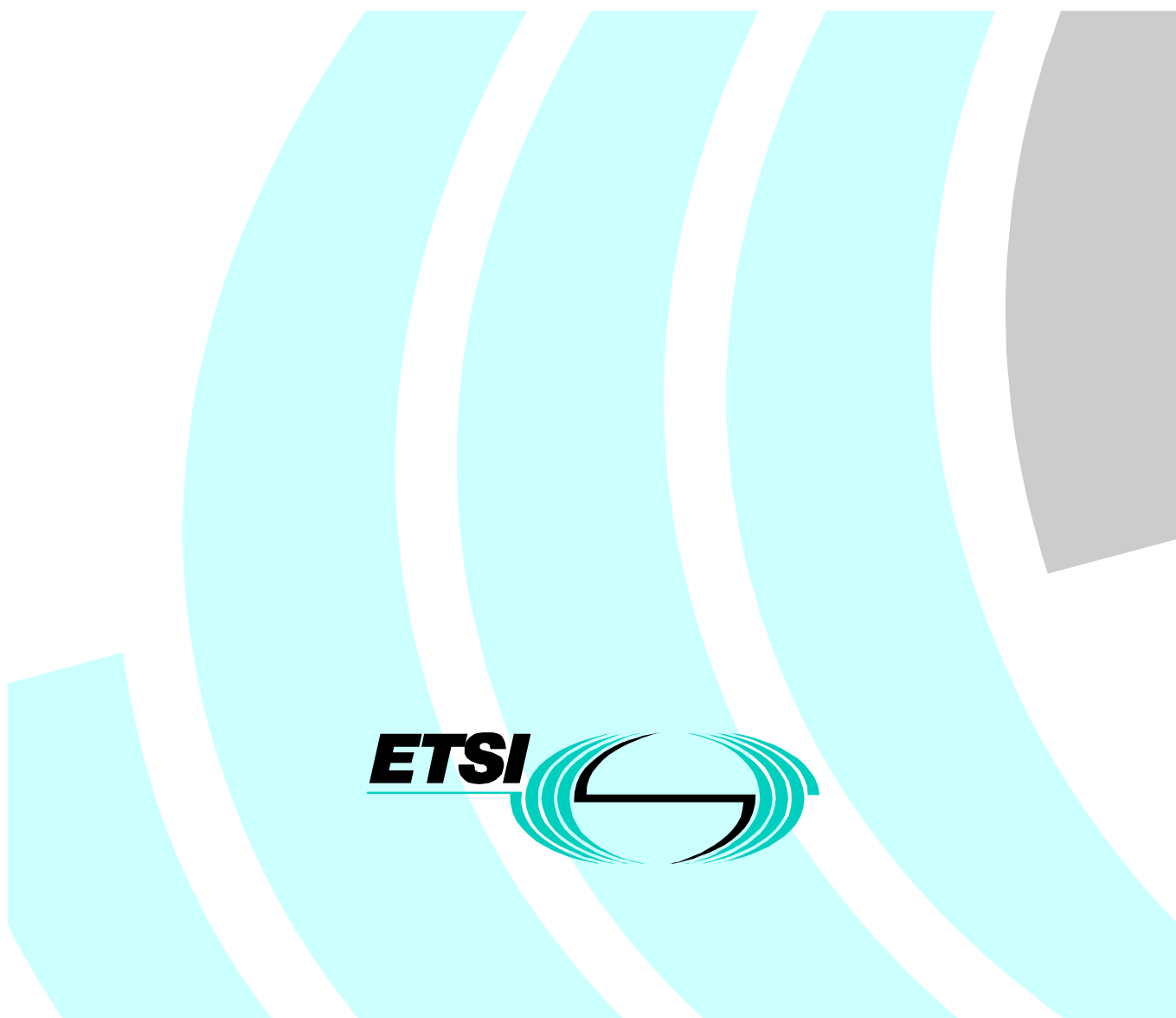# ETSI TS 101 335 V3.0.2 (2000-05)

Technical Specification

Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Test specifications; Version 3

ETSI

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Foreword

This Technical Specification (TS) has been produced by ETSI Project Telecommunications and Internet Protocol Harmonization over Networks (TIPHON).

Introduction

The present document describes interoperability and compatibility tests for H.323 [8] entities concerning the different TIPHON Scenarios. It is not intended to provide an exhaustive testing of all facets of H.323 and SCN operation. Specific configurations were chosen to provide coverage of the more common commercial deployments.

The test cases specified in this test plan shall be performed on many different platforms. Therefore, specific details on *how* to perform each test are not included, only instructions on *what* information shall be exchanged are included.

1   Scope

The scope of the present document is to define interoperability test specifications for the following scenarios:

- PC to PC;

- PC to Phone;

- Phone to PC;

- Phone to Phone using IP;

- PC to PC using the SCN.

2   References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

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

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1]   ETSI TS 101 319: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Signalling for basic calls from a H.323 terminal to a terminal in a Switched-Circuit Network (SCN)".

[2]   ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

[3]   ITU-T Recommendation G.711: "Pulse code modulation (PCM) of voice frequencies".

[4]   ITU-T Recommendation G.723.1 (1996): "Dual rate speech coder for multimedia communications transmitting at 5.3 and 6.3 kbit/sec".

[5]   ITU-T Recommendation G.729: "C source code and test vectors for implementation verification of the G.729 8 kbit/s CS-ACELP speech coder".

[6]   ITU-T Recommendation H.225.0: "Call signalling protocols and media stream packetization for packet-based multimedia communication systems".

[7]   ITU-T Recommendation H.245: "Control protocol for multimedia communication".

[8]   ITU-T Recommendation H.323: "Packet-based multimedia communications systems".

[9]   ETSI TS 101 321 (V1.4): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Inter-domain pricing, authorization and usage exchange".

[10]   ETSI TS 101 312 (V1.3): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Network architecture and reference configurations; Scenario 1".

[11]   ETSI TS 101 313: "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Network architecture and reference configurations; Phase II: Scenario 1 + Scenario 2".

[12]   ITU-T Recommendation G.728: "Coding of speech at 16 kbit/s using low-delay code excited linear prediction".

3 Abbreviations

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

A	Audio
ARQ	Admissions Request
ACF	Admissions Confirm
ARJ	Admissions Reject
D	Data
DRQ	Disengage Request
DTMF	Dual Tone Multi Frequency
IP	Internet Protocol
LRQ	Location Request
LCF	Location Confirm
QoS	Quality of Service
SCN	Switched Circuit Networks

4 Test Strategy

Interoperability testing should be performed after a vendor has completed product and system testing with its own test procedures. To progress interoperability testing, the vendor's test procedures should include those contained in the present document. The purpose of interoperability testing is to test compatibility with other products, which use the same TIPHON specifications.

5 Scoring

The present document has integrated the scoring sheets into the description of the call flow. To score a test simply fill in a ok in the succeed box, if this event did not occur put in a -. If this line is not applicable for the test just check n.a.

There will be electronic forms that automatically calculate the percentage of the successful executed parts of the test and the output will be a simple percentage value.

6 Overview

For setup of equipment, the present document uses a number of basic configurations. These are used to run a certain number of tests.

The basic configurations are:

1) Terminal <-> Terminal;

2) Telephone <-> Terminal;

3) Telephone <-> Telephone using IP as a transit Network;

4) Terminal to Terminal using SCN as a transit Network.

Using these test configurations a number of different tests are performed. For example a call first from the Telephone to the Terminal and then the other way around or using different codex.

These tests can include a variety of special features like FastConnect, H.245 tunnelling, security or QoS.

The number of Gatekeepers involved in these configurations depends on the actual executed test.

All the call flows shown in the tables are an example flows that should be followed if possible. In some cases not all the described messages occur.

7 Prerequisites

7.1 IP related

The following prerequisites are taken from TIPHON specifications:

- ITU-T Recommendation H.323 [8] and TS 101 319 [1] shall be used;

- ITU-T Recommendation H.225.0 [6] FastConnect shall be used for all calls;

- ITU-T Recommendation H.245 [7] Tunnelling shall be used whenever H.245 messages are exchanged;

- TS 101 321 [9] shall be used;

- Gatekeeper Routed Signalling is mandatory, Direct Routed Signalling is optional;

- Originating Terminals and Originating Gateways should always use ARQ (LRQ is optional);

- the Gatekeeper to register with, should be configured manually, using the IP-Address;

- H.323 Terminals shall register to the Gatekeeper using a E.164 [2] alias only;

- Gateways shall register to the Gatekeeper using Prefixes only;

- Endpoints shall support the **keep Alive** procedure as specified in subclauses 7.2.2 and 8.4.2 of ITU-T Recommendation H.323 [8];

- if Fast Connect procedure is used, the SETUP Message shall include the **fastStart** Parameter, and the fast parameter shall be returned in exactly one message including the CONNECT Message.

7.2 SCN related

To identify the different types of SCN interfaces the following shall be considered:

- TS 101 312 (V1.3) [10] (TIPHON Phase I, Scenario 1, Architecture) § 4.1 identifies 4 different reference points between IP Networks and SCN: E1 between GW and PSTN, E2 between GW and ISDN, E3 between GW and GSM and E4 between GW and PISN. All E Reference points may be User to Network interfaces (UNI) or Network to network interfaces (NNI).
  The TIPHON Phase II document (TS 101 313 [11]) identifies additionally for all types of SCN's a separation in an E.a reference point between Media Gateway and SCN and an E.b reference point between Signalling Gateway and SCN.

- If the SCN interface is an UNI interface, the gateway can play either the "role" of the user or of the network side.

- If the SCN interface is an (P)NNI interface, the gateway (or two gateways connected by the IP) can offer two types of services in principle:

  - Transparent transfer of SCN Signalling across IP connections.

  - Signalling interworking between SCN and IP "transit nodes".

  (P)NNI's are located between Originating, Transit and Terminating Network nodes.

- The testing of SCN behaviour at decomposited gateways requires the simultanious test at two different SCN interfaces, details are for further study.

8   Parameter for each test

There are some extra parameters that can be selected for each test:

8.1   Audio Codec

As TIPHON is not only focussing on the call establishment but also on the Media stream, the audio codec should be an extra parameter that should vary from test to test.

Here is a list of all Codec that are defined in ETSI TIPHON:

- ITU-T Recommendation G.711 [3];

- ITU-T Recommendation G.723.1 [4];

- ITU-T Recommendation G.728 [12];

- ITU-T Recommendation G.729 [5];

- GSM Full Rate;

- GSM Half Rate.

Which codec is selected should be specified prior to the test.

8.2   Number of intermediate Gatekeepers

All tests can be executed with one or more Gatekeepers. The Number of Gatekeepers is just another parameter for these tests.

The description has to be extended accordingly, if more than 2 Gatekeepers are involved.

If only one Gatekeeper is participating in a scenario, simply mark the not relevant lines of the table with n.a. in the succeeded column and simply ignore them.

9   Configurations

9.1   Terminal to Terminal

NOTE: Gatekeeper B is only present in specific test cases.

Figure 1: Terminal to Terminal
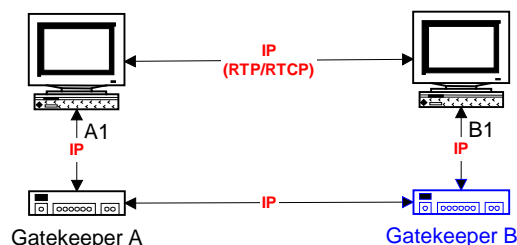
All tests can be executed with one or more Gatekeepers. The Number of Gatekeepers is just another parameter for these tests.

Direction	Description	Test Flow	Extra feature	Comment
A1 -> B1	Successful call	9.1.1	Fast connect	TIPHON Scenario 0
B1-> A1	Successful call	9.1.1	Fast connect	TIPHON Scenario 0
A1 -> B1	Successful call	9.1.3	Fast connect fallback	TIPHON Scenario 0
B1-> A1	Successful call	9.1.3	Fast connect fallback	TIPHON Scenario 0
A1 -> B1	Successful call	9.1.1	H.245 tunnelling	TIPHON Scenario 0
B1-> A1	Successful call	9.1.1	H.245 tunnelling	TIPHON Scenario 0
A1 -> B1	Successful call	9.1.4	H.245 tunnelling fallback	TIPHON Scenario 0
B1-> A1	Successful call	9.1.4	H.245 tunnelling fallback	TIPHON Scenario 0
A1 <-> B1	DTFM Tones	t.b.d	DTMF transmission	
A1 -> D	Basic **un**successful call	9.1.2		TIPHON Scenario 0
B1 -> D	Basic **un**successful call	9.1.2		TIPHON Scenario 0

9.1.1 Successful call from a H.323 Terminal to another H.323 Terminal

This test verifies the TIPHON Scenario-0 service where the Originating Terminal and the Terminating Terminal are registered with the same Gatekeeper or where the two Gatekeepers have a trusted relationship.

No.	Action	Succeeded
1	Both Terminal A1 and the Terminal B1 shall register with their respective Gatekeeper(s).	
2	Terminal A1 initiates a call using a E.164 address.	
3	Terminal A1 sends ARQ to Gatekeeper A.	
4	Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B. *	
5	Gatekeeper B returns LCF. *	
6	Gatekeeper A returns ACF.	
7	Terminal A1 sends SETUP its Gatekeeper (including fast connect options).	
8	Gatekeeper A forwards SETUP to Gatekeeper B. *	
9	Gatekeeper B forwards SETUP to Terminal B1.	
10	Terminating Terminal B1 performs ARQ/ACF sequence.	
11	Terminal B1 sends an ALERT Message back.	
12	The User at Terminal A1 should be informed that the other Terminal is alerting.	
13	After Terminal B1 has accepted the call, the CONNECT message should travel back to the originating Terminal A1.	
14	Media is exchanged and quality is evaluated.	
15	Terminal A1 terminates the call and sends a RELEASE_COMPLETE and a DRQ to its Gatekeeper.	
16	The Gatekeeper(s) forward(s) the RELEASE_COMPLETE to the Terminal B1.	
17	The User at Terminal B1 should be informed that the remote peer terminated the call.	
18	The Terminal B1 should send the DRQ to its Gatekeeper.	

∗ *only present if this test is run with two Gatekeepers*

9.1.2 Unsuccessful call from H.323 Terminal to another H.323 Terminal

This test verifies the TIPHON Scenario-0 service where the Originating Terminal and the Terminating Terminal should be registered with the same Gatekeeper or where the two Gatekeepers have a trusted relationship, but the connection fails as the Terminating Terminal is not registered.

No.	Action	Succeeded
1	Both Terminal A1 and the Terminal B1 shall register with their respective Gatekeeper(s).	
2	Terminal A1 initiates a call using a E.164 address.	
3	Terminal A1 sends ARQ to Gatekeeper A.	
4	Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B. *	
5	Gatekeeper B returns LRJ. *	
6	Gatekeeper A returns ARJ.	
7	The user should be informed that the call failed indicating the cause.	

∗ *only present if this test is run with two Gatekeepers*

If there are three Gatekeepers involved, the procedure should be extended accordingly.

9.1.3   Fast Connect Fallback to H.245 tunneling

This test verifies the support of fallback for the Fast Connect Procedure.

The calling party shall include the fastConnect parameter in the setup message and set the h245Tunneling to TRUE. The called party shall not include the fastStart IE in any message but set the h245Tunneling to TRUE. As a result, the call has to be established using a H.225.0 tunnel for the H.245 connection.

The high level call flow is described in 9.1.1.

9.1.4   H.245 Tunneling Fallback to plain H.245

This test verifies the support of fallback for the H.245 tunneling Procedure as described in 8.2.1 of H.323 [8].

The calling party shall not include the fastConnect parameters in the setup message, but set the h245Tunneling parameter to TRUE. The called party shall set the h245Tunneling element to FALSE. As a result the call has to be established using a separate H.245 connection.

The high level call flow is described in 9.1.1.

9.2   Terminal <-> Telephone
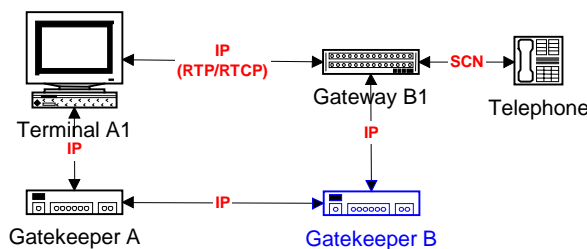

NOTE: Gatekeeper B is only present in specific test cases.

Figure 2: Terminal <-> Telephone

All tests can be executed with one or more Gatekeepers. The Number of Gatekeepers is just another parameter for these tests.

Direction	Description	Test Flow	Extra feature	Comment
A1 -> Tel	Successful call	0	Fast connect	TIPHON Scenario 1
Tel -> A1	Successful call	0	Fast connect	TIPHON Scenario 2
A1 -> Tel	Successful call	9.2.9	Fast connect fallback	TIPHON Scenario 1
Tel -> A1	Successful call	9.2.9	Fast connect fallback	TIPHON Scenario 2
A1 -> Tel	Successful call	0	H.245 tunnelling	TIPHON Scenario 1
Tel -> A1	Successful call	0	H.245 tunnelling	TIPHON Scenario 2
A1 -> Tel	Successful call	9.2.10	H.245 tunnelling fallback	TIPHON Scenario 1
Tel -> A1	Successful call	9.2.10	H.245 tunnelling fallback	TIPHON Scenario 2
Tel -> A1	Successful call	t.b.d	Overlapped sending	
Tel <-> A1	Successful call	t.b.d	DTMF transmission	
A1 -> D	Basic **un**successful call	9.2.3		TIPHON Scenario 1
A1 -> Tel x	**Un**successful call with voice after disconnect	9.2.4		TIPHON Scenario 1
A1 -> Tel x	**Un**successful call with voice before connect	9.2.5		TIPHON Scenario 1
Tel-> D	Basic **un**successful call	9.2.6		TIPHON Scenario 2
A1 -> Tel	Authorization and Call Routing via Settlement Server	9.2.7		TIPHON Scenario 1
A1 -> Tel	Usage Report to Settlement Server	9.2.8		TIPHON Scenario 1

9.2.1 Successful call from a H.323 Terminal to a Telephone

This test verifies the TIPHON Scenario-1 service where the Originating Terminal and the Terminating Gateway are registered with the same Gatekeeper or where the two Gatekeepers have a trusted relationship.

No.	Action	succeeded
1	Both Terminal A1 and the Gateway B1 shall register with their respective Gatekeeper(s).	
2	Terminal A1 initiates a call using a E.164 address.	
3	Terminal A1 sends ARQ to Gatekeeper A.	
4	Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B. *	
5	Gatekeeper B returns LCF. *	
6	Gatekeeper A returns ACF.	
7	Terminal A1 sends SETUP to its Gatekeeper (including fast connect options).	
8	Gatekeeper A forwards SETUP to Gatekeeper B. *	
9	Gatekeeper B forwards SETUP to Gateway B.	
10	Terminating Gateway B performs ARQ/ACF sequence.	
11	Gateway B initiates call establishment to SCN.	
12	After the ALERT Message was received on the SCN side, it should be forwarded to the Terminal.	
13	The User at the Terminal should be informed that the Telephone is ringing.	
14	After the Telephone was picked up, the connect message should be forwarded from the Gateway to the Terminal and Media should be present immediately.	
15	Media is exchanged and quality is evaluated.	
16	Terminal A1 terminates the call and sends a RELEASE_COMPLETE and a DRQ to its Gatekeeper	
17	The Gatekeeper(s) forward(s) the RELEASE_COMPLETE to the Gateway.	
18	The Gateway initiates a call de-establishment to the SCN.	
19	The User at the Telephone should hear appropriate tones.	
20	The Gateways should send the DRQ to its Gatekeeper, after all resources associated with this call were released.	

* *only present if this test is run with two Gatekeepers*

If there are three Gatekeepers involved, the procedure should be extended accordingly.

9.2.2 Successful call from a Telephone to a H.323 Terminal

This test verifies the TIPHON Scenario-2 service where the Originating Gateway and the Terminating Terminal are registered with the same Gatekeeper or where the two Gatekeepers have a trusted relationship.

No.	Action	succeeded
1	Both Terminal A1 and the Gateway B1 shall register with their respective Gatekeeper(s).	
2	Telephone should dial a number to reach Terminal A1 this can be done using one or two stage dialling.	
3	Gateway sends ARQ to its Gatekeeper.	
4	Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B. *	
5	Gatekeeper B returns LCF. *	
6	Gatekeeper A returns ACF.	
7	Gateway sends SETUP to its Gatekeeper (including fast connect options).	
8	Gatekeeper A forwards SETUP to Gatekeeper B. *	
9	Gatekeeper B forwards SETUP to Terminal.	
10	Terminal performs ARQ/ACF sequence.	
11	Terminal sends ALERT message back.	
12	The Telephone should be informed that the Terminal is alerted and the user should hear "" appropriate tones.	
13	After the User of the Terminal has answered the call, a CONNECT message should be forwarded to the Telephone and Media should be present immediately.	
14	Media is exchanged and quality is evaluated.	
15	The Telephone should release the call.	
16	The Gateway should send a RELEASE_COMPLETE to its Gatekeeper and proceed to de-establish the call on the SCN side.	
17	The Gatekeeper(s) forward(s) the RELEASE_COMPLETE to the Terminal.	
18	The User is informed that the call was terminated by the remote peer and the Terminal should send a DRQ to its Gatekeeper.	
19	The Gateways should send the DRQ to its Gatekeeper, after all resources associated with this call were released.	

* *only present if this test is run with two Gatekeepers*

If there are three Gatekeepers involved, the procedure should be extended accordingly.

9.2.3 Unsuccessful Call from a Terminal to an "unknown SCN Number"

This test verifies the TIPHON Scenario-1 service where the Originating Terminal and the Terminating Gateway are registered with the same Gatekeeper or where the two Gatekeepers have a trusted relationship, but the connection fails as the Number can not be terminated in the SCN.

No.	Action	succeeded
1	Terminal A1 shall register with its respective Gatekeeper.	
2	Terminal A1 initiates a call using a E.164 address.	
3	Terminal A1 sends ARQ to Gatekeeper A.	
4	Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B. *	
5	Gatekeeper B returns LRJ, indicating an unknown number. *	
6	Gatekeeper A returns ARJ.	
7	The user should be informed that the call failed indicating the cause.	

* *only present if this test is run with two Gatekeepers*

If there are three Gatekeepers involved, the procedure should be extended accordingly.

9.2.4 Unsuccessful call with voice after DISCONNECT

This test verifies the ability to transfer data in after a DISCONNECT message was received (on the SCN side) using TIPHON Scenario-1 service where the Originating Terminal and the Terminating Gateway are registered with the same Gatekeeper or the Gatekeepers have a trusted relationship.

NOTE: The in-band information generated by the announcement machine is sent during the release of the call.

No.	Action	succeeded
1	Both Terminal A1 and the Gateway B1 shall register with their respective Gatekeeper(s).	
2	Terminal A1 initiates a call using a E.164 address.	
3	Terminal A1 sends ARQ to Gatekeeper A.	
4	Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B. *	
5	Gatekeeper B returns LCF. *	
6	Gatekeeper A returns ACF.	
7	Terminal A1 sends SETUP to its Gatekeeper (including fast connect options).	
8	Gatekeeper A forwards SETUP to Gatekeeper B. *	
9	Gatekeeper B forwards SETUP to Gateway B.	
10	Terminating Gateway B performs ARQ/ACF sequence.	
11	Gateway B initiates call establishment to SCN.	
12	The SCN answers using a DISCONNECT Message, indicating that there is a voice message present in the media channel.	
13	Gateway B sends a PROGRESS Message to its Gatekeeper (including fast connect option).	
14	The PROGRESS Message is forwarded to the Terminal and Media is switched on.	
15	The Message should be presented to the User.	
16	Terminal A1 terminates the call and sends a RELEASE_COMPLETE and a DRQ to its Gatekeeper.	
17	The Gatekeeper(s) forward(s) the RELEASE_COMPLETE to the Gateway.	
18	The Gateway initiates a call de-establishment to the SCN.	
19	The Gateway should send the DRQ to its Gatekeeper, after all resources associated with this call were released..	

∗ *only present if this test is run with two Gatekeepers*

If there are three Gatekeepers involved, the procedure should be extended accordingly.

The only difference between "0 Unsuccessful call with voice after disconnect"and "0 Unsuccessful call with voice before connect" is the behaviour of the SCN, sending a PROGRESS or a DISCONNECT Message.

9.2.5   Unsuccessful call with voice before connect

This test verifies the ability to transfer data before CONNECT message was received using TIPHON Scenario-1 service where the Originating Terminal and the Terminating Gateway are registered the same Gatekeepers or the Gatekeepers have a trusted relationship.

NOTE: The in-band information generated by the announcement machine is sent before the active phase of the call i.e. SCN will never generate a CONNECT message.

No.	Action	succeeded
1	Both Terminal A1 and the Gateway B1 shall register with their respective Gatekeeper(s).	
2	Terminal A1 initiates a call using a E.164 address.	
3	Terminal A1 sends ARQ to Gatekeeper A.	
4	Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B. *	
5	Gatekeeper B returns LCF. *	
6	Gatekeeper A returns ACF.	
7	Terminal A1 sends SETUP to its Gatekeeper (including fast connect options).	
8	Gatekeeper A forwards SETUP to Gatekeeper B. *	
9	Gatekeeper B forwards SETUP to Gateway B.	
10	Terminating Gateway B performs ARQ/ACF sequence.	
11	Gateway B initiates call establishment to SCN.	
12	The SCN answers using a PROGRESS Message, indicating that there is a voice message present in the media channel.	
13	Gateway B forwards PROGRESS Message to its Gatekeeper (including fast connect option).	
14	The PROGRESS Message is forwarded to the Terminal and Media is switched on.	
15	The Message should be presented to the User.	
16	Terminal A1 terminates the call and sends a RELEASE_COMPLETE and a DRQ to its Gatekeeper.	
17	The Gatekeeper(s) forward(s) the RELEASE_COMPLETE to the Gateway.	
18	The Gateway initiates a call de-establishment to the SCN.	
19	The Gateway should send the DRQ to its Gatekeeper, after all resources associated with this call were released.	

∗   *only present if this test is run with two Gatekeepers*

If there are three Gatekeepers involved, the procedure should be extended accordingly.

The only difference between "0 Unsuccessful call with voice after disconnect"and "0 Unsuccessful call with voice before connect" is the behaviour of the SCN, sending a PROGRESS or a DISCONNECT Message.

9.2.6   Unsuccessful Call from a Telephone to an "unknown IP Number"

This test verifies the TIPHON Scenario-2 service where the Originating Gateway and the Terminating Terminal should be registered with the same Gatekeeper or where the two Gatekeepers have a trusted relationship, but the connection fails as the Terminating Terminal is not registered.

No.	Action	succeeded
1	Gateway B1 shall register with its respective Gatekeeper.	
2	Telephone should dial a number to reach Terminal A1 this can be done using one or two stage dialling.	
3	Gateway B1 sends ARQ to Gatekeeper A.	
4	Gatekeeper B issues LRQ (uni/multicast) to Gatekeeper A. *	
5	Gatekeeper A returns LRJ, indicating an unknown number. *	
6	Gatekeeper B returns ARJ.	
7	The user should be informed that this number is not available, by playing a busy tone or an announcement.	

∗   *only present if this test is run with two Gatekeepers*

If there are three Gatekeepers involved, the procedure should be extended accordingly.

9.2.7   Authorization and Call Routing via Settlement Server

This test verifies that a gatekeeper is able to successfully communicate with a settlement server to receive authorization and call routing information in an interoperable manner.

The reference configuration of the figure 3 shows the general interaction between the gatekeeper and the settlement server. The steps in the figure are:

1) Source Endpoint sends H.323 Setup to Gatekeeper A.

NOTE: This assumes Gatekeeper Routed Calls with pre-granted ARQs.

2) Gatekeeper A sends <AuthorizationRequest> to OSP Server.

3) OSP Server replies with <AuthorizationResponse>.

4) Gatekeeper A continues call setup with H.323 Setup to Gatekeeper B.

5) Gatekeeper B continues call setup with H.323 Setup to Destination Endpoint.

6) Destination Endpoint accepts call.

Note that this test scenario is strictly concerned with the interaction between Gatekeeper A and the OSP Server (steps 2 and 3).
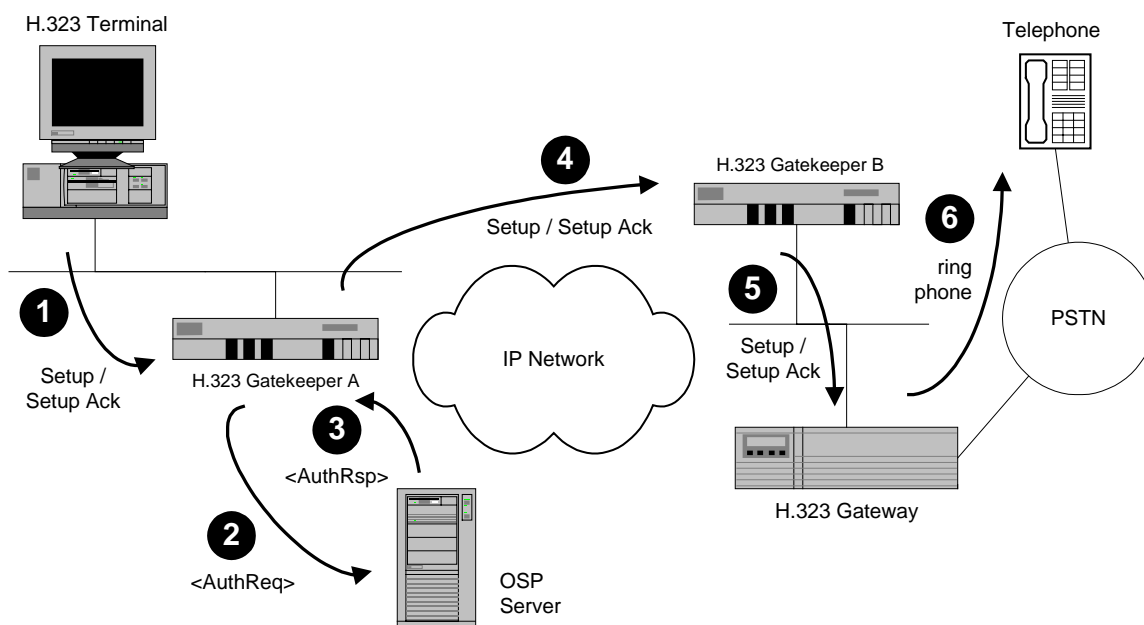
Figure 3 : Authorization and Call Routing from Gatekeeper to Settlement Server

No.	Action	succeeded
1	Both Terminal A1 and the Gateway B1 shall register with their respective Gatekeeper(s). (all should use pre granted ARQ)	
2	Terminal A1 initiates a call using a E.164 address.	
3	Terminal A1 sends SETUP to its Gatekeeper (including fast connect options).	
4	Gatekeeper A establishes a SSL Connection to the OSP Server.	
5	Gatekeeper A sends AuthReq to the OSP Server.	
6	OSP Server replies with AuthRsp including the call signalling address of Gatekeeper B.	
8	Gatekeeper A forwards SETUP to Gatekeeper B.	
9	Gatekeeper B forwards SETUP to Gateway B.	
11	Gateway B initiates call establishment to SCN.	
12	After the ALERT Message was received on the SCN side, it should be forwarded to the Terminal.	
13	The User at the Terminal should be informed that the Telephone is ringing.	
14	After the Telephone was picked up, the CONNECT message should be forwarded from the Gateway to the Terminal and Media should be present immediately.	
15	Media is exchanged and quality is evaluated.	
16	Terminal A1 terminates the call and sends a RELEASE_COMPLETE and a DRQ to its Gatekeeper.	
17	The Gatekeeper(s) forward(s) the RELEASE_COMPLETE to the Gateway.	
18	The Gateway initiates a call de-establishment to the SCN.	
19	The User at the Telephone should hear appropriate tones.	

9.2.8 Usage Report to Settlement Server

This test verifies that gatekeepers are able to successfully communicate with a settlement server to provide usage information in an interoperable manner.

The reference configuration of the figure 4 shows the general interaction between the gatekeepers and the settlement server. The steps in the figure are:

7) Gatekeepers release call

8) Gatekeeper A sends <UsageIndication> to OSP Server.

9) OSP Server replies with <UsageConfirmation>.

10) Gatekeeper B sends <UsageIndication> to OSP Server.

11) OSP Server replies with <UsageConfirmation>.

Note that this test scenario is strictly concerned with the interaction between the Gatekeepers and the OSP Server (steps 8 to 11).
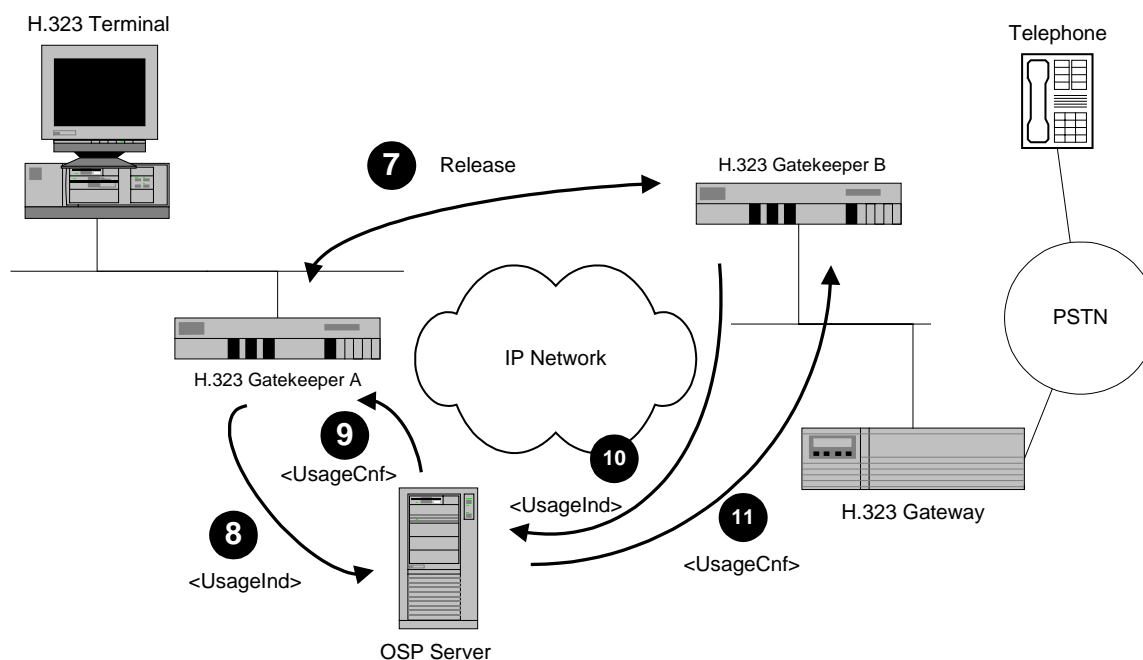
Figure 4 : Usage Reporting to Settlement Server

No.	Action	succeeded
1	Both Terminal A1 and the Gateway B1 shall register with their respective Gatekeeper(s). (all should use pre granted ARQ)	
2	Terminal A1 initiates a call using a E.164 address.	
3	Terminal A1 sends SETUP to its Gatekeeper (including fast connect options).	
4	Gatekeeper A establishes a SSL Connection to the OSP Server.	
5	Gatekeeper A sends AuthReq to the OSP Server.	
6	OSP Server replies with AuthRsp including the call signalling address of Gatekeeper B.	
8	Gatekeeper A forwards SETUP to Gatekeeper B.	
9	Gatekeeper B forwards SETUP to Gateway B.	
11	Gateway B initiates call establishment to SCN.	
12	After the ALERT Message was received on the SCN side, it should be forwarded to the Terminal.	
13	The User at the Terminal should be informed that the Telephone is ringing.	
14	After the Telephone was picked up, the connect message should be forwarded from the Gateway to the Terminal and Media should be present immediately.	
15	Media is exchanged and quality is evaluated.	
16	Terminal A1 terminates the call and sends a RELEASE_COMPLETE and a DRQ to its Gatekeeper.	
17	The Gatekeeper(s) forward(s) the RELEASE_COMPLETE to the Gateway.	
18	The Gateway initiates a call de-establishment to the SCN.	
19	The User at the Telephone should hear appropriate tones.	

9.2.9   Fast Connect Fallback to H.245 tunneling

This test verifies the support of fallback for the Fast Connect Procedure.

The calling party shall include the fastConnect parameter in the setup message and set the h245Tunneling to TRUE. The called party shall not include the fastStart IE in any message but set the h245Tunneling to TRUE. As a result, the call has to be established using a H.225.0 tunnel for the H.245 connection.

The high level call flow is described in 9.2.1 or 9.2.2.

9.2.10   H.245 Tunneling Fallback to plain H.245

This test verifies the support of fallback for the H.245 tunneling Procedure as described in 8.2.1 of H.323 [8].

The calling party shall not include the fastConnect parameters in the setup message, but set the h245Tunneling parameter to TRUE. The called party shall set the h245Tunneling element to FALSE. As a result the call has to be established using a separate H.245 connection.

The high level call flow is described in 9.2.1 or 9.2.2.

9.2.11 The use of Alternate Gatekeeper structure during registration

This test verifies the proper exchange of alternate Gatekeeper information and the handover during registration, if the primary Gatekeeper rejects the Gatekeeper discovery.

No.	Action	succeeded
1	The Endpoint (Gateway of Terminal) performs a GRQ to a preconfigured Gatekeeper.	
2	The Gatekeeper send back a GRJ with the reason set to "resourceUnavailable" and a list of Alternate Gatekeepers = {Gatekeeper B, priority=1};	
3	The Endpoint sends a GRQ to Gatekeeper B.	
4	Gatekeeper B answers with GRC.	
5	The Endpoint registers with Gatekeeper B by sending a RRQ.	
6	Gatekeeper B accepts registration by sending RCF back to the Endpoint.	

9.2.12 Automatical fallback to alternate Gatekeeper after registration

This test verifies the proper exchange of alternate Gatekeeper information and the handover after registration, if the primary Gatekeeper no longer responds to **keep Alive** messages.

No.	Action	succeeded
1	The Endpoint (Gateway of Terminal) performs a GRQ to a preconfigured Gatekeeper.	
2	The Gatekeeper accepts the discovery and sends back a GCF.	
3	The Endpoint registers with Gatekeeper A.	
4	Gatekeeper A accepts registration by sending RCF back to the Endpoint, including a list of Alternate Gatekeepers = {Gatekeeper B, priority=1};	
5	Gatekeeper A is disconnected (network disconnection preventing any RAS communication)	
6	The Endpoint send RRQ including the **keep Alive** bit set, but does not receive any answer.	
7	Upon timeout, the Endpoint shall send GRQ to Gatekeeper B	
8	Gatekeeper B shall accept the discovery and answers sending a GCF.	
9	The Endpoint registers with Gatekeeper B by sendiung a RRQ.	
10	Gatekeeper B accepts registration by sending RCF back to the Endpoint.	

9.3 Telephone to Telephone using IP Network
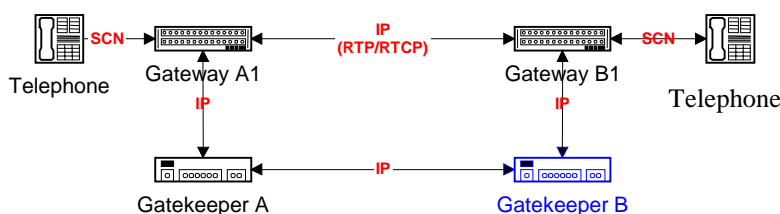
NOTE: Gatekeeper B is only present in specific test cases.

Figure 5: Telephone to Telephone using IP Network

All tests can be executed with one or more Gatekeepers. The Number of Gatekeepers is just another parameter for these tests.

Direction	Description	Test Flow	Extra feature	Comment
Tel A -> Tel B	Successful call	0	Fast connect	TIPHON Scenario 3
Tel B -> Tel A	Successful call	9.3.1	Fast connect	TIPHON Scenario 3
Tel A -> Tel B	Successful call	9.3.5	Fast connect fallback	TIPHON Scenario 3
Tel B -> Tel A	Successful call	9.3.5	Fast connect fallback	TIPHON Scenario 3
Tel A -> Tel B	Successful call	9.3.6	H.245 tunnelling	TIPHON Scenario 3
Tel B -> Tel A	Successful call	9.3.6	H.245 tunnelling	TIPHON Scenario 3
Tel A -> Tel B	Successful call	9.3.4	H.245 tunnelling fallback	TIPHON Scenario 3
Tel B -> Tel A	Successful call	9.3.4	H.245 tunnelling fallback	TIPHON Scenario 3
Tel A -> Tel. B	Successful call	t.b.d	Overlapped sending	TIPHON Scenario 3
Tel B -> Tel. B	Successful call	t.b.d	Overlapped sending	TIPHON Scenario 3
Tel A <-> Tel. B	Successful call	t.b.d	DTMF transmission	TIPHON Scenario 3
Tel A -> Tel B	Basic **un**successful call	9.3.2		TIPHON Scenario 3
Tel B -> Tel A	Basic **un**successful call	9.3.2		TIPHON Scenario 3
Tel A -> Tel B	Authorization and Call Routing via Settlement Server	9.3.3	OSP	TIPHON Scenario 3
Tel A -> Tel B	Authorization and Call Routing via Settlement Server	9.3.3	OSP	TIPHON Scenario 3
Tel A -> Tel B	Usage Reporting to Settlement Server	9.3.4	OSP	TIPHON Scenario 3
Tel A -> Tel B	Usage Reporting to Settlement Server	9.3.4	OSP	TIPHON Scenario 3

9.3.1   Successful call from a Telephone to a Telephone using IP Network

This test verifies the TIPHON Scenario-3 service where the Originating Gateway and the Terminating Gateway are registered with the same Gatekeeper or where the two Gatekeepers have a trusted relationship.

No.	Action	succeeded
1	Both Gateways A1 and B1 shall register with their respective Gatekeeper(s).	
2	The Telephone calls Gateway A1 and initiates a call to Telephone B.	
3	Gateway A1 sends ARQ to Gatekeeper A.	
4	Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B. *	
5	Gatekeeper B returns LCF. *	
6	Gatekeeper A returns ACF.	
7	Gateway A1 sends SETUP to its Gatekeeper (including fast connect options).	
8	Gatekeeper A forwards SETUP to Gatekeeper B. *	
9	Gatekeeper B forwards SETUP to Gateway B.	
10	Terminating Gateway B performs ARQ/ACF sequence.	
11	Gateway B initiates call establishment to SCN.	
12	After the ALERT Message was received on the B SCN, it should be forwarded to the Gateway A1.	
13	The User at the Telephone A should be informed that Telephone B is ringing.	
14	After Telephone B was picked up, the CONNECT message should be forwarded from the Gateway to the Gateway and Media should be present immediately.	
15	Media is exchanged and quality is evaluated.	
16	Telephone A terminates the call.	
17	Gateway A1 send a RELEASE_COMPLETE and to its Gatekeeper.	
18	The Gatekeeper(s) forward(s) the RELEASE_COMPLETE to Gateway. B	
19	The Gateway B initiates a call de-establishment to the SCN B.	
20	The User at the Telephone B should hear appropriate tones.	
21	The Gateways should send the DRQ to its Gatekeeper, after all resources associated with this call were released.	

*   *only present if this test is run with two Gatekeepers*

If there are three Gatekeepers involved, the procedure should be extended accordingly.

9.3.2 Unsuccessful call from a Telephone to a Telephone using IP Network

This test verifies the TIPHON Scenario-3 service where the Originating Gateway and the Terminating Gateway are registered with the same Gatekeeper or where the two Gatekeepers have a trusted relationship, but the connection fails as the Number can not be terminated in the SCN.

No.	Action	succeeded
1	Both Gateways A1 and B1 shall register with their respective Gatekeeper(s).	
2	The Telephone calls Gateway A1 and initiates a call to a Telephone.	
3	Gateway A1 sends ARQ to Gatekeeper A.	
4	Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B. *	
5	Gatekeeper B returns LCF. *	
6	Gatekeeper A returns ACF.	
7	Gateway A1 sends SETUP to its Gatekeeper (including fast connect options).	
8	Gatekeeper A forwards SETUP to Gatekeeper B. *	
9	Gatekeeper B forwards SETUP to Gateway B.	
10	Terminating Gateway B performs ARQ/ACF sequence.	
11	Gateway B initiates call establishment to SCN.	
12	The call could not be terminated in the SCN.	
13	The User at the Telephone A should be informed that the call could not be completed.	
14	After the Telephone A terminates the call, a RELESASE_COMPLETE should be sent to Gatekeeper A.	
15	The Gatekeeper(s) forward(s) the RELEASE_COMPLETE to Gateway B.	
16	The Gateway B initiates a call de-establishment to the SCN B.	
17	The Gateways should send the DRQ to its Gatekeeper, after all resources associated with this call were released.	

∗ *only present if this test is run with two Gatekeepers*

If there are three Gatekeepers involved, the procedure should be extended accordingly.

9.3.3 Authorization and Call Routing via Settlement Server

This test verifies that a gateway (acting without a gatekeeper present) is able to successfully communicate with a settlement server to receive authorization and call routing information in an interoperable manner.

The reference configuration of the figure 6 shows the general interaction between the gateway and the settlement server. The steps in the figure are:

1) Gateway A requires settlement services for a call.

2) Gateway A sends <AuthorizationRequest> to OSP Server.

3) OSP Server replies with <AuthorizationResponse>.

4) Gateway A sends H.323 Setup to Gateway B.

5) Destination Endpoint accepts call.

Note that this test scenario is strictly concerned with the interaction between Gateway A and the OSP Server (steps 2 and 3).
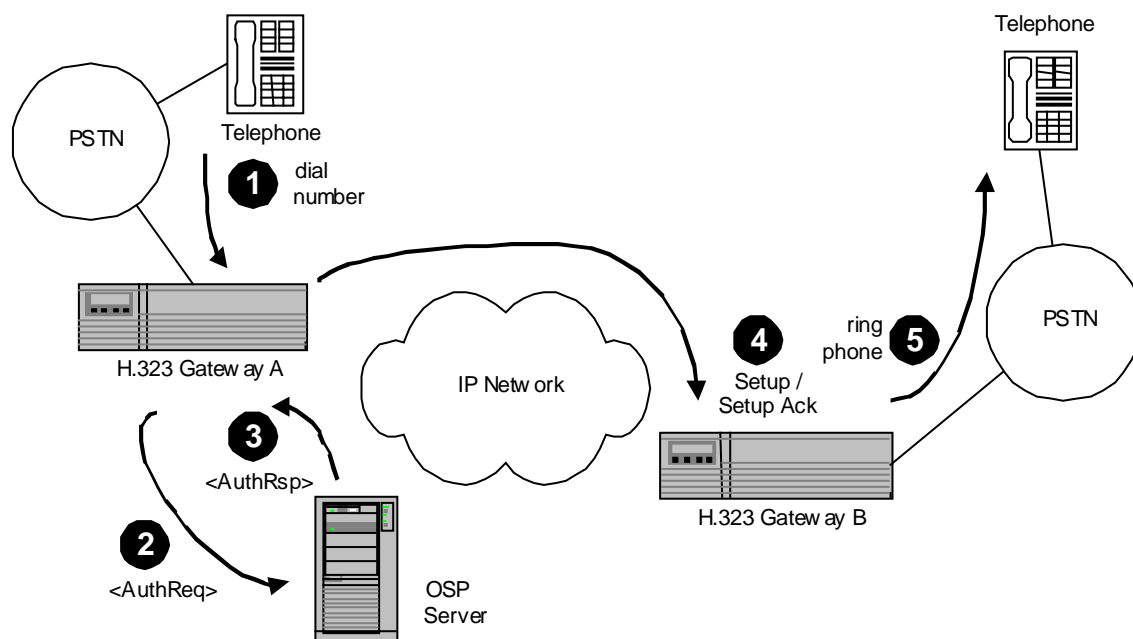
Figure 6 : Authorization and Call Routing from Gatekeeper to Settlement Server

No.	Action	succeeded
1	The Telephone calls Gateway A1 and initiates a call to Telephone B.	
2	Gateway A establishes a SSL connection to OSP Server	
3	Gateway A sends AuthReq to the OSP Server.	
4	OSP Server accepts Authorization and replies with AuthRsp.	
5	Gateway A sends SETUP to Gateway B (including fast connect options).	
6	Gateway B initiates call establishment to SCN.	
7	After the ALERT Message was received on the B SCN, it should be forwarded to the Gateway A.	
8	The User at the Telephone A should be informed that Telephone B is ringing.	
9	After Telephone B was picked up, the CONNECT message should be forwarded to the Gateway and Media should be present immediately.	
10	Media is exchanged and quality is evaluated.	
11	Telephone A terminates the call.	
12	Gateway A send a RELEASE_COMPLETE and to Gateway B.	
13	The Gateway B initiates a call de-establishment to the SCN B.	
14	The User at Telephone B should hear appropriate tones.	

9.3.4   Usage Reporting to Settlement Server

This test verifies that gateways are able to successfully communicate with a settlement server to provide usage information in an interoperable manner.

The reference configuration of the figure 7 shows the general interaction between the gateways and the settlement server. The steps in the figure are:

6) Gateways release call

7) Gateway A sends <UsageIndication> to OSP Server.

8) OSP Server replies with <UsageConfirmation>.

9) Gateway B sends <UsageIndication> to OSP Server.

10) OSP Server replies with <UsageConfirmation>.

Note that this test scenario is strictly concerned with the interaction between the Gateways and the OSP Server (steps 7 to 10).
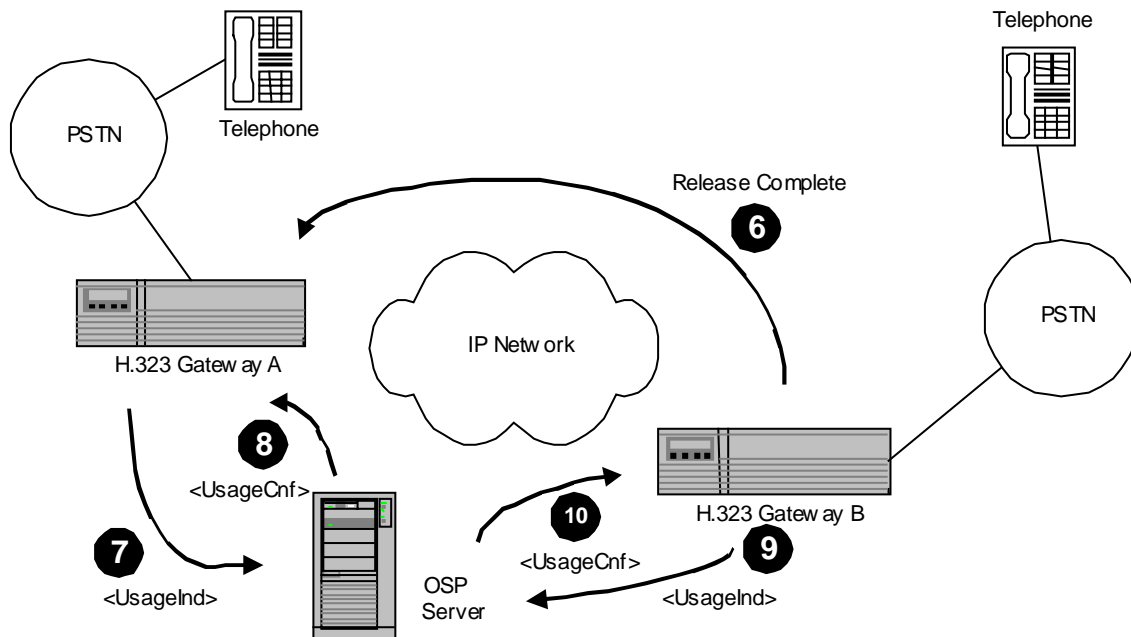
Figure 7 : Usage Reporting to Settlement Server

No.	Action	succeeded
1	The Telephone calls Gateway A and initiates a call to Telephone B.	
2	Gateway A establishes a SSL connection to OSP Server	
3	Gateway A sends AuthReq to the OSP Server.	
4	OSP Server accepts Authentication and replies with AuthRsp.	
5	Gateway A sends SETUP to Gateway B (including fast connect options).	
6	Gateway B initiates call establishment to SCN.	
7	After the ALERT Message was received on the B SCN, it should be forwarded to the Gateway A.	
8	The User at the Telephone A should be informed that Telephone B is ringing.	
9	After Telephone B was picked up, the CONNECT message should be forwarded to the Gateway and Media should be present immediately.	
10	Media is exchanged and quality is evaluated.	
11	Telephone A terminates the call.	
12	Gateway A1 send a RELEASE_COMPLETE and to Gateway B.	
13	The Gateway B initiates a call de-establishment to the SCN B.	
14	The User at the Telephone B should hear appropriate tones.	
15	Gateway A sends UsageIndication to the OSP Server.	
16	OSP Server sends UsageConfirm to Gateway A.	
17	Gateway B sends UsageIndication to the OSP Server.	
18	OSP Server sends UsageConfirm to Gateway B.	
19	Gatekeeper A sends UsageIndication to the OSP Server.	
20	OSP Server sends UsageConfirm to Gatekeeper A.	
21	Gatekeeper B sends UsageIndication to the OSP Server.	
22	OSP Server sends UsageConfirm to Gatekeeper B.	

9.3.5   Fast Connect Fallback to H.245 tunneling

This test verifies the support of fallback for the Fast Connect Procedure.

The calling party shall include the fastConnect parameter in the setup message and set the h245Tunneling to TRUE. The called party shall not include the fastStart IE in any message but set the h245Tunneling to TRUE. As a result, the call has to be established using a H.225.0 tunnel for the H.245 connection.

The high level call flow is described in 9.3.1.

9.3.6   H.245 Tunneling Fallback to plain H.245

This test verifies the support of fallback for the H.245 tunneling Procedure as described in 8.2.1 of H.323 [8].

The calling party shall not include the fastConnect parameters in the setup message, but set the h245Tunneling parameter to TRUE. The called party shall set the h245Tunneling element to FALSE. As a result the call has to be established using a separate H.245 connection.

The high level call flow is described in 9.3.1.

9.4   Terminal to Terminal using SCN Network
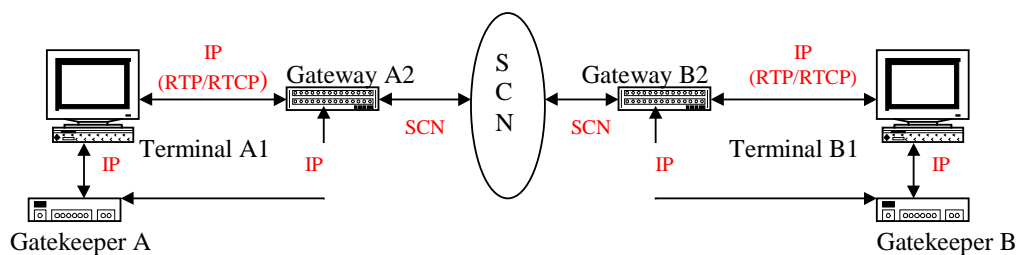
Possible Tests:

Direction	Description	Test Flow	Extra feature	Comment
A1 -> B1	Successful call	9.4.1	Fast connect	TIPHON Scenario 4
B1-> A1	Successful call	9.4.1	Fast connect	TIPHON Scenario 4
A1 -> B1	Successful call	9.4.1	H.245 tunnelling	TIPHON Scenario 4
B1-> A1	Successful call	9.4.1	H.245 tunnelling	TIPHON Scenario 4
A1 -> D	Basic **un**successful call	9.4.2		TIPHON Scenario 4
B1 -> D	Basic **un**successful call	9.4.2		TIPHON Scenario 4

9.4.1 Successful call from a H.323 Terminal to a H.323 Terminal using SCN Network

This test verifies the TIPHON Scenario-4 service where the Originating Terminal and Gateway are registered to one Gatekeeper and the Terminating Gateway and Terminal are registered to another Gatekeeper.

No.	Action	succeeded
1	All Terminals and Gateways should register with their respective Gatekeepers.	
2	Terminal A1 initiates a call using a E.164 address.	
3	Terminal A1 sends ARQ to Gatekeeper A.	
4	Gatekeeper A returns ACF.	
5	Terminal sends setup to Gatekeeper A	
6	Gatekeeper A forwards SETUP to Gateway A2.	
7	Gateway A2 performs ARQ/ACF sequence.	
8	Gateway A2 initiates an outgoing call to Gateway B1.	
9	Gateway B2 detects an incoming call and send an ARQ to Gatekeeper B.	
10	Gatekeeper B responds with an ACF.	
11	Gateway B2 sends SETUP to Gatekeeper B.	
12	Gatekeeper(s) forward(s) SETUP to Terminal B1.	
13	Terminal B1 send ARQ to Gatekeeper B.	
14	Gatekeeper B answers with ACF.	
15	Terminal B1 accepts the call and sends an ALERT Message.	
16	Terminal send ALERT message back.	
17	The originating Terminal should be informed that the other side is alerted.	
18	After the User of the Terminal has answered the call, a CONNECT message should be forwarded to the originating side, and Media should be present immediately.	
19	Media is exchanged and quality is evaluated.	
20	Terminal B1 sends a RELEASE_COMPLETE and a DRQ to the Gatekeeper B.	
21	The Gatekeeper B forwards this to the Gateway B2.	
22	The Gateway B2 should terminate the SCN call to Gateway A1.	
23	Gateway A2 sends a RELEASE_COMPLETE to the Gatekeeper A.	
24	Gatekeeper A should inform the Terminal A1 that the call is released.	
25	Terminal A1 should inform the user that the remote peer terminated the call and send a DRQ to the Gatekeeper.	
26	The Gateway A2 and B2 should send a DRQ to their Gatekeepers, after all resources have been released.	

9.4.2 Unsuccessful call from a H.323 Terminal to a H.323 Terminal using SCN Network

This test verifies the TIPHON Scenario-4 service where the Originating Terminal and Gateway are registered to one Gatekeeper and the Terminating Gateway and Terminal are registered to another Gatekeeper. The call can not be completed as the called Terminal is not registered with its Gatekeeper.

No.	Action	succeeded
1	All Terminals and Gateways should register with their respective Gatekeepers.	
2	Terminal A1 initiates a call using a E.164 address.	
3	Terminal A1 sends ARQ to Gatekeeper A.	
4	Gatekeeper A returns LCF.	
5	Terminal sends setup to Gatekeeper A	
6	Gatekeeper A forwards SETUP to Gateway A2.	
7	Gateway A2 performs ARQ/ACF sequence.	
8	Gateway A2 initiates an outgoing call to Gateway B1.	
9	Gateway B2 detects an incoming call and send an ARQ to Gatekeeper B.	
10	Gatekeeper B responds with an ARJ.	
11	Gateway B2 disconnects SCN call providing the proper DISCONNECT CAUSE.	
12	Gateway A2 sends RELEASE_COMPLETE to Gatekeeper A including the CAUSE.	
13	Gateway A2 forwards RELEASE_COMPLETE to Terminal A1 including the CAUSE.	
14	The User at Terminal 1 is informed that the called user is not reachable and the CAUSE is presented.	

History

Document history		
V1.1.1	March 1999	Publication
V2.1.4	September 1999	Publication
V3.0.2	May 2000	Publication