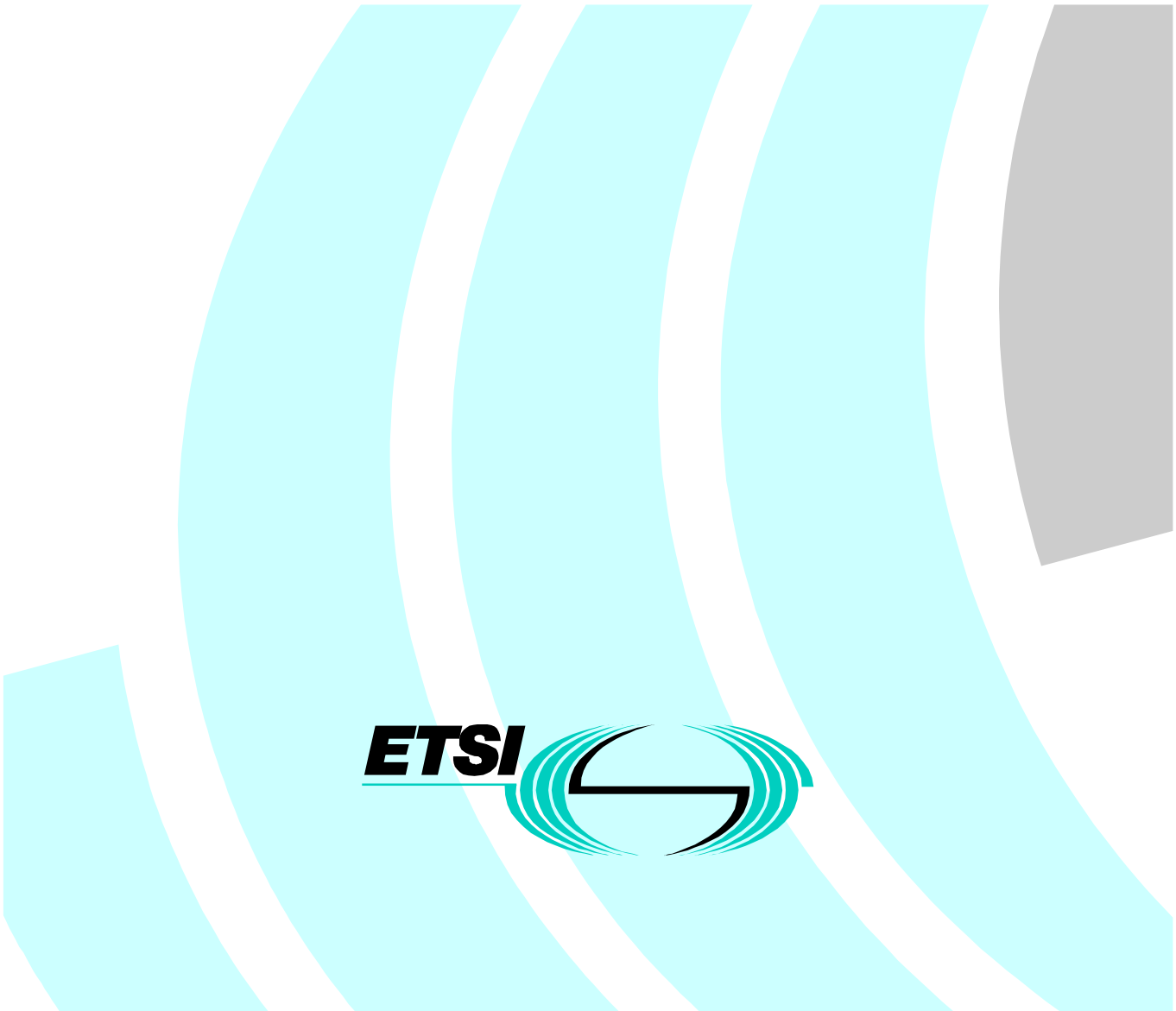
ETSI TS 101 335 V2.1.4 (1999-09)

Technical Specification

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



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Contents

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Foreword

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

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.

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

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

[6] ITU-T Recommendation H.261: "Video codec for audiovisual services at p x 64 kbit/s".

[7] ITU-T Recommendation H.263: "Video coding for low bit rate communication".

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

[9] ITU-T Recommendation T.120: "Data protocols for multimedia conferencing".

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

[11] 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.723.1 (1996): "Dual rate speech coder for multimedia communications transmitting at 5.3 and 6.3 kbit/s".

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

[14] ITU-T Recommendation G.722: "7 kHz audio-coding within 64 kbit/s".

[15] ITU-T Recommendation Q.931: "SDN user-network interface layer 3 specification for basic call control".

3 Abbreviations

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

A	Audio
A/V	Audio/Video
ACF	Admissions Confirm
ARJ	Admissions Reject
ARQ	Admissions Request
BRI	Basic Rate Interface
D	Data
DCF	Disengage Confirm
DRQ	Disengage Request
DTMF	Dual Tone Multi Frequence
GSM	Group Special Mobile
GW	Gateway
IP	Internet Protocol
IRQ	Information Request
IRR	Intellectual Property Rights
ISDN	Integrated Services Digital Network
LCF	Location Confirm
LRJ	Location Reject
LRQ	Location Request
NNI	Network to Network Interface
OSP	Open Settlement Protocol
PRI	Primary Rate Interface
PSTN	Public Switched Telephone Network
QoS	Quality of Service
SCN	Switched Circuit Networks
TIPHON	Telecommuications Internet Protocol Harmonization Over Networks
UNI	User Network Interface

4 Introduction

The present document describes interoperability and compatibility tests for H.323 [8] entities concerning the different TIPHON Scenarios.

These tests are based on end-to-end systems testing - higher level functionality, rather than on specific protocol layers or requirements.

The progression of the test scenarios is intended to allow network and equipment setup to be added to in a sequential manner, and the more complicated scenarios are run.

The present document is not intended to provide an exhaustive testing of all facets of H.323 [8] and SCN operation. Specific scenarios were chosen to provide coverage of the more common commercial deployments.

The test cases specified in this test plan will 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.

5 Overview

The IP related and SCN related tests are divided into clause 10 to clause 18.

- Clause 10 contains interoperability tests for scenario 0, which is the communication between IP network based users.
- Clause 11.1 contains interoperability tests for scenario 1, which is the communication between IP network based users and SCN based users, in which the call set-up is originated by the IP network user.

  Clause 11.2 contains the related information for the SCN side.
- Clause 12.1 contains interoperability tests for scenario 2, which is the communication between IP network based users and SCN based users, in which the call set-up is originated by the SCN based user.

  Clause 12.1 contains the related information for the SCN side.
- Clause 13.1 contains interoperability tests for scenario 3, which is the communication between SCN based users, using IP based networks for the connection/trunking between the involved users.

  Clause 13.2 contains the related information for the SCN side.
- Clause 14.1 contains interoperability tests for scenario 4, which is the communication between IP network based users, using SCNs for the connection/trunking between the involved users.

  Clause 14.2 contains the related information for the SCN side.
- Clause 15 contains interoperability tests for scenarios 0,1,2,3 with Transit Gatekeeper.
- Clause 16 contains interoperability tests for scenarios 0,1,2,3 according to TIPHON Security Profile.
- Clause 17 contains interoperability tests for additional services (e.g. DTMF).
- Clause 18.1 contains interoperability tests for additional supplementary services.

  Clause 18.2 contains the related information for the SCN side.

6 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 shall 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.

7 Scoring

The scores associated to the individual tests are for informative purposes only allowing the manufacturers to asses the progress of their implementations towards full interoperability.

7.1 Overall end-to-end scoring

To achieve an end-to-end scoring value, the following shall be calculated:

Scenario 0: The IP related scoring defined in clause 10 is the end to end value.

Scenario 1 and 2: Both, the IP related and the SCN related scoring values have to be summarized in that way, that the lowest value determined the result.

Scenario 3 and 4: The scoring values of the originating user side, the transit network and the destinating user side have to be summarized in that way, that the lowest value determined the result.

8 Prerequisites

8.1 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 [4] FastConnect shall be used for all calls.
- ITU-T Recommendation H.245 [5]. H.245 [5] Tunnelling, described in ITU-T Recommendation H.323 [8], shall be used whenever H.245 [5] messages are exchanged.
- Gatekeeper Routed Signalling is mandatory, Direct Routed Signalling is optional.

Originating Terminals and Originating Gateways shall always use ARQ (LRQ is optional).

8.2 SCN related

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

- TS 101 312 [10] (TIPHON Phase I, Scenario 1, Architecture) subclause 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 simultaneous test at two different SCN interfaces, details are for further study.
- According to the TIPHON scenarios the "Call direction" is important. In this first version only the distinction between "PC to phone" and "Phone to PC" is considered according to the ongoing standardization by TIPHON. "Phone to phone" however may be realized for several configurations by the concatenation of "Phone to PC" and "PC to Phone". This concatenation is done by the IP network connecting the two gateways concerned.

9 Profile Definitions

Although audio currently is the only media type utilized in the TIPHON specification, a complete set of H.323 [8] media types is given for the purpose of compatibility with full H.323 [8] systems.

Profile 1	**Required by Recommendation**

Audio	**Video**	**Data**	**Addressing**

G.711	***H.261***	***T.120***	***E.164/H.323ID***

Profile 2 **Low Bitrate Deployment**

Audio	**Video**	**Data**	**Addressing**
G.723.1	***H.263***	***T.120***	***E.164/H.323ID***

Profile 3

Audio	**Video**	**Data**	**Addressing**
G.728	***H.261***	***T.120***	***E.164/H.323ID***

Profile 4

Audio	**Video**	**Data**	**Addressing**
G.711	***H.263***	***T.120***	***E.164***

Profile 5

Audio	**Video**	**Data**	**Addressing**
G.728	***H.263***	***T.120***	***E.164***

Profile 6

Audio	**Video**	**Data**	**Addressing**
G.722	***H.261***	***T.120***	***E.164***

Profile 7

Audio	Video	Data	Addressing
G.722	*H.263*	*T.120*	*E.164*

Profile 8

Audio	Video	Data	Addressing
GSM Full Rate	*H.263*	*T.120*	*E.164*

Profile 9

Audio	Video	Data	Addressing
GSM EFR	*H.263*	*T.120*	*E.164*

10 Scenario 0 PC to PC

TEST 1.	IP-Host to IP-Host / Single Gatekeeper
This test verifies the TIPHON Scenario-0 service where the Originating Terminal and the Terminating Gateway are registered with the same Gatekeeper.	

The reference configuration described next shall be used:

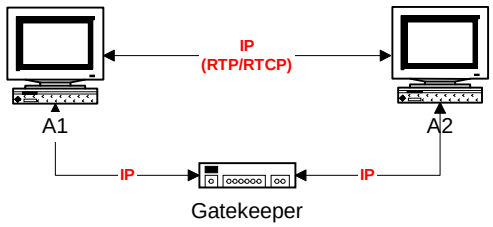


Figure 1: PC to PC with 1 Gatekeeper

1. Endpoints perform discovery/registration using alias.
2. Endpoint A1 calls Endpoint A2

   2.1. Endpoint A1- sends ARQ to Gatekeeper with alias.

2.2. Endpoint A1 receives ACF with IP address and contacts Endpoint A2 (optional) or GK (mandatory).

Note that the SETUP message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

2.3. Endpoint A2 sends ARQ to Gatekeeper and receives ACF.

Note that the fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

2.4. Gatekeeper has call active.

3. Users evaluate media quality. *(A, A/V; A/V with D)*

4. Endpoints terminate call

4.1. Both endpoints send DRQ to Gatekeeper.

4.2. Both endpoints receive DCF.

4.3. Gatekeeper has call cleared.

5. Endpoint A2 calls Endpoint A1

5.1. Endpoint A2 sends ARQ to Gatekeeper with alias.

5.2. Endpoint A2 receives ACF with IP address and contacts Endpoint A1 (optional) or GK (mandatory).

Note that the SETUP message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

5.3. Endpoint A1 sends ARQ to Gatekeeper and receives ACF.

Note that the fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

5.4. Gatekeeper has call active.

6. Users evaluate media quality. *(A, A/V; A/V with D)*

7. Endpoints terminate call

7.1. Both endpoints send DRQ to Gatekeeper.

7.2. Both endpoints receive DCF.

7.3. Gatekeeper has call cleared.

8. Endpoint A1 calls Endpoint C (unknown alias)

8.1. Endpoint A1 sends ARQ to Gatekeeper with alias.

8.2. Endpoint A1 receives ARJ.

9. Endpoint A2 calls Endpoint D (unknown alias)

9.1. Endpoint A2 sends ARQ to Gatekeeper with alias.

9.2. Endpoint A2 receives ARJ.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received, Terminal and Gateway fail to connect	35
Connected, ARQ fails for Gateway	40
Connected, no media exchanged	50
Connected, garbled or broken media	60
Connected, media in only one direction	70
Connected, good Audio in both directions, call clearing failed.	80
Connected, good media in both directions, Terminal and Gateway clear call, Gatekeeper does not.	90
Connected, good media in both directions, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected, good media in both directions, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
Q.931 [15] Keep-alive (Status Enquiry/Status) fails	*50*
Either Terminal/Gateway doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*

TEST	2.	IP-Host to IP-Host / Two Gatekeepers
This test verifies the TIPHON Scenario-0 service where the Originating Terminal and the Terminating Gateway are registered with different Gatekeepers that maintain trust relationship.		

The reference configuration described next shall be used:

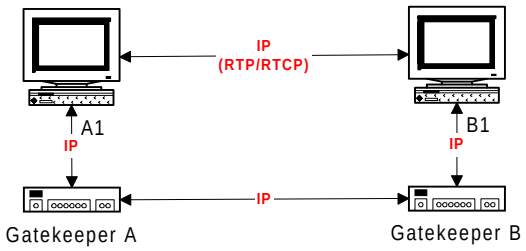


Figure 2: PC to PC with 2 Gatekeepers

1. Endpoints perform discovery/registration using alias

2. Endpoint A1 calls Endpoint B1

   2.1. Endpoint A1 sends ARQ to Gatekeeper A.

   2.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B.

   2.3. Gatekeeper A returns ACF.

Note that the SETUP message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   2.4. Gatekeeper A has call active.

   2.5. Endpoint B1 performs ARQ/ACF sequence, returns CONNECT.

Note that the fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   2.6. Gatekeeper B has call active.

3. Media is exchanged and quality is evaluated. *(A, A/V; A/V with D)*

4. Endpoints terminate call

   4.1. Both endpoints send DRQ to Gatekeeper.

   4.2. Both endpoints receive DCF.

   4.3. Gatekeepers have calls cleared.

5. Endpoint B1 calls Endpoint A1

   5.1. Endpoint B1 sends ARQ to Gatekeeper B.

   5.2. Gatekeeper B issues LRQ (uni/multicast) to Gatekeeper A.

   5.3. Gatekeeper B returns ACF.

Note that the SETUP message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   5.4. Gatekeeper B has call active.

   5.5. Endpoint A1 performs ARQ/ACF sequence, returns CONNECT.

Note that the fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   5.6. Gatekeeper A has call active.

6. Media is exchanged and quality is evaluated. *(A/V; A/V with D)*

7. Endpoints terminate call

   7.1. Both endpoints send DRQ to Gatekeeper.

   7.2. Both endpoints receive DCF.

   7.3. Gatekeepers have calls cleared.

8. Endpoint A1 calls Endpoint C (unknown endpoint)

   8.1. Endpoint A1 sends ARQ to Gatekeeper A.

   8.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B.

   8.3. Gatekeeper B returns LRJ.

   8.4. Gatekeeper A returns ARJ.

9. Endpoint B1 calls Endpoint D (unknown endpoint)

   9.1. Endpoint B1 sends ARQ to Gatekeeper B.

   9.2. Gatekeeper B issues LRQ (uni/multicast) to Gatekeeper A.

   9.3. Gatekeeper A returns LRJ.

   9.4. Gatekeeper B returns ARJ.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
Both Terminal and Gateway register, LRQ Fails for	15
Unknown address does not result in LRJ	20
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received, Terminal and Gateway fail to connect	35
Connected, ARQ fails for Gateway	40
Connected, no media exchanged	50
Connected, garbled or broken media	60
Connected, media in only one direction	70
Connected, good Audio in both directions, call clearing failed.	80
Connected, good media in both directions, Terminal and Gateway clear call, Gatekeeper does not.	90
Connected, good media in both directions, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected, good media in both directions, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
Q.931 [15] Keep-alive (Status Enquiry/Status) fails	*50*
Either Terminal/Gateway doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*

11 Scenario 1 PC to Phone

The reference configuration described next shall be used:

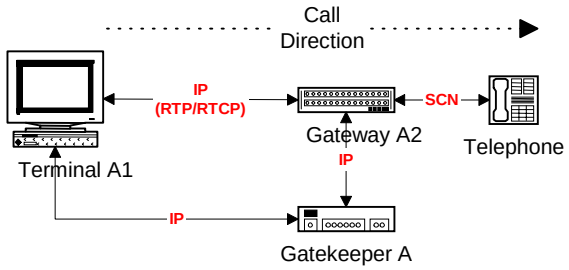


Figure 3: PC to Phone with 1 Gatekeeper

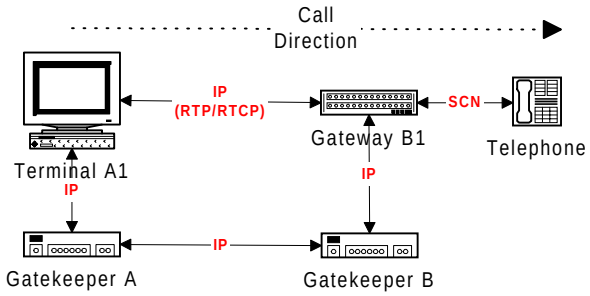


Figure 4: PC to Phone with 2 Gatekeepers

11.1 IP related tests

TEST 3.	IP-Host to SCN-Phone / Single Gatekeeper
This test verifies the TIPHON Scenario-1 service where the Originating Terminal and the Terminating Gateway are registered with the same Gatekeeper.	

1. Both Terminal A1 and Gateway A2 shall register with Gatekeeper A.

2. Terminal A1 calls phone number which is unknown to Gatekeeper A.

   2.1. Terminal A1 sends ARQ to Gatekeeper A.

   2.2. Gatekeeper A returns ARJ (reason: unknown number).

3. A1 calls phone number.

   3.1. A1 sends ARQ to Gatekeeper A.

   3.2. The Gatekeeper A returns ACF.

Note that the H.225.0 [4] SETUP message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   3.3. Gateway A2 performs ARQ/ACF sequence with Gatekeeper A.

Note that the fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   3.4. Gatekeeper A has call active.

   3.5. Gateway A2 completes connection with the SCN endpoint and opens media channels.

4. Media are exchanged and quality is evaluated.

5. Terminal A1 and Gateway A2 finish the call.

   5.1. Terminal A1 and Gateway A2 send DRQ to Gatekeeper A.

   5.2. Both Terminal A1 and Gateway A2 receive DCF.

   5.3. Gatekeeper A has calls cleared.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received, Terminal and Gateway fail to connect	35
Connected, ARQ fails for Gateway (note)	40
Connected, no media exchanged (note)	50
Connected, garbled or broken media (note)	60
Connected, media in only one direction (note)	70
Connected, good Audio in both directions, call clearing failed. (note)	80
Connected, good media in both directions, Terminal and Gateway clear call, Gatekeeper does not. (note)	90
Connected, good media in both directions, call cleared with wrong reason. (note)	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected, good media in both directions, call cleared. (note)	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
Q.931 [15] *Keep-alive (Status Enquiry/Status) fails*	*50*
Either Terminal or Gateway doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
NOTE: The fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).	

TEST	4.	IP-Host to SCN-Phone / Two Gatekeepers
This test verifies the TIPHON Scenario-1 service where the Originating Terminal and the Terminating Gateway are registered with different Gatekeepers.		

The reference configuration described next shall be used:

1. Both Terminal A1 and the Gateway B1 shall register with their respective Gatekeeper.

2. Terminal A1 calls a phone number which is unknown to the Gatekeeper (s).

   2.1. Terminal A1 sends ARQ to Gatekeeper A.

   2.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B.

   2.3. Gatekeeper B returns LRJ (reason: unknown number).

   2.4. Gatekeeper A returns ARJ (reason: unknown number).

3. Terminal A1 calls a phone number.

   3.1. Terminal A1 sends ARQ to Gatekeeper A.

   3.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B.

   3.3. Gatekeeper A returns ACF.

Note that the SETUP message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   3.4. Gatekeeper A has call active.

   3.5. Gateway B1 Terminating Gateway performs ARQ/ACF sequence, returns CONNECT.

Note that the fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   3.6. Gatekeeper B has call active.

3.7. Media is exchanged and quality is evaluated.

4. Terminal A1 and Gateway B1 finish the call.

4.1. Terminal A1 and Gateway B1 send DRQ to their Gatekeepers.

4.2. Terminal A1 and Gateway B1 receive DCF.

4.3. Gatekeepers have calls cleared.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
Both Terminal and Gateway register, LRQ Fails for Caller	15
Unknown address does not result in LRJ	20
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received, Terminal and Gateway fail to connect	3
Connected, ARQ fails for Gateway (note)	40
Connected, no media exchanged (note)	50
Connected, garbled or broken media (note)	60
Connected, media in only one direction (note)	70
Connected, good Audio in both directions, call clearing failed. (note)	80
Connected, good media in both directions, Terminal and Gateway clear call, Gatekeeper does not. (note)	90
Connected, good media in both directions, call cleared with wrong reason. (note)	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected, good media in both directions, call cleared. (note)	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
*Q.931 [*15*] Keep-alive (Status Enquiry/Status) fails*	*50*
Either Terminal or Gateway doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
NOTE: The fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).	

11.2 SCN related tests

11.2.1 Related types of SCN interfaces – Overview

No.	Type of interface	SCN Protocol	"Gateway role"	TIPHON Ref. Point	Call Direction	Detailed in (sub)clause
A11	Analogue	-	Analogue network	E1, UNI	PC to Phone	11.2.2
A21	Analogue	-	Analogue user(s)	E1, UNI	PC to Phone	11.2.3
	Others ?					
D11	PCM 30	CAS	Digital Network node	E1, UNI	PC to Phone	
	Others ?					
I11	ISDN BRI / PRI (E1/T1)	DSS1	DSS1 Network side	E2, UNI	PC to Phone	
I21	ISDN BRI / PRI (E1/T1)	DSS1	DSS1 User(s) side	E2, UNI	PC to Phone	
N11	ISDN PRI (E1/T1)	ISUP	SS #7 Transit node	E2, NNI	PC to Phone	
N21	E1 / T1	ISUP	Signalling GW: SS #7 Terminating node	E(2)b, NNI	PC to Phone	
	PCM trunk (E1/T1)	-	Media GW: PCM (Network side)	E(2)a, NNI ?		
G11	E1 / T1	MAP	Signalling GW: SS #7 Terminating MSC ?	E(3)b, NNI	PC to Phone	
	?	?	Media GW: BSC Network side ?	E(3)a, NNI ?		
P11	Private	private	(Terminating) PINX (outgoing call)	E4, UNI	PC to Phone	
P21	Private	private	private user(s) (incoming call)	E4, UNI	PC to Phone	

11.2.2 Analog User Network Interface – Gateway role: Network side

TEST S1.	Call termination by the SCN based user Analog User Network Interface – Gateway role: Network side
This test verifies the TIPHON Scenario-1 service where the Terminating User is at the SCN side.	

Result:	Score
No Power feeding	0
Ringing	10
Calling Line Identification	20
Connected	60
Connected, Supplementary Services Control (by DTMF or Pulse)	70
Connected, Call waiting indication	90
Connected, good media in both directions, call cleared with unclear reason	97
Connected, Call cleared	100
Error Recovery ?	?

11.2.3 Analog User Network Interface – Gateway role: User side

TEST S1.	Call termination by the SCN based user Analog User Network Interface – Gateway role: User side
This test verifies the TIPHON Scenario-1 service where the Terminating User is at the SCN side.	

For further study.

11.2.4 ISDN User Network Interface - Gateway role: Network side

For further study.

12 Scenario 2 Phone to PC

The reference configuration described next shall be used:

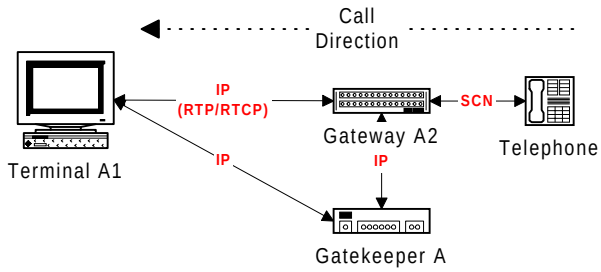


Figure 5: Phone to PC with 1 Gatekeeper

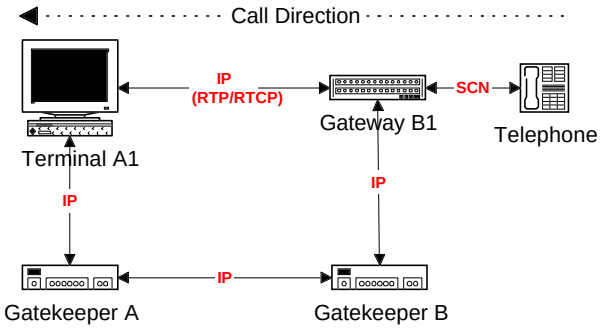


Figure 6: Phone to PC with 2 Gatekeepers

12.1 IP related tests

TEST 5.	Phone to IP-Host / Single Gatekeeper
This test verifies the TIPHON Scenario-2 service where the Originating Gateway and the Terminating Terminal are registered with the same Gatekeeper.	

1. Both Terminal A1 and Gateway A2 shall register with the Gatekeeper A.
2. Gateway A2 gets phone number from the SCN Telephone which is unknown to Gatekeeper A.
   - 2.1. Gateway A2 sends ARQ to Gatekeeper A.
   - 2.2. Gatekeeper A returns ARJ (reason: unknown number).
3. Gateway A2 gets phone number from the SCN Telephone .
   - 3.1. Gateway A2 sends ARQ to Gatekeeper A.
   - 3.2. Gatekeeper A returns ACF.

Note that the H.225.0 [4] SETUP message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   - 3.3. Terminal A1 performs ARQ/ACF sequence with Gatekeeper A.

Note that the fast parameter shall be returned in the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

3.4. Gatekeeper A has call active.

3.5. Terminal A1 completes connection with the SCN endpoint and opens media channels.

4. Media are exchanged and quality is evaluated.

5. Gateway A2 and Terminal A1 finish the call.

5.1. Terminal A1 and Gateway A2 send DRQ to the Gatekeeper.

5.2. Both Terminal A1 and Gateway A2 receive DCF.

5.3. Gatekeeper A has calls cleared.

Result:	**Score**
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received, Terminal and Gateway fail to connect	35
Connected, ARQ fails for Gateway (note)	40
Alerting received but no ringing tone.	47
Connected, no media exchanged (note)	50
Connected, garbled or broken media (note)	60
Connected, media in only one direction (note)	70
Connected, good Audio in both directions, call clearing failed. (note)	80
Connected, good media in both directions, Terminal and Gateway clear call, Gatekeeper does not. (note)	90
Connected, good media in both directions, call cleared with wrong reason. (note)	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected, good media in both directions, call cleared. (note)	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
*Q.931 [*15*] Keep-alive (Status Enquiry/Status) fails*	*50*
Either Terminal or Gateway doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
NOTE: The fast parameter shall be returned the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).	

TEST	**6.**	**Phone to IP-Host / Two Gatekeepers**
This test verifies the TIPHON Scenario-2 service where the Originating Gateway and the Terminating Terminal are registered with different Gatekeepers .		

1. Both Gateway B1 and Terminal A1 shall register with their respective Gatekeeper.

2. Gateway B1 gets phone number from an SCN Telephone which is unknown to the Gatekeeper(s).

2.1. Gateway B1 sends ARQ to Gatekeeper B.

2.2. Gatekeeper B issues LRQ (uni/multicast) to Gatekeeper A.

2.3. Gatekeeper A returns LRJ (reason: unknown number).

2.4. Gatekeeper B returns ARJ (reason: unknown number).

3. Gateway B1 gets phone number from the SCN Telephone .

3.1. Gateway B1 sends ARQ to Gatekeeper B.

3.2. Gatekeeper B issues LRQ (uni/multicast) to Gatekeeper A.

3.3. Gatekeeper B returns ACF.

Note that the H.225.0 [4] SETUP message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

3.4. Gatekeeper B has call active.

3.5. Terminal A1 performs ARQ/ACF sequence, returns CONNECT.

Note that the fast parameter shall be returned in the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

3.6. Gatekeeper B has call active.

3.7. Media is exchanged and quality is evaluated.

4. Gateway B1 and Terminal A1 finish the call.

4.1. Gateway B1 and Terminal A1 send DRQ to their Gatekeepers.

4.2. Gateway B1 and Terminal A1 receive DCF.

4.3. Gatekeepers have calls cleared.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
Both Terminal and Gateway register, LRQ Fails for Caller	15
Unknown address does not result in LRJ	20
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received, Terminal and Gateway fail to connect	35
Connected, ARQ fails for Gateway	40
Alerting received but no ringing tone.	47
Connected, no media exchanged	50
Connected, garbled or broken media	60
Connected, media in only one direction	70
Connected, good Audio in both directions, call clearing failed.	80
Connected, good media in both directions, Terminal and Gateway clear call, Gatekeeper does not.	90
Connected, good media in both directions, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected, good media in both directions, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
Q.931 [15] Keep-alive (Status Enquiry/Status) fails	*50*
Either Terminal or Gateway doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
NOTE: The fast parameter shall be returned in the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).	

12.2 SCN related tests

For further study.

13 Scenario 3 Phone to Phone

The reference configuration described next shall be used:

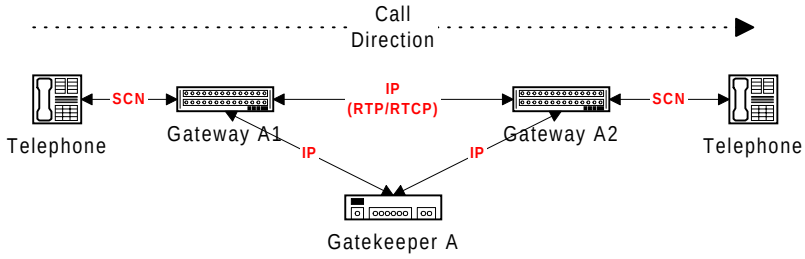


Figure 7: Phone to Phone with 1 Gatekeeper

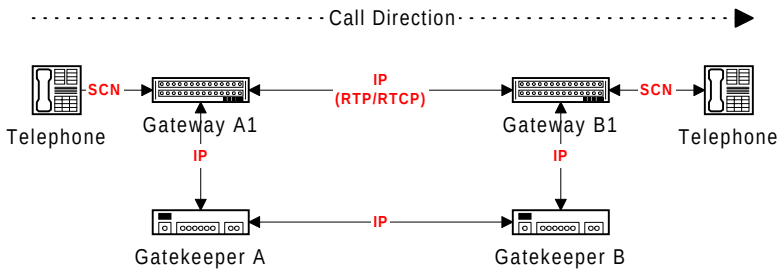


Figure 8: Phone to Phone with 2 Gatekeepers

13.1 IP related tests

TEST 7.	Phone to Phone / Single Gatekeeper
This test verifies the TIPHON Scenario-3 service where the Originating Gateway and the Terminating Gateway are registered with the same Gatekeeper.	

1. Both Gateway A1 and Gateway A2 shall register with Gatekeeper A.
2. Gateway A1 gets phone number from the SCN Telephone which is unknown to Gatekeeper A.
   - 2.1. Gateway A1 sends ARQ to Gatekeeper A.
   - 2.2. Gatekeeper A returns ARJ (reason: unknown number).
3. Gateway A1 gets phone number from the SCN Telephone.
   - 3.1. Gateway A1 sends ARQ to Gatekeeper A.
   - 3.2. Gatekeeper A returns ACF.

Note that the H.225.0 [4] SETUP message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   - 3.3. Gateway A2 performs ARQ/ACF sequence, returns CONNECT.

Note that the fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

3.4. Gatekeeper A has call active.

3.5. Media is exchanged and quality is evaluated.

4. Gateway A1 and Gateway A2 finish the call.

4.1. Gateway A1 and Gateway A2 send DRQ to Gatekeeper A.

4.2. Gateway A1 and the Gateway A2 receive DCF.

4.3. Gatekeeper A has calls cleared.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received, Terminal and Gateway fail to connect	35
Connected, ARQ fails for Gateway	40
Alerting received but no ringing tone.	47
Connected, no media exchanged	50
Connected, garbled or broken media	60
Connected, media in only one direction	70
Connected, good Audio in both directions, call clearing failed.	80
Connected, good media in both directions, Terminal and Gateway clear call, Gatekeeper does not.	90
Connected, good media in both directions, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected, good media in both directions, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
*Q.931 [*15*] Keep-alive (Status Enquiry/Status) fails*	*50*
Either Gateways doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
NOTE: The fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).	

TEST	8.	Phone to Phone / Two Gatekeepers
This test verifies the TIPHON Scenario-3 service where the Originating Gateway and the Terminating Gateway are registered with different Gatekeepers.		

The reference configuration described next shall be used:

1. Both Gateway A1 and Gateway B1 shall register with their respective Gatekeeper.

2. The Gateway A1gets phone number from the SCN Telephone which is unknown to the Gatekeeper(s).

2.1. Gateway A1 sends ARQ to Gatekeeper A.

2.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B.

2.3. Gatekeeper B returns LRJ (reason: unknown number).

2.4. Gatekeeper A returns ARJ (reason: unknown number).

3. Gateway A1 gets phone number from an SCN Telephone.

3.1. Gateway A1 sends ARQ to Gatekeeper A.

3.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B.

3.3. Gatekeeper B returns ACF.

Note that the H.225.0 [4] SETUP message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

3.4. Gatekeeper A has call active.

3.5. Gateway B1 performs ARQ/ACF sequence, returns CONNECT.

Note that the fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

3.6. Gatekeeper B has call active.

3.7. Media is exchanged and quality is evaluated.

4. Gateway A1 and Gateway B1 finish the call.

4.1. Gateway A1 and Gateway B1 send DRQ to their Gatekeepers.

4.2. Gateway A1 and Gateway B1 receive DCF.

4.3. Gatekeepers have calls cleared.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
Both Terminal and Gateway register, LRQ Fails for Caller	15
Unknown address does not result in LRJ	20
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received, Terminal and Gateway fail to connect	35
Connected, ARQ fails for Gateway	40
Alerting received but no ringing tone.	47
Connected, no media exchanged	50
Connected, garbled or broken media	60
Connected, media in only one direction	70
Connected, good Audio in both directions, call clearing failed.	80
Connected, good media in both directions, Terminal and Gateway clear call, Gatekeeper does not.	90
Connected, good media in both directions, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected, good media in both directions, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
Q.931 [15] Keep-alive (Status Enquiry/Status) fails	*50*
Either Terminals doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
NOTE: The fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).	

13.2 SCN related tests

For further study.

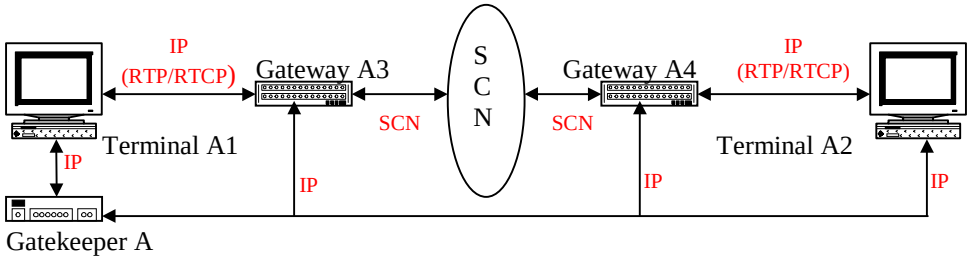
13.3 Call origination and termination by a SCN based user

For further study.

14 Scenario 4 PC to PC using SCN

TEST 9.	IP-Host to IP-Host / Single Gatekeeper
This test verifies the TIPHON Scenario-3 service where the Originating Terminal, transit gateways and the Terminating Terminal are registered with the same Gatekeeper.	

The reference configuration described next shall be used:



Note that there should be an IP connectivity between Gatekeeper A and Gateway 4 and Terminal A2.
Note that the he connection between A3 and A4 may only exist on a functional level.

Figure 9: PC to PC with 1 Gatekeeper via SCN

1. Endpoints perform discovery/registration (A1,A2,A3,A4)

2. Endpoint A1 calls Endpoint A2

   2.1. Endpoint A1- sends ARQ to Gatekeeper A.

   2.2. Gatekeeper A returns ARJ (reason : unknown number).

3. A1 calls Terminal A2

   3.1. Terminal A1 sends ARQ to Gatekeeper A.

   3.2. The Gatekeeper A returns ACF.

   3.3. Terminal A1 sends H.225.0 [4]/Q.931 [15] SETUP to the Gateway A3 (via Gatekeeper A).

Note that the H.225.0 [4]/Q.931 [15] SETUP received message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   3.4. Gateway A3 sends ISDN/Q.931 [15] SETUP message to the Terminating Gateway A4.

   3.5. Gateway A4 receives ISDN/Q.931 [15] SETUP message and sends ARQ to Gatekeeper A.

   3.6. Gatekeeper A returns ACF.

   3.7. Gateway A4 sends H.225.0 [4]/Q.931 [15] SETUP to the Terminal A2 (via Gatekeeper A).

   3.8. Terminal A2 receives H.225.0 [4]/Q.931 [15] SETUP.

Note that the H.225.0 [4]/Q.931 [15] SETUP received message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   3.9. Terminal A2 sends ARQ to Gatekeeper A.

   3.10. Terminal A2 receives ACF and returns CONNECT.

Note that the fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

3.11. Gatekeeper A has call active.

3.12. Terminal A1 completes connection via gateways and SCN with Terminal A2 and opens media channels.

4. Media are exchanged and quality is evaluated.

5. Endpoints finish the call.

5.1. Endpoints send DRQ to the Gatekeeper.

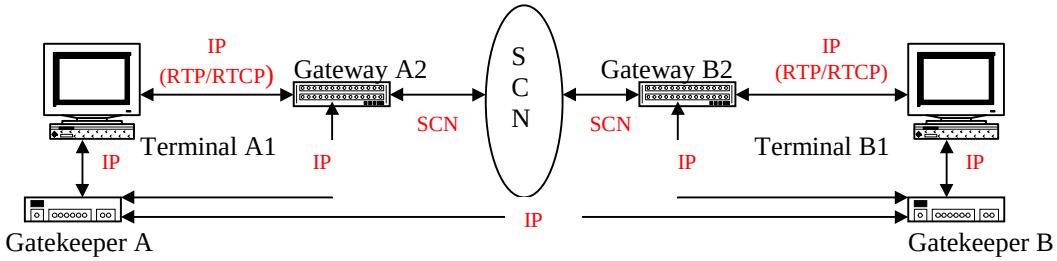
5.2. Endpoints receive DCF.

5.3. Gatekeeper has calls cleared.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway A1,A3 registers with Gatekeeper	10
Either Terminal or Gateway A2,A4 registers with Gatekeeper	20
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received by Gateway A3, Terminals fail to connect	35
Registered, ACF received by Gateway A4, Terminals fail to connect	40
Registered, ACF received by Terminal A2, Terminals fail to connect	45
Connected, no media exchanged (note)	50
Connected, garbled or broken media (note)	60
Connected, media in only one direction (note)	70
Connected, good Audio in both directions, call clearing failed. (note)	80
Connected, good media in both directions, Terminal and Gateway clear call, Gatekeeper does not. (note)	90
Connected, good media in both directions, call cleared with wrong reason. (note)	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected, good media in both directions, call cleared. (note)	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
Q.931 [15] Keep-alive (Status Enquiry/Status) fails	*50*
Either Gateways doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
NOTE: The fast connect parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode. (via H. 225 channel)	

TEST	10.	IP-Host to IP-Host / Two Gatekeepers
This test verifies the TIPHON Scenario-3 service where the Originating Terminal and the Terminating Terminal are registered with different Gatekeepers that maintain trust relationship.		

The reference configuration described next shall be used:



Note thatThere should be an IP connectivity between Gatekeeper A and Gatekeeper B.

Figure 10: PC to PC with 2 Gatekeepers

1. Both Terminal A1, Gateway A2 and Terminal B1 and Gateway B2 shall register with their respective Gatekeeper.

2. Terminal A1 calls a phone number which is unknown to the Gatekeeper (s).

   2.1. Terminal A1 sends ARQ to Gatekeeper A.

   2.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B.

   2.3. Gatekeeper B returns LRJ (reason: unknown number).

   2.4. Gatekeeper A returns ARJ (reason: unknown number).

3. Terminal A1 calls a phone number.

   3.1. Terminal A1 sends ARQ to Gatekeeper A.

   3.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B.

   3.3. Gatekeeper A returns ACF.

   3.4. Terminal A1 sends H.225.0 [4]/Q.931 [15] SETUP to the Gateway A2 (via Gatekeeper A)

Note that the H.225.0 [4]/Q.931 [15] SETUP message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   3.5. Gateway A2 sends ISDN/Q.931 [15] SETUP to the Terminating gateway B2.

   3.6. Gateway B2 receives ISDN/Q.931 [15] SETUP and sends ARQ to Gatekeeper B.

   3.7. Gatekeeper B returns ACF.

   3.8. Gateway B2 sends H.225.0 [4]/Q.931 [15] SETUP to the Terminal B1 (via Gatekeeper B)

   3.9. Gateway B2 sends H.225.0 [4]/Q.931 [15] SETUP message to the Terminal B1 (via Gatekeeper B).

   3.10. Terminal B1 receives H.225.0 [4]/Q.931 [15] SETUP

Note that the H.225.0 [4]/Q.931 [15] SETUP received message shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   3.11. Terminal B1 sends ARQ to Gatekeeper B.

   3.12. Terminal B1 receives ACF to Gatekeeper and returns CONNECT

Note that the fast parameter shall be returned in any message upto and including the H.225.0 [4] CONNECT message. Any H.245 [5] signalling used shall occur in tunnelling mode (via H.225.0 [4] channel).

   3.13. Gatekeeper A has call active

   3.14. Gatekeeper B has call active.

   3.15. Media is exchanged and quality is evaluated..

4. Terminal A1,B1 and Gateway A2,B2 finish the call.

   4.1. Terminal A1,B1 and Gateway A2,B2 send DRQ to their Gatekeepers.

   4.2. Terminal A1,B1 and Gateway A2,B2 receive DCF.

   4.3. Gatekeepers have calls cleared.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
Both Terminal and Gateway register, LRQ Fails for	15
Unknown address does not result in LRJ	20
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received by Gateway A2 fail to connect	35
Registered, ACF received by Gateway B2 fail to connect	40
Registered, ACF received by Terminal B1 fail to connect	45
Connected, no media exchanged	50
Connected, garbled or broken media	60
Connected, media in only one direction	70
Connected, good Audio in both directions, call clearing failed.	80
Connected, good media in both directions, Terminal and Gateway clear call, Gatekeeper does not.	90
Connected, good media in both directions, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected, good media in both directions, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
Q.931 [15] Keep-alive (Status Enquiry/Status) fails	*50*
Either Terminal/Gateway doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*

15 Scenarios 0,1,2,3 with Transit Gatekeeper

TEST 11.	IP-Host to IP-Host / Two Administrative Domains via a Transit Gatekeeper
This test verifies the TIPHON Scenario-0 service where the Originating Terminal and the Terminating Terminal are registered with different Gatekeepers that do not maintain trust relationship, and need a third party to establish trust. This may also occur when QoS needs to be guaranteed across administrative domains.	

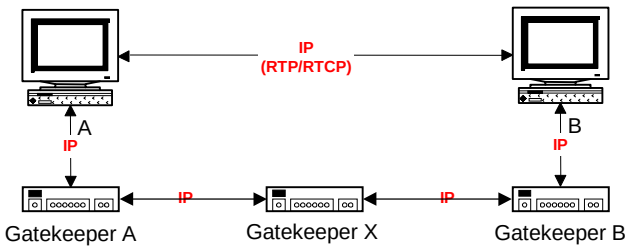


Figure 11: PC to PC with 3 Gatekeepers

1. Terminals perform discovery/registration with their respective Gatekeepers

2. Terminal A calls Terminal B

   2.1. Terminal A sends ARQ to Gatekeeper A

   2.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper X

   2.3. Gatekeeper X issues LRQ (uni/multicast) to Gatekeeper B

   2.4. Gatekeeper B returns LCF to Gatekeeper X

   2.5. Gatekeeper X returns LCF to Gatekeeper A

   2.6. Gatekeeper A returns ACF to Terminal A

Note that the Setup shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode.

2.7. Terminal A issues Setup to Gatekeeper A

2.8. Gatekeeper A sends Setup to Gatekeeper X

2.9. Gatekeeper X sends Setup to Gatekeeper B

2.10. Gatekeeper B sends Setup to Terminal B

2.11. Terminal B performs ARQ/ACF sequence, returns Connect to Gatekeeper B

2.12. Gatekeeper B sends Connect to Gatekeeper X, Gatekeeper B has call active

2.13. Gatekeeper X sends Connect to Gatekeeper A, Gatekeeper X has call active

2.14. Gatekeeper A sends Connect to Terminal A, Gatekeeper A has call active

Note that the fast parameter shall be returned in any message upto and including the Connect. Any H.245 [5] signalling used shall occur in tunnelling mode.

3. Media is exchanged and quality is evaluated. *(A, A/V; A/V with D)*

4. Terminals terminate call

4.1. Both Terminals send DRQ to Gatekeeper.

4.2. Both Terminals receive DCF.

4.3. Gatekeepers have calls cleared.

5. Terminal B calls Terminal A

5.1. Terminal B sends ARQ to Gatekeeper B

5.2. Gatekeeper B issues LRQ (uni/multicast) to Gatekeeper X

5.3. Gatekeeper X issues LRQ (uni/multicast) to Gatekeeper A

5.4. Gatekeeper A returns LCF to Gatekeeper X

5.5. Gatekeeper X returns LCF to Gatekeeper B

5.6. Gatekeeper B returns ACF to Terminal B

Note that the Setup shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode.

5.7. Terminal B issues Setup to Gatekeeper B

5.8. Gatekeeper B sends Setup to Gatekeeper X

5.9. Gatekeeper X sends Setup to Gatekeeper A

5.10. Gatekeeper A sends Setup to Terminal A,

5.11. Terminal A performs ARQ/ACF sequence, returns Connect to Gatekeeper A

5.12. Gatekeeper A sends Connect to Gatekeeper X, Gatekeeper A has call active

5.13. Gatekeeper X sends Connect to Gatekeeper B, Gatekeeper X has call active

5.14. Gatekeeper B sends Connect to Terminal B, Gatekeeper B has call active

Note that the fast parameter shall be returned in any message upto and including the Connect. Any H.245 [5] signalling used shall occur in tunnelling mode.

6. Media is exchanged and quality is evaluated. *(A/V; A/V with D)*

7. Terminals terminate call

   7.1. Both Terminals send DRQ to Gatekeeper.

   7.2. Both Terminals receive DCF.

   7.3. Gatekeepers have calls cleared.

8. Terminal A calls Terminal C (unknown Terminal)

   8.1. Terminal A sends ARQ to Gatekeeper A.

   8.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper X.

   8.3. Gatekeeper X issues LRQ (uni/multicast) to Gatekeeper B.

   8.4. Gatekeeper B returns LRJ to Gatekeeper X.

   8.5. Gatekeeper X returns LRJ to Gatekeeper A.

   8.6. Gatekeeper A returns ARJ to Terminal A.

9. Terminal B calls Terminal D (unknown Terminal)

   9.1. Terminal B sends ARQ to Gatekeeper B.

   9.2. Gatekeeper B issues LRQ (uni/multicast) to Gatekeeper X.

   9.3. Gatekeeper X issues LRQ (uni/multicast) to Gatekeeper A.

   9.4. Gatekeeper A returns LRJ to Gatekeeper X.

   9.5. Gatekeeper X returns LRJ to Gatekeeper B.

   9.6. Gatekeeper B returns ARJ to Terminal B.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of both Terminals to register with Gatekeeper	5
Only one Terminal registers with Gatekeeper	7
Both Terminals registered, ARQ Fails for Caller	10
LRQ fails between First Gatekeeper and Transit Gatekeeper	12
LRQ fails between Transit Gatekeeper and Last Gatekeeper	15
Unknown address does not result in ARJ and/or LRJ	17
ACF received by Terminal A, but Setup fails between Terminal A and First Gatekeeper	20
Setup fails between First Gatekeeper and Transit Gatekeeper	22
Setup fails between Transit Gatekeeper and Last Gatekeeper	25
Setup fails between Last Gatekeeper and Terminal B	27
Setup received by Terminal B, but ARQ fails for Terminal B	30
Alerting fails between Terminal B and Terminal A (optional)	*32*
ACF received by Terminal B, but Connect fails between Terminal B and Last Gatekeeper	40
Connect fails between Last Gatekeeper and Transit Gatekeeper	42
Connect fails between Transit Gatekeeper and First Gatekeeper	45
Connect fails between First Gatekeeper and Terminal A	47
Terminals are connected, but no media exchanged	50
Connected, garbled or broken media	60
Connected, media in only one direction	70
Connected, good Audio in both directions, call clearing failed.	80
Connected, good media in both directions, Terminals clear call, Gatekeepers does not	90
Connected, good media in both directions, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
Q.931 [15] Keep-alive (Status Enquiry/Status) fails	*50*
Either Terminal or Gateway doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
Note that the SETUP message shall include the FastStart parameter. The fast parameter shall be returned in any message upto and including the Connect message. Any H.245 [5] signalling used shall occur in tunnelling mode.	

TEST 12.	IP-Host to Phone / Two Administrative Domains via a Transit Gatekeeper
This test verifies the TIPHON Scenario-1 service where the Originating Terminal and the Terminating Gateway are registered with different Gatekeepers that do not maintain trust relationship, and need a third party to establish trust. This may also occur when QoS needs to be guaranteed across administrative domains.	

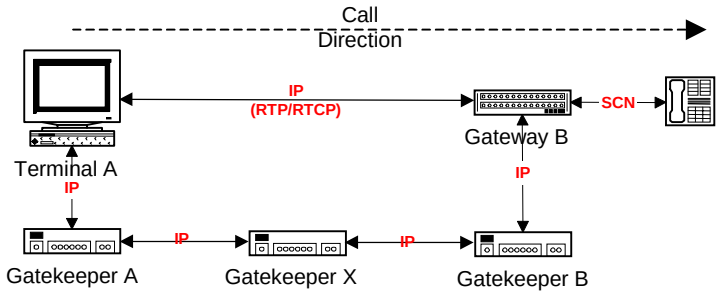


Figure 12: PC to Phone with 3 Gatekeepers

1. Terminal and Gateway perform discovery/registration with their respective Gatekeepers

2. Terminal A calls Gateway B

   2.1. Terminal A sends ARQ to Gatekeeper A.

   2.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper X.

   2.3. Gatekeeper X issues LRQ (uni/multicast) to Gatekeeper B.

2.4. Gatekeeper B returns LCF to Gatekeeper X.

2.5. Gatekeeper X returns LCF to Gatekeeper A.

2.6. Gatekeeper A returns ACF to Terminal A.

Note that the Setup shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode.

2.7. Terminal A issues Setup to Gatekeeper A.

2.8. Gatekeeper A sends Setup to Gatekeeper X.

2.9. Gatekeeper X sends Setup to Gatekeeper B.

2.10. Gatekeeper B sends Setup to Gateway B.

2.11. Gateway B performs ARQ/ACF sequence, returns Connect to Gatekeeper B.

2.12. Gatekeeper B sends Connect to Gatekeeper X, Gatekeeper B has call active.

2.13. Gatekeeper X sends Connect to Gatekeeper A, Gatekeeper X has call active.

2.14. Gatekeeper A sends Connect to Terminal A, Gatekeeper A has call active.

Note that the fast parameter shall be returned in any message upto and including the Connect. Any H.245 [5] signalling used shall occur in tunnelling mode.

3. Media is exchanged and quality is evaluated. *(A, A/V; A/V with D)*

4. Terminal and Gateway terminate call

4.1. Both Terminal A and Gateway B send DRQ to their respective Gatekeepers.

4.2. Both Terminal A and Gateway B receive DCF.

4.3. Gatekeepers have calls cleared.

5. Terminal A calls Terminal C (unknown Terminal)

5.1. Terminal A sends ARQ to Gatekeeper A.

5.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper X.

5.3. Gatekeeper X issues LRQ (uni/multicast) to Gatekeeper B.

5.4. Gatekeeper B returns LRJ to Gatekeeper X.

5.5. Gatekeeper X returns LRJ to Gatekeeper A.

5.6. Gatekeeper A returns ARJ to Terminal A.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of both Terminal and Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	7
Both Terminal and Gateway registered, ARQ Fails for Caller	10
LRQ fails between First Gatekeeper and Transit Gatekeeper	12
LRQ fails between Transit Gatekeeper and Last Gatekeeper	15
Unknown address does not result in ARJ and/or LRJ	17
ACF received by Terminal, but Setup fails between Terminal and First Gatekeeper	20
Setup fails between First Gatekeeper and Transit Gatekeeper	22
Setup fails between Transit Gatekeeper and Last Gatekeeper	25
Setup fails between Last Gatekeeper and Gateway	275
Setup received by Gateway, but ARQ fails for Gateway	30
Alerting fails between Gateway *and Terminal (optional)*	*32*
ACF received by Gateway, but Connect fails between Gateway and Last Gatekeeper	40
Connect fails between Last Gatekeeper and Transit Gatekeeper	42
Connect fails between Transit Gatekeeper and First Gatekeeper	45
Connect fails between First Gatekeeper and Terminal	47
Terminal and Gateway are connected, but no media exchanged	50
Connected, garbled or broken media	60
Connected, media in only one direction	70
Connected, good Audio in both directions, call clearing failed.	80
Connected, good media in both directions, Terminal and Gateway clear call, Gatekeepers does not	90
Connected, good media in both directions, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
Q.931 [15] Keep-alive (Status Enquiry/Status) fails	*50*
Terminal or Gateway *doesn't re-register on time (Keep-Alive), if requested by Gatekeeper*	*10*
Note that the SETUP message shall include the FastStart parameter. The fast parameter shall be returned in any message upto and including the Connect message. Any H.245 [5] signalling used shall occur in tunnelling mode.	

TEST Optional	13.	Phone to IP-Host / Two Administrative Domains via a Transit Gatekeeper
This test verifies the TIPHON Scenario-2 service where the Originating Gateway and the Terminating Terminal are registered with different Gatekeepers that do not maintain trust relationship, and need a third party to establish trust. This may also occur when QoS needs to be guaranteed across administrative domains.		

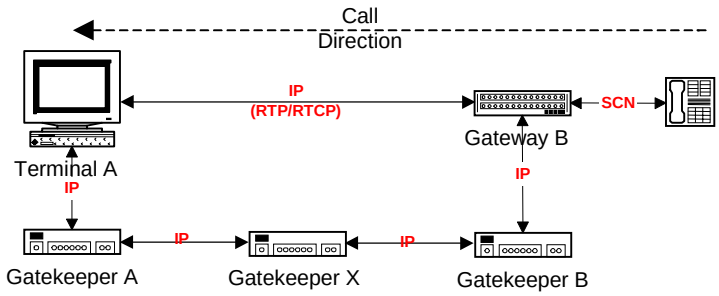


Figure 13: Phone to PC with 3 Gatekeepers

1. Gateway and Terminal perform discovery/registration with their respective Gatekeepers

2. Gateway B calls Terminal A

   2.1. Gateway B sends ARQ to Gatekeeper B.

   2.2. Gatekeeper B issues LRQ (uni/multicast) to Gatekeeper X.

2.3. Gatekeeper X issues LRQ (uni/multicast) to Gatekeeper A.

2.4. Gatekeeper A returns LCF to Gatekeeper X.

2.5. Gatekeeper X returns LCF to Gatekeeper B.

2.6. Gatekeeper B returns ACF to Gateway B.

Note that the Setup shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode.

2.7. Gateway B issues Setup to Gatekeeper B.

2.8. Gatekeeper B sends Setup to Gatekeeper X.

2.9. Gatekeeper X sends Setup to Gatekeeper A.

2.10. Gatekeeper A sends Setup to Terminal A.

2.11. Terminal A performs ARQ/ACF sequence, returns Connect to Gatekeeper A.

2.12. Gatekeeper A sends Connect to Gatekeeper X, Gatekeeper A has call active.

2.13. Gatekeeper X sends Connect to Gatekeeper A, Gatekeeper X has call active.

2.14. Gatekeeper B sends Connect to Gateway B, Gatekeeper B has call active.

Note that the fast parameter shall be returned in any message upto and including the Connect. Any H.245 [5] signalling used shall occur in tunnelling mode.

3. Media is exchanged and quality is evaluated. *(A, A/V; A/V with D)*

4. Gateway and Terminal terminate call

4.1. Both Gateway B and Terminal A send DRQ to their respective Gatekeepers.

4.2. Both Gateway B and Terminal A receive DCF.

4.3. Gatekeepers have calls cleared.

5. Gateway B calls Terminal C (unknown Terminal)

5.1. Gateway B sends ARQ to Gatekeeper B.

5.2. Gatekeeper B issues LRQ (uni/multicast) to Gatekeeper X.

5.3. Gatekeeper X issues LRQ (uni/multicast) to Gatekeeper A.

5.4. Gatekeeper A returns LRJ to Gatekeeper X.

5.5. Gatekeeper X returns LRJ to Gatekeeper B.

5.6. Gatekeeper B returns ARJ to Gateway B.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of both Gateway and Terminal to register with Gatekeeper	5
Either Gateway or Terminal registers with Gatekeeper	7
Both Gateway and Terminal registered, ARQ Fails for Caller	10
LRQ fails between First Gatekeeper and Transit Gatekeeper	12
LRQ fails between Transit Gatekeeper and Last Gatekeeper	15
Unknown address does not result in ARJ and/or LRJ	17
ACF received by Gateway, but Setup fails between Gateway and First Gatekeeper	20
Setup fails between First Gatekeeper and Transit Gatekeeper	22
Setup fails between Transit Gatekeeper and Last Gatekeeper	25
Setup fails between Last Gatekeeper and Terminal	27
Setup received by Terminal, but ARQ fails for Terminal	30
Alerting fails between Gateway and Terminal (optional)	*32*
ACF received by Terminal, but Connect fails between Terminal and Last Gatekeeper	40
Connect fails between Last Gatekeeper and Transit Gatekeeper	42
Connect fails between Transit Gatekeeper and First Gatekeeper	45
Connect fails between First Gatekeeper and Gateway	47
Terminals are connected, but no media exchanged	50
Connected, garbled or broken media	60
Connected, media in only one direction	70
Connected, good Audio in both directions, call clearing failed.	80
Connected, good media in both directions, Terminal and Gateway clear call, Gatekeepers does not	90
Connected, good media in both directions, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared with unclear reason Connected, good media in both directions, call cleared.	97 100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
Q.931 [15] Keep-alive (Status Enquiry/Status) fails for either Gateway or Terminal	*50*
Gateway or Terminal doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
Note that the SETUP message shall include the FastStart parameter. The fast parameter shall be returned in any message upto and including the Connect message. Any H.245 [5] signalling used shall occur in tunnelling mode.	

TEST Optional	14.	Phone to Phone / Two Administrative Domains via Transit Gatekeeper
This test verifies the TIPHON Scenario-3 service where the Originating Gateway and the Terminating Gateway are registered with different Gatekeepers that do not maintain trust relationship, and need a third party to establish trust. This may also occur when QoS needs to be guaranteed across administrative domains.		

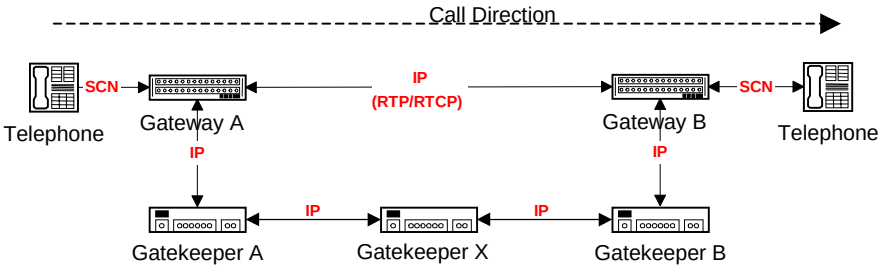


Figure 14: Phone to Phone with 3 Gatekeepers

1. Gateways perform discovery/registration with their respective Gatekeepers

2. Gateway A calls Gateway B

   2.1. Gateway A sends ARQ to Gatekeeper A.

   2.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper X.

2.3. Gatekeeper X issues LRQ (uni/multicast) to Gatekeeper B.

2.4. Gatekeeper B returns LCF to Gatekeeper X.

2.5. Gatekeeper X returns LCF to Gatekeeper A.

2.6. Gatekeeper A returns ACF to Gateway A.

Note that the Setup shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode.

2.7. Gateway A issues Setup to Gatekeeper A.

2.8. Gatekeeper A sends Setup to Gatekeeper X.

2.9. Gatekeeper X sends Setup to Gatekeeper B.

2.10. Gatekeeper B sends Setup to Gateway B.

2.11. Gateway B performs ARQ/ACF sequence, returns Connect to Gatekeeper B.

2.12. Gatekeeper B sends Connect to Gatekeeper X, Gatekeeper B has call active.

2.13. Gatekeeper X sends Connect to Gatekeeper A, Gatekeeper X has call active.

2.14. Gatekeeper A sends Connect to Gateway A, Gatekeeper A has call active.

Note that the fast parameter shall be returned in any message upto and including the Connect. Any H.245 [5] signalling used shall occur in tunnelling mode.

3. Media is exchanged and quality is evaluated. *(A, A/V; A/V with D)*

4. Gateways terminate call

4.1. Both Gateways send DRQ to Gatekeeper.

4.2. Both Gateways receive DCF.

4.3. Gatekeepers have calls cleared.

5. Gateway B calls Gateway A

5.1. Gateway B sends ARQ to Gatekeeper B.

5.2. Gatekeeper B issues LRQ (uni/multicast) to Gatekeeper X.

5.3. Gatekeeper X issues LRQ (uni/multicast) to Gatekeeper A.

5.4. Gatekeeper A returns LCF to Gatekeeper X.

5.5. Gatekeeper X returns LCF to Gatekeeper B.

5.6. Gatekeeper B returns ACF to Gateway B.

Note that the Setup shall include the FastStart parameter. Any H.245 [5] signalling used shall occur in tunnelling mode.

5.7. Gateway B issues Setup to Gatekeeper B.

5.8. Gatekeeper B sends Setup to Gatekeeper X.

5.9. Gatekeeper X sends Setup to Gatekeeper A.

5.10. Gatekeeper A sends Setup to Gateway A.

5.11. Gateway A performs ARQ/ACF sequence, returns Connect to Gatekeeper A.

5.12. Gatekeeper A sends Connect to Gatekeeper X, Gatekeeper A has call active.

5.13. Gatekeeper X sends Connect to Gatekeeper B, Gatekeeper X has call active.

5.14. Gatekeeper B sends Connect to Gateway B, Gatekeeper B has call active.

Note that the fast parameter shall be returned in any message upto and including the Connect. Any H.245 [5] signalling used shall occur in tunnelling mode.

6. Media is exchanged and quality is evaluated. *(A/V; A/V with D)*

7. Gateways terminate call

7.1. Both Gateways send DRQ to Gatekeeper.

7.2. Both Gateways receive DCF.

7.3. Gatekeepers have calls cleared.

8. Gateway A calls Phone C (unknown Phone)

8.1. Gateway A sends ARQ to Gatekeeper A.

8.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper X.

8.3. Gatekeeper X issues LRQ (uni/multicast) to Gatekeeper B.

8.4. Gatekeeper B returns LRJ to Gatekeeper X.

8.5. Gatekeeper X returns LRJ to Gatekeeper A.

8.6. Gatekeeper A returns ARJ to Gateway A.

9. Gateway B calls Phone D (unknown Phone)

9.1. Gateway B sends ARQ to Gatekeeper B.

9.2. Gatekeeper B issues LRQ (uni/multicast) to Gatekeeper X.

9.3. Gatekeeper X issues LRQ (uni/multicast) to Gatekeeper A.

9.4. Gatekeeper A returns LRJ to Gatekeeper X.

9.5. Gatekeeper X returns LRJ to Gatekeeper B.

9.6. Gatekeeper B returns ARJ to Gateway B.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of both Gateways to register with Gatekeeper	5
Only one Gateway registers with Gatekeeper	7
Both Gateways registered, ARQ Fails for Caller	10
LRQ fails between First Gatekeeper and Transit Gatekeeper	12
LRQ fails between Transit Gatekeeper and Last Gatekeeper	15
Unknown address does not result in ARJ and/or LRJ	17
ACF received by Gateway A, but Setup fails between Gateway A and First Gatekeeper	20
Setup fails between First Gatekeeper and Transit Gatekeeper	22
Setup fails between Transit Gatekeeper and Last Gatekeeper	25
Setup fails between Last Gatekeeper and Gateway B	27
Setup received by Gateway B, but ARQ fails for Gateway B	30
Alerting fails between Gateway B and Gateway A (optional)	*32*
ACF received by Gateway B, but Connect fails between Gateway B and Last Gatekeeper	40
Connect fails between Last Gatekeeper and Transit Gatekeeper	42
Connect fails between Transit Gatekeeper and First Gatekeeper	45
Connect fails between First Gatekeeper and Gateway A	47
Gateways are connected, but no media exchanged	50
Connected, garbled or broken media	60
Connected, media in only one direction	70
Connected, good Audio in both directions, call clearing failed.	80
Connected, good media in both directions, Gateways clear call, Gatekeepers does not	90
Connected, good media in both directions, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected, good media in both directions, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
*Q.931 [*15*] Keep-alive (Status Enquiry/Status) fails for any* Gateway	*50*
Either Gateway *doesn't re-register on time (Keep-Alive), if requested by Gatekeeper*	*10*
NOTE: The SETUP message shall include the FastStart parameter. The fast parameter shall be returned in any message upto and including the Connect message. Any H.245 [5] signalling used shall occur in tunnelling mode.	

16 Scenarios 0,1,2,3 according to TIPHON Security Profile

TEST .	Scenarios 1,2,3 according to TIPHON Security Profile TBD

For further study.

17 Additional Test Services

Test cases for in-band indicated in a PROGRESS message from SCN:

TEST 15.	IP-Host to SCN-Announcement machine / Single Gatekeeper
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 with the same Gatekeeper.	
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.	

The reference configuration described next shall be used:

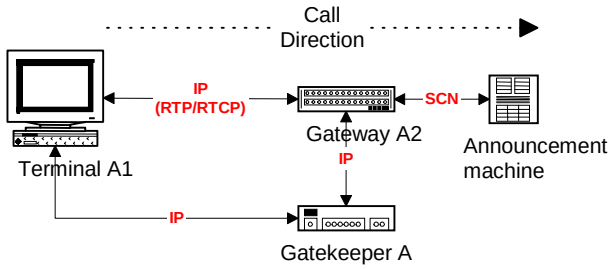


Figure 15: PC to Announcement machine with 1 Gatekeeper

1. Both Terminal A1 and Gateway A2 shall register with Gatekeeper A.
2. Terminal A1 calls phone number which is unknown to Gatekeeper A.
   - 2.1. Terminal A1 sends ARQ to Gatekeeper A.
   - 2.2. Gatekeeper A returns ARJ (reason: unknown number).
3. A1 calls a phone number marked as vacant in SCN
   - 3.1. A1 sends ARQ to Gatekeeper A.
   - 3.2. The Gatekeeper A returns ACF.

Note that the H.225.0 [4] SETUP message shall include the **fastStart** parameter.

   - 3.3. Gateway A2 performs ARQ/ACF sequence with Gatekeeper A, returns PROGRESS

Note that the fast parameter shall be returned in the PROGRESS message.

   - 3.4. An announcement machine is connected to the call

4. Media are exchanged and quality is evaluated.
5. Terminal A1 and Gateway A2 finish the call.
   - 5.1. Terminal A1 and Gateway A2 send DRQ to Gatekeeper A.
   - 5.2. Both Terminal A1 and Gateway A2 receive DCF.
   - 5.3. Gatekeeper A has calls cleared.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received, Terminal and Gateway fail to connect	35
ARQ fails for Gateway	40
Connected to the announcement machine, no media exchanged	50
Connected to the announcement machine, garbled or broken media	60
Connected to the announcement machine, good Audio, call clearing failed.	80
Connected to the announcement machine, good media, Terminal and Gateway clear call, Gatekeeper does not.	90
Connected to the announcement machine, good media, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected to the announcement machine, good media in both directions, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
Q.931 [15] Keep-alive (Status Enquiry/Status) fails	*50*
Either Terminal/Gateway doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
NOTE: The SCN does not return a CONNECT message instead a PROGRESS message is returned. The **fastStart** parameter shall be returned in the PROGRESS message.	

TEST	16.	IP-Host to SCN-Announcement machine / Two Gatekeepers
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 with different Gatekeepers.		
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.		

The reference configuration described next shall be used:

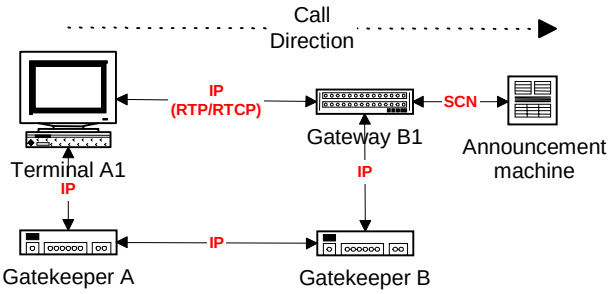


Figure 16: PC to Announcement machine with 2 Gatekeepers

1. Both Terminal A1 and the Gateway B1 shall register with their respective Gatekeeper.

2. Terminal A1 calls a phone number which is unknown to the Gatekeeper (s).

   2.1. Terminal A1 sends ARQ to Gatekeeper A.

   2.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B.

   2.3. Gatekeeper B returns LRJ (reason: unknown number).

   2.4. Gatekeeper A returns ARJ (reason: unknown number).

3. A1 calls a phone number marked as vacant in SCN

   3.1. Terminal A1 sends ARQ to Gatekeeper A.

   3.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B.

3.3. Gatekeeper A returns ACF.

Note that the SETUP message shall include the **fastStart** parameter.

3.4. Gatekeeper A has call active.

3.5. Gateway B1 Terminating Gateway performs ARQ/ACF sequence, returns PROGRESS.

Note that the fast parameter shall be returned in PROGRESS message.

3.6. Gatekeeper B has call active.

3.7. An announcement machine is connected in SCN

3.8. Media is exchanged and quality is evaluated.

4. Terminal A1 and Gateway B1 finish the call.

4.1. Terminal A1 and Gateway B1 send DRQ to their Gatekeepers.

4.2. Terminal A1 and Gateway B1 receive DCF.

4.3. Gatekeepers have calls cleared.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
Both Terminal and Gateway register, LRQ Fails for Caller	15
Unknown address does not result in LRJ	20
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received, Terminal and Gateway fail to connect	35
Connected, ARQ fails for Gateway	40
Connected to announcement machine, no media exchanged	50
Connected to announcement machine, garbled or broken media	60
Connected to announcement machine, good Audio, call clearing failed.	80
Connected to announcement machine, good media, Terminal and Gateway clear call, Gatekeeper does not. (note)	90
Connected to announcement machine, good media, call cleared with wrong reason.	95
Connected, good media, call cleared with unclear reason	97
Connected to announcement machine, good media, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
*Q.931 [*15*] Keep-alive (Status Enquiry/Status) fails*	*50*
Either Terminal/Gateway doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
NOTE: The SCN does not return a CONNECT message instead a PROGRESS message is returned. The **fastStart** parameter shall be returned in the PROGRESS message.	

TEST 17.	**IP-Host to SCN-Announcement machine / Single Gatekeeper**
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.	
NOTE: The in-band information generated by the announcement machine is sent during the release of the call.	

The reference configuration described next shall be used:

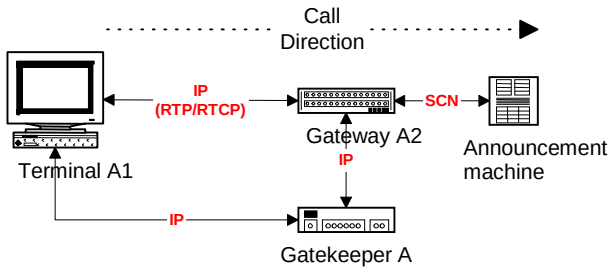


Figure 17: PC to Announcement machine with 1 Gatekeeper

1. Both Terminal A1 and Gateway A2 shall register with Gatekeeper A.
2. Terminal A1 calls phone number which is unknown to Gatekeeper A.
   - 2.1. Terminal A1 sends ARQ to Gatekeeper A.
   - 2.2. Gatekeeper A returns ARJ (reason: unknown number).
3. A1 calls a phone number marked as vacant in SCN
   - 3.1. A1 sends ARQ to Gatekeeper A.
   - 3.2. The Gatekeeper A returns ACF.

Note that the H.225.0.0 [4] SETUP message shall include the **fastStart** parameter.

   - 3.3. Gateway A2 performs ARQ/ACF sequence with Gatekeeper A, returns PROGRESS

Note that the fast parameter shall be returned in the PROGRESS message.

   - 3.4. An announcement machine is connected to the call

4. Media are exchanged and quality is evaluated.
5. Terminal A1 and Gateway A2 finish the call.
   - 5.1. Terminal A1 and Gateway A2 send DRQ to Gatekeeper A.
   - 5.2. Both Terminal A1 and Gateway A2 receive DCF.
   - 5.3. Gatekeeper A has calls cleared.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received, Terminal and Gateway fail to connect	35
ARQ fails for Gateway	40
Connected to the announcement machine, no media exchanged	50
Connected to the announcement machine, garbled or broken media	60
Connected to the announcement machine, good Audio, call clearing failed.	80
Connected to the announcement machine, good media, Terminal and Gateway clear call, Gatekeeper does not.	90
Connected to the announcement machine, good media, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected to the announcement machine, good media in both directions, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
Q.931 [15] Keep-alive (Status Enquiry/Status) fails	*50*
Either Terminal/Gateway doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
NOTE: The SCN does not return a CONNECT message instead a DISCONNECT message, indicating that in-band information is available, is returned. The **fastStart** parameter shall be returned in a PROGRESS message.	

TEST	18.	IP-Host to SCN-Announcement machine / Two Gatekeepers
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 different Gatekeepers.		
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.		

The reference configuration described next shall be used:

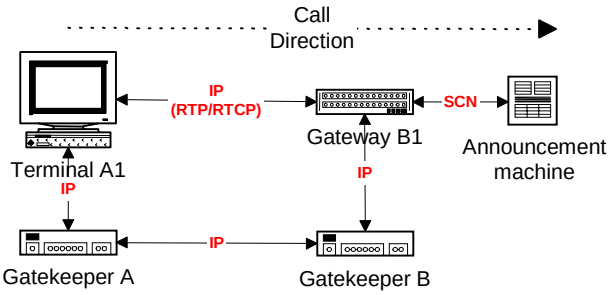


Figure 18: PC to Announcement machine with 2 Gatekeepers

1. Both Terminal A1 and the Gateway B1 shall register with their respective Gatekeeper.

2. Terminal A1 calls a phone number which is unknown to the Gatekeeper (s).

   2.1. Terminal A1 sends ARQ to Gatekeeper A.

   2.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B.

   2.3. Gatekeeper B returns LRJ (reason: unknown number).

   2.4. Gatekeeper A returns ARJ (reason: unknown number).

3. A1 calls a phone number marked as vacant in SCN

   3.1. Terminal A1 sends ARQ to Gatekeeper A.

3.2. Gatekeeper A issues LRQ (uni/multicast) to Gatekeeper B.

3.3. Gatekeeper A returns ACF.

Note that the SETUP message shall include the **fastStart** parameter.

3.4. Gatekeeper A has call active.

3.5. Gateway B1 Terminating Gateway performs ARQ/ACF sequence, returns PROGRESS.

Note that the fast parameter shall be returned in PROGRESS message.

3.6. Gatekeeper B has call active.

3.7. An announcement machine is connected in SCN

3.8. Media is exchanged and quality is evaluated.

4. Terminal A1 and Gateway B1 finish the call.

4.1. Terminal A1 and Gateway B1 send DRQ to their Gatekeepers.

4.2. Terminal A1 and Gateway B1 receive DCF.

4.3. Gatekeepers have calls cleared.

Result:	Score
Failure to discover Gatekeeper (either Directed or Multicast)	0
Failure of either Terminal or Gateway to register with Gatekeeper	5
Either Terminal or Gateway registers with Gatekeeper	10
Both Terminal and Gateway register, LRQ Fails for Caller	15
Unknown address does not result in LRJ	20
ARQ fails for Caller	25
Unknown address does not result in ARJ	30
Registered, ACF received, Terminal and Gateway fail to connect	35
Connected, ARQ fails for Gateway	40
Connected to announcement machine, no media exchanged	50
Connected to announcement machine, garbled or broken media	60
Connected to announcement machine, media in only one direction	70
Connected to announcement machine, good Audio in both directions, call clearing failed.	80
Connected to announcement machine, good media in both directions, Terminal and Gateway clear call, Gatekeeper does not. (note)	90
Connected to announcement machine, good media in both directions, call cleared with wrong reason.	95
Connected, good media in both directions, call cleared with unclear reason	97
Connected to announcement machine, good media in both directions, call cleared.	100
At any Time	
RAS Keep-alive (IRQ/IRR or spontaneous IRR) fails	*20*
*Q.931 [*15*] Keep-alive (Status Enquiry/Status) fails*	*50*
Either Terminal/Gateway doesn't re-register on time (Keep-Alive), if requested by Gatekeeper	*10*
NOTE: The SCN does not return a CONNECT message instead a DISCONNECT message is returned. The **fastStart** parameter shall be returned in the PROGRESS message.	

TEST . Optional	Scenarios 1,2,3 with DTMF in a Call

For further study.

TEST Optional	.	Scenarios 1,2,3 with Overlap sending and Receiving

For further study.

18 Additional Supplementary Services

For further study.

18.1 IP related tests

18.2 SCN related tests

19 Interaction with Settlement Services

This test specification considers two alternatives for communication with settlement service providers. The first assumes complex domains, which are those zones sufficiently complex to require their own H.323 [8] gatekeeper. The second alternative describes simpler domains in which gatekeepers are not required (and could, for example, consist of just a single gateway). Each approach includes a series of interoperability tests.

19.1 Communication between Complex Domains and Settlement Services

TEST 19.	**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 Figure 19 shows the general interaction between the gatekeeper and the settlement server. The steps in the figure are:

1) Source Endpoint sends H.323 [8] 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 [8] Setup to Gatekeeper B.

5) Gatekeeper B continues call setup with H.323 [8] Setup to Destination Endpoint.

6) Destination Endpoint accepts call.

NOTE 1: This test scenario is strictly concerned with the interaction between Gatekeeper A and the OSP Server (steps 2 and 3 above.)

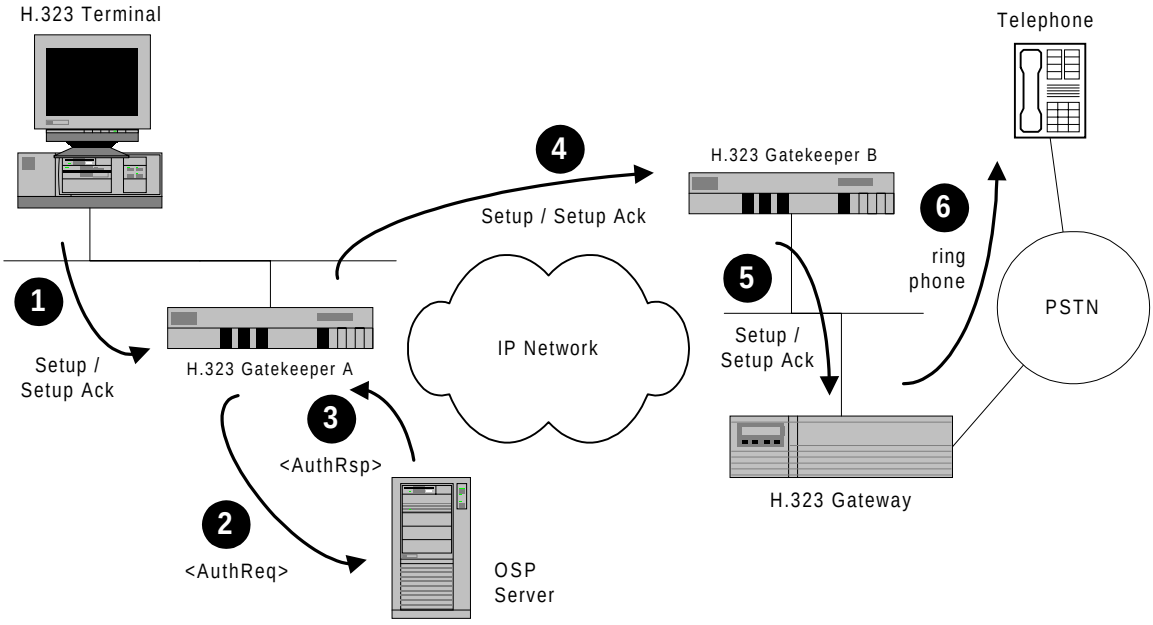


Figure 19: Authorization and Call Routing from Gatekeeper to Settlement Server

Result:	Score
Gatekeeper A does not complete SSL negotiation with OSP Server	0
Gatekeeper A successfully completes SSL negotiation with OSP Server	10
Gatekeeper A does not send <AuthorizationRequest>	20
OSP server does not reply with <AuthorizationResponse>	30
Authorization fails, OSP Server rejects Gatekeeper A request	40
Authorization fails, OSP Server does not return destination of Gatekeeper B	50
Authorization complete, Gatekeeper A does not attempt connection to destination	70
Authorization complete, Gatekeeper A attempts connection with destination other than GK B	80
Authorization complete, Gatekeeper A attempts connection with Gatekeeper B	90
Authorization complete, Gatekeeper A connects successfully with Gatekeeper B	100

TEST 20.	Usage Reporting 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 Figure 20 shows the general interaction between the gatekeepers and the settlement server. The steps in the figure are:

- Gatekeepers release call.
- Gatekeeper A sends <UsageIndication> to OSP Server.
- OSP Server replies with <UsageConfirmation>.
- Gatekeeper B sends <UsageIndication> to OSP Server.
- OSP Server replies with <UsageConfirmation>.

NOTE 2: This test scenario is strictly concerned with the interaction between the Gatekeepers and the OSP Server (steps 8-11 above).

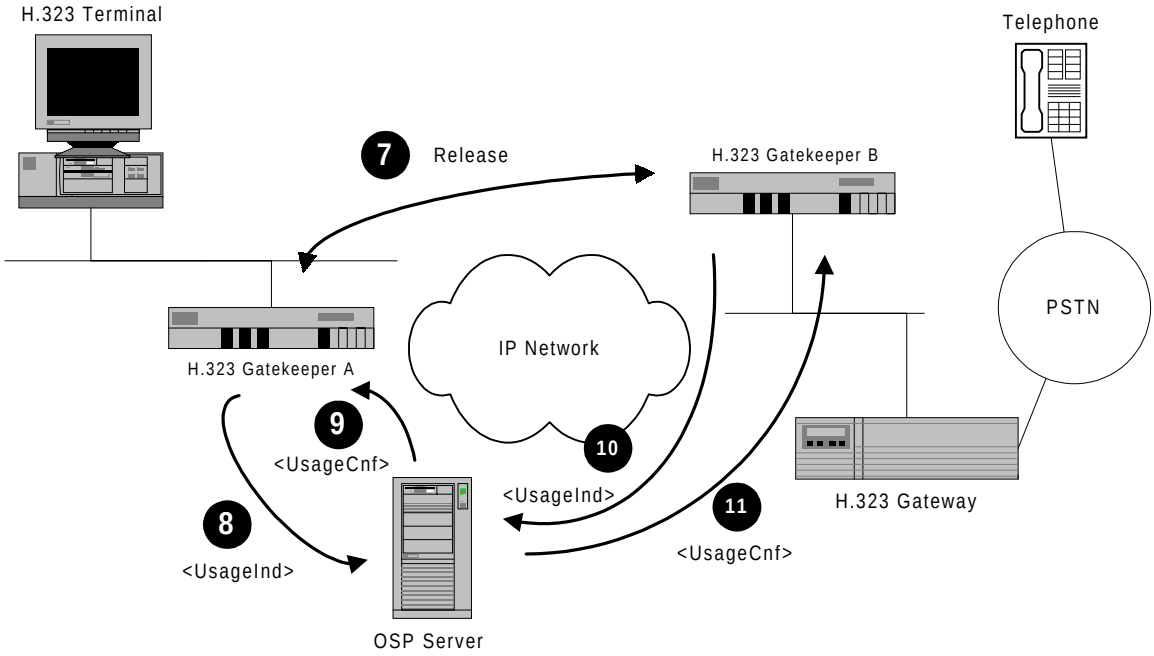


Figure 20: Usage Reporting to Settlement Server

Result:	Score
Call released, neither gatekeeper attempts to send <UsageIndication> to OSP Server	0
Call released, only one gatekeeper attempts to send <UsageIndication> to OSP Server	30
Call released, both gatekeepers send <UsageIndication> messages to OSP Server but only one gatekeeper's usage reports accepted by OSP server	60
Usage reporting complete, both gatekeepers' usage reports accepted by OSP Server	100

19.2 Communication between Simple Domains and Settlement Services

TEST 21.	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 Figure 21 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 [8] Setup to Gateway B.

5) Destination Endpoint accepts call.

NOTE 1: This test scenario is strictly concerned with the interaction between Gateway A and the OSP Server (steps 2 and 3 above).

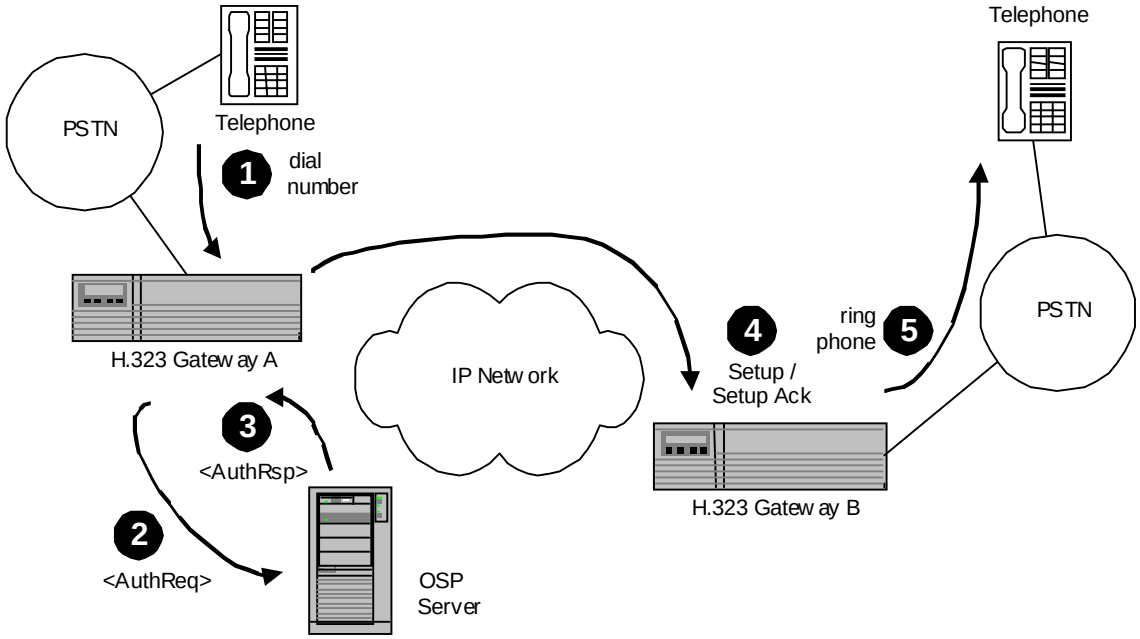


Figure 21: Authorization and Call Routing from Gatekeeper to Settlement Server

Result:	Score
Gateway A does not complete SSL negotiation with OSP Server	0
Gateway A successfully completes SSL negotiation with OSP Server	10
Gateway A does not send <AuthorizationRequest>	20
OSP server does not reply with <AuthorizationResponse>	30
Authorization fails, OSP Server rejects Gateway A request	40
Authorization fails, OSP Server does not return destination of Gateway B	50
Authorization complete, Gateway A does not attempt connection to destination	70
Authorization complete, Gateway A attempts connection with destination other than GW B	80
Authorization complete, Gateway A attempts connection with Gateway B	90
Authorization complete, Gateway A connects successfully with Gateway B	100

TEST 22.	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 22 shows the general interaction between the gateways and the settlement server. The steps in the figure are:

1) Gateways release call.

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

3) OSP Server replies with <UsageConfirmation>.

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

5) OSP Server replies with <UsageConfirmation>.

NOTE 2: This test scenario is strictly concerned with the interaction between the Gateways and the OSP Server (steps 7-10 above).

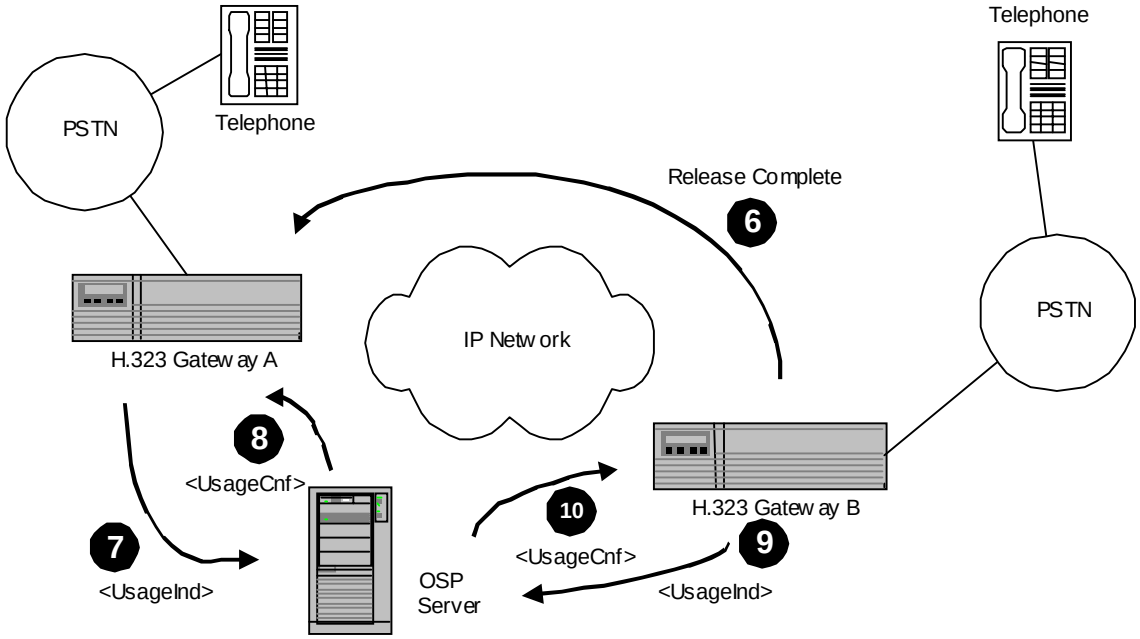


Figure 22: Usage Reporting to Settlement Server

Result:	Score
Call released, neither gateway attempts to send <UsageIndication> to OSP Server	0
Call released, only one gateway attempts to send <UsageIndication> to OSP Server	30
Call released, both gateways send <UsageIndication> messages to OSP Server but only one gateway's usage reports accepted by OSP server	60
Usage reporting complete, both gateways' usage reports accepted by OSP Server	100

Annex A (informative): SCN side scoring table

Table A.1: SCN side scoring table

Function	Score	Relevance for SCN Interface No. (No. according table 1)									
		A11	**A12**	**A21**	**A22**	**I11**	**P11**	**P31**			
Power feeding		X	X			X	X				
Synchronization											
Master						X		(X)			
Slave								(X)			
Layer 2 activation						X	(X)	X			
Dialtone			X			(X)	(X)	(X)			
Dialling											
Pulse			X		X	(X)	(X)				
DTMF			X		X	(X)	(X)				
Keypad						(X)	(X)	X			
Functional						X	(X)	X			
Funct. / Overlap						X	(X)	X			
Supplementary Services Control											
Pulse		X	X	X	X	(X)	(X)				
DTMF		X	X	X	X	(X)	(X)				
Keypad						(X)	(X)	X			
Functional (Bearer Independent)						X	(X)	X			
Calling Line Identification (for authorization etc.)		X		X		X	(X)	X			
Ringing		X		X		(X)	(X)	(X)			
Ringback tone			X		X		(X)	(X)			
Busy tone / Announcements			X		X		(X)	(X)			
Connected		X	X	X	X	X	X	X			
Connected, Call waiting indication		X	X	X	X	X	(X)	X			
Connected, Supplementary Services Control											
Pulse		X	X	X	X	(X)	(X)				
DTMF		X	X	X	X	(X)	(X)				
Keypad						(X)	(X)	X			
Functional (Bearer Related)						X	(X)	X			
Connected, Call cleared		X	X	X	X	X	X	X			
Error recovery		X	X	X	X	X	X	X			

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