified to indicate that item 2 does not apply for the 417 message.	1-6
1300	<VoIP-GEN-SIP-01300> [ATIS-1000023.a]: For an enabled SIP RPH capable VoIP NE, the use of the 'resource-priority' option tag with the 'Require' header field shall be configurable (i.e., enabled or disabled), with a default setting of disabled. NOTE: According to RFC 3261, if a 420 (Bad Extension) response is received, the sending NE may retry the request, omitting any extensions listed in the Unsupported header field in the response. Removal of the Resource-Priority header will cause the request to be treated as a normal call at all downstream NEs. Thus it is desirable that service providers analyze 420 responses received by an NE and configure the “route list” at that NE so that these routes are the last to be attempted.	1-5
1400	<VoIP-GEN-SIP-01400>: When an enabled SIP RPH capable VoIP NE receives a request with an RPH with multiple instances of the ets namespace (e.g., Resource-Priority: ets.0, ets.2), it shall: 1. Log the header as an error condition; and 2. Reject the request with a 400 (Bad Request) response with a 417 code in the Reason header field. The response shall use the ets namespace with the DF value.	2-2 (Note 3) (Note 4)
1500	<VoIP-GEN-SIP-01500>: When an enabled SIP RPH capable VoIP NE receives a request with an RPH with multiple instances of the wps namespace (e.g., Resource-Priority: ets.0, wps.2, wps.4), it shall: 1. Log the header as an error condition; and 2. Reject the request with a 400 (Bad Request) response with a 417 code in the Reason header field. The response shall use the ets namespace with the DF value.	2-2 (Note 3) (Note 4)
1600	<VoIP-GEN-SIP-01600>: When an enabled SIP RPH capable VoIP NE receives a request with an RPH with an invalid ets resource value (e.g., Resource-Priority: ets.7), it shall: 1. Log the header as an error condition; and 2. Reject the request with a 400 (Bad Request) response with a 417 code in the Reason header field. The response shall use the ets namespace with the DF value.	2-2 (Note 3) (Note 4)
1700	<VoIP-GEN-SIP-01700>: When an enabled SIP RPH capable VoIP NE receives a request with an RPH with an invalid wps resource value (e.g., Resource-Priority: ets.0, wps.9), it shall: 1. Log the header as an error condition; and 2. Reject the request with a 400 (Bad Request) response with a 417 code in the Reason header field. The response shall not use the ets namespace with the DF value.	2-2 (Note 3) (Note 4)
1800	<VoIP-GEN-SIP-01800>:When an enabled SIP RPH capable VoIP NE receives a request with an RPH with a wps resource value and no ets resource value (e.g., Resource-Priority: wps.4), it shall: 1. Log the header as an error condition; and 2. Reject the request with a 400 (Bad Request) response with a 417 code in the Reason header field. The response shall use the ets namespace with the DF value.	2-2 (Note 3) (Note 4)

#	Requirement	Reference Test
1900	<VoIP-GEN-SIP-01900> When an enabled SIP RPH capable VoIP NE receives a 400 (Bad Request) response with a 417 code in the Reason header field, the enabled SIP RPH capable VoIP NE shall be configurable to: 1. Reject the call; or 2. Resend the call without the ets and wps namespaces, preserving the other namespaces in the RPH; or 3. Resend the call with a single copy of ets.DF, removing the wps namespace if present, and preserving the other namespaces in the RPH. The default action is to resend the call with a single copy of ets.DF, removing the wps namespace if present, and preserving the other namespaces in the RPH.	1-8
2000	<VoIP-GEN-SIP-02000>: Upon completion of one of the actions in Requirement VoIP-GEN-SIP-01900, the VoIP NE shall log the request and response as an error condition	1-8
2100	<VoIP-GEN-SIP-02100>: An enabled SIP RPH capable VoIP NE receiving a SIP message with an RPH shall propagate the RPH in the message and shall insert the RPH in each response it generates to the received message. The exceptions to this requirement are the 100 and 403 responses, which do not have an RPH.	1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1*, 3-2*, 4-1*
2200	<VoIP-GEN-SIP-02200>: An enabled SIP RPH capable VoIP NE receiving a SIP response with an RPH shall propagate the RPH in the response and shall insert the RPH in new messages it generates associated with this session.	1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1*, 3-2*, 4-1*
2300	<VoIP-GEN-SIP-02300>: For recognized ETS calls/sessions, an enabled SIP RPH capable VoIP NE shall receive and provide priority treatment based on the RPH contained in the following SIP messages: INVITE, ACK, BYE, CANCEL, INFO, PRACK, REFER, UPDATE.	1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1*, 3-2*, 4-1* (Note 1)
2400	<VoIP-GEN-SIP-02400>: An enabled SIP RPH capable VoIP NE shall also receive and provide priority treatment for the 1xx, 2xx, 3xx, 4xx, 5xx, and 6xx responses for recognized ETS calls (sessions), except for 100 and 403 responses. This includes the case where the upstream network element may not respond with an RPH included.	1-1, 1-2, 1-3, 1-4,1-7 (3xx, 5xx, 6xx) 1-11, 2-1, 3-1*, 3-2*, 4-1*
2500	<VoIP-GEN-SIP-02500>: When an enabled SIP RPH capable VoIP NE receives an ACK, BYE, CANCEL, INFO, PRACK, REFER, UPDATE or a response with an ets RPH for a non-recognized ETS call/session (i.e., the INVITE did not have an ets namespace or an ETS-DN), the enabled SIP RPH capable VoIP NE shall: 1. Log the message as an error condition; 2. Use neither the ets nor wps namespaces in messages and responses associated with this session; and 3. Process the messages and responses as for a normal call.	2-3 (ACK) 2-4 (UPDATE) 1-9 (200 OK) (Note 1) (Note 5)
2600	A. <VoIP-GEN-SIP-02600>: If an enabled SIP RPH capable VoIP NE does not understand any of the resource values in the request, the treatment depends on the presence of the 'Require' 'resource-priority' option tag:	
	1. Without the option tag, the enabled SIP RPH capable VoIP NE shall treat the request as if it contained no 'Resource-Priority' header field and processes the request as a normal call/session. Resource values that are not understood shall NOT be modified or deleted. Resource values that are understood to be in error shall be handled as specified in <VoIP-GEN-SIP-01400> thru <01800>.	2-5
	2A. With the option tag, it shall reject the request with a 417 (Unknown Resource-Priority) response code. A 417 (Unknown Resource-Priority) response MAY, if specified according to local policy, include an 'Accept-Resource-Priority' header field enumerating the acceptable resource values. 2B. Sending the 'Accept-Resource-Priority' header field with an Unknown Resource-Priority (417) response shall be configurable (enabled or disabled), with a default value of disabled.	2-5
	B. If a VoIP NE receives a SIP request containing the 'Require' header field with the 'resource-priority' option tag, there are three possible responses:	

#	Requirement	Reference Test
	1. Following standard SIP behavior, if a SIP request contains the 'Require' header field with the 'resource-priority' option tag, a SIP user agent shall respond with a 420 (Bad Extension) if it does not support the SIP RPH extension. It then lists "resource-priority" in the 'Unsupported' header field included in the response.	2-5
	2. If the NE is an enabled SIP RPH capable VoIP NE, but does not understand any of the namespaces, then it shall reject the request with a 417 (Unknown Resource-Priority) response code. Namespaces that are understood to be in error (e.g., incorrect syntax) shall be handled as specified in Requirement <VoIP-GEN-SIP-01400> thru <01800>.	2-5
	3. If the NE is an enabled SIP RPH capable VoIP NE, understands the ets namespace, and the namespace syntax is correct, it shall process the SIP request in accordance with the requirements found in this document.	(Note 6)
2700	<VoIP-GEN-SIP-02700>: If a SIP request fails because an enabled SIP RPH capable VoIP NE cannot handle the signaling load, the NE shall return a 503 (Service Unavailable) response. The response shall include a Reason Header Q.850 value of 42 (switching equipment congestion).	(Note 2)
2800	<VoIP-GEN-SIP-02800>: When a call request arrives at an enabled SIP RPH capable VoIP NE that is unable to accept the call (e.g., due to processor resource constraints), the UAS shall return a 503 (Service unavailable) response. This response shall include a Reason Header Q.850 value of 42 (switching equipment congestion).	(Note 2)
2900	<VoIP-GEN-SIP-02900>: If an enabled SIP RPH capable VoIP NE gets 486 (Busy Here) responses on all branches, as identified by the branch parameter in the Via Header, and has exhausted all available call treatments, it shall then return a 600 (Busy Everywhere) response to the caller. The response shall include a Reason Header Q.850 value of 17 (user busy). NOTE: This should be studied to determine whether only a 486 should be returned.	1-10
3000	<VoIP-GEN-SIP-03000>: An enabled SIP RPH capable VoIP NE shall not change the Unsupported header value for RP. NOTE: If an NE receives a 503, it attempts the request to the next VoIP NE in the route list. Though this is correct SIP behavior, it needs to be validated in the architecture.	1-6
3100	<VoIP-GEN-SIP-03100>: An enabled SIP RPH capable VoIP NE shall be configurable on a per-UNI and per-NNI basis to either: 1. Use the ets resource value received across an IP UNI or an IP NNI in requests it sends into the network; or 2. Reset the received ets resource value to the DF resource value for requests sent into the network.	1-5
3200	<VoIP-GEN-SIP-03200>: Each IP UNI and NNI on SIP RPH capable VoIP NE shall be configurable to accept or reject a SIP INVITE with the ets RPH and a normal (non-ETS-DN) destination number. The default shall be to reject the SIP INVITE. It is recommended that the reject be a 403 (Forbidden) response with two reason header fields: (1) a 417 (RPH header) code for SIP; and (2) a Reason Header Q.850 value of 21 (call rejected). Note that the 403 response shall not contain the ets RPH header. If the UNI or NNI is provisioned to accept an ets RPH, then <VoIP-GEN-SIP-03100> shall apply. NOTE: <VoIP-GEN-SIP-03200> refers specifically to a SIP INVITE and not to other messages associated with a session. <VoIP-GEN-SIP-02500> handles the case for an ets Resource-Priority header in other messages.	1-5

NOTE 1: MESSAGE, NOTIFY, PUBLISH, REFER, and SUBSCRIBE SIP messages are not used for basic voice services. They are not tested in this issue of the document.

NOTE 2: Loading an NE to capacity is beyond the scope of this test plan.

NOTE 3: Requirements <VoIP-GEN-SIP-01400> through <VoIP-GEN-SIP-01800> are defined in support of the NEs only recognizing and acting upon the ets and wps namespace.

NOTE 4: An NE needs to identify only one error associated with the ets and wps namespaces, and not all errors. This is so the NE does not send back multiple 400 responses, one for each error discovered. The log will contain the complete header, which can be analyzed later.

NOTE 5: BYE and CANCEL are not critical and will not be tested for this requirement in this issue of the document.

NOTE 6: This requirement is not tested since [ATIS-1000023.a] states in requirement <VoIP-GEN-SIP-01000> that "Due to potential interoperability problems it is not recommended to send the 'Required' header field with the 'resource-priority' option tag."

* NOTE: For this test case these requirements can only be verified if packets are probed at reference points "B" and "C".

The following are requirements specified in [ATIS-1000023] Section 6.3 to be tested for ETS across IP Network-to-Network Interconnection:

#	Requirement	Reference Test
	The following related to IP Border Element requirements as specified in [ATIS-100023 Section 6.3] are applicable:	
B100	<VoIP-IPBE-SIP-00100>: Upon receipt of an SIP INVITE with To Header =ETS DN, for subsequent SIP messages in response to the INVITE, the IPBE shall create the RPH with an ets namespace. The ets value shall have a default value; the default value shall be configurable. An ETS DN is a provisionable parameter provisioned against dialable numbers in the appropriate translation tables.	1-1, 1-2, 1-3, 1-4, 1-5, 1-11, 2-1, 3-1, 3-2*, 4-1*
B200	<VoIP-IPBE-SIP-00200>: VoIP IPBEs that have implemented VoIP ETS priority treatment features shall trigger these features based upon the receipt of RPH=ets.x and/or a SIP INVITE with To header = ETS-DN. An IPBE NE shall recognize an incoming ETS call by: a. The presence of a valid RPH of ets.x; and/or b. The presence of an ETS-DN (e.g., 710-NXX-XXXX). At a minimum, 10 ETS-DNs shall be configurable or provisionable. A DN can be a partial string (e.g., 710) or a complete number (e.g., 710 NCS GETS). Matching of the ETS-DNs shall start with the leading digit of the received called number.	1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1*, 3-2*, 4-1*
B300	<VoIP-IPBE-SIP-00300>: A request received with an ETS-DN is assumed to be an ETS (NS/EP) call, and the device shall provide NS/EP treatment to the call. The IPBE may set or modify the values associated with the ets and wps namespaces, based on provisionable parameters.	1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1, 3-2*, 4-1*
B400	<VoIP-IPBE-SIP-00400>: The IPBE shall be configurable to accept or reject a SIP INVITE with the ets RPH and a normal (non-ETS-DN) destination number on a per interface basis. The default shall be to reject the SIP INVITE. It is recommended that the reject be a 403 (Forbidden) response with two reason header fields: (1) a 417 (RPH header) code for SIP; and (2) a Reason Header Q.850 value of 21 (call rejected). Note that the 403 response shall not contain the ets RPH header.	1-5

* NOTE: For this test case these requirements can only be verified if packets are probed at reference points "B" and "C".

A.3 [ATIS-0100011] and [ATIS-1000020]

The unique markings use at the IP and transport layers to differentiate ETS signaling from non-ETS signaling are based on the SLA for the NNI interface. Such markings may include a unique COS value or VLAN identifier at layer 2, and a unique DSCP or MPLS identifier at layer 3 based on the SLA for the NNI interface.

#	Requirement	Reference Section	Reference Test
10	[ATIS-0100011] indicates that priority enabling mechanisms in IP and transport layers should be able to recognize and signal “High” priority values of incoming ETS calls/session and provide appropriate action.	[ATIS-0100011]	1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1, 3-2, 4-1
11	[ATIS-1000011] recommends assignment of a local DiffServ Code Point (DSCP) to ETS VoIP service based on SLA at NNI interfaces between public domain carriers. [ATIS-1000011] also indicates that this recommendation should be adopted as part of the interconnection agreements between public domain service providers to define how DiffServ PHB Code Points will be applied to ETS and non-ETS VoIP calls at NNI.	[ATIS-1000011]	1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1, 3-2, 4-1
12	[ATIS-1000020 Section 6] provides requirements that shall be met for the purpose of admitting High Priority ETS VoIP. [ATIS-1000020 Section 8] indicates that critical communications requirements of ETS VoIP calls can be met by assigning them to a separate class of traffic with a unique EF DiffServ Code Point (DSCP).	[ATIS-1000020 Section 6] [ATIS-1000020 Section 8]	1-1, 1-2, 1-3, 1-4, 1-11, 2-1, 3-1, 3-2, 4-1

Appendix B

(Informative)

10 B. Template for ETS Data Collection Questionnaire

This Appendix provides a template for an ETS data collection questionnaire for the IP NNI.

B.1 Introduction

It is assumed that the interconnected carriers will exchange with each other on a bi-lateral basis the unique markings use to differentiate ETS traffic from non-ETS traffic on the IP NNI (e.g., unique COS value or VLAN identifier at layer 2, and unique DSCP or MPLS identifier at layer 3). This section provides a template for an ETS data collection questionnaire.

B.2 Questionnaire Template

B.2.1 ETS Support

Does the IP NNI support ETS according to ATIS standards?

Carrier A	Yes	☐	No	☐
Carrier B	Yes	☐	No	☐

If no, it is assumed that the interconnected carrier will receive and transparently pass ETS signaling information (i.e., SIP RPH). If this is not the case, indicate restrictions that apply for the IP NNI.

B.2.2 ETS Authentication and Authorization

Does the IP NNI support routing of ETS call/session for authentication and authorization? For example, indicate whether unauthenticated ETS call/session requests can be forwarded across the IP NNI for authentication and authorization.

Carrier A	Yes	☐	No	☐
Carrier B	Yes	☐	No	☐

B.2.3 Layer 3 ETS Signaling Markings

Is any unique marking or scheme used to differentiate ETS signaling traffic from non-ETS signaling traffic on the IP NNI at layer 3? If yes, indicate the unique marking or scheme used at layer 3 (e.g., DSCP or MPLS identifier).

Carrier A	Yes	☐	No	☐	Marking/Scheme:	
Carrier B	Yes	☐	No	☐	Marking/Scheme:	

B.2.4 Layer 2 ETS Signaling Markings

Is any unique marking or scheme used to differentiate ETS signaling traffic from non-ETS signaling traffic on the IP NNI at layer 2? If yes, indicate the unique marking or scheme used at layer 2 (e.g., COS value or VLAN identifier).

Carrier A	Yes	☐	No	☐	Marking/Scheme:	
Carrier B	Yes	☐	No	☐	Marking/Scheme:	

B.2.5 Layer 3 ETS Bearer Packet Markings

Is any unique marking or scheme used to differentiate ETS bearer traffic from non-ETS bearer traffic on the IP NNI at layer 3? If yes, indicate the unique marking or scheme used at layer 3 (e.g., DSCP or MPLS identifier).

Carrier A	Yes	☐	No	☐	Marking/Scheme:	
Carrier B	Yes	☐	No	☐	Marking/Scheme:	

B.2.6 Layer 2 ETS Bearer Packet Markings

Is any unique marking or scheme used to differentiate ETS bearer traffic from non-ETS bearer traffic on the IP NNI at layer 2? If yes, indicate the unique marking or scheme used at layer 2 (e.g., COS value or VLAN identifier).

Carrier A	Yes	☐	No	☐	Marking/Scheme:	
Carrier B	Yes	☐	No	☐	Marking/Scheme:	