INTERNATIONAL STANDARD

ISO/IEC 21411

First edition
2001-08-15

Information technology — Telecommunications and information exchange between systems — Corporate telecommunication networks — Signalling interworking between QSIG and H.323 — Call diversion supplementary services

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseaux de télécommunications corporatifs — Signalisation de travail entre QSIG et H.323 — Services supplémentaires de diversion d'appel

Reference number
ISO/IEC 21411:2001(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

Contents

Annexes

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 21411 was prepared by ECMA (as ECMA-309) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

Annex A forms a normative part of this International Standard. Annex B is for information only.

Introduction

This International Standard is one of a series of Standards defining the interworking of services and signalling protocols deployed in Corporate telecommunication Networks (CNs). The series uses telecommunication concepts as developed by ITU-T and conforms to the framework of International Standards on Open Systems Interconnection as defined by ISO/IEC.

This International Standard defines the signalling protocol interworking for call diversion supplementary services between a Private Integrated Services Network (PISN) and a packet-based private telecommunications network based on the Internet Protocol (IP). It is further assumed that the protocol for the PISN part is that defined for the Q reference point (QSIG) and that the protocols for the IP-based network are based on ITU-T Recommendation H.323.

This International Standard is based upon the practical experience of ECMA member companies and the results of their active and continuous participation in the work of ISO/IEC JTC 1, ITU-T, ETSI and other international and national standardization bodies. It represents a pragmatic and widely based consensus.

Information technology - Telecommunications and information exchange between systems - Corporate telecommunication networks - Signalling interworking between QSIG and H.323 - Call diversion supplementary services

1 Scope

This International Standard specifies signalling interworking between “QSIG” and “H.323” in support of call diversion supplementary services within a Corporate telecommunication Network (CN).

“QSIG” is a signalling protocol that operates at the Q reference point between Private Integrated Services eXchanges (PINX) within a Private Integrated Services Network (PISN). The Q reference point is defined in ISO/IEC 11579-1. A PISN provides circuit-switched basic services and supplementary services to its users. QSIG is specified in other Standards, in particular ISO/IEC 11572 (call control in support of basic services), ISO/IEC 11582 (generic functional protocol for the support of supplementary services) and a number of standards specifying individual supplementary services. ISO/IEC 13873 specifies the QSIG protocol in support of call diversion services.

“H.323” is a set of signalling protocols for the support of voice or multimedia communication within a packet network, in particular a packet network that uses the Internet Protocol (IP) as its network layer protocol (IP network). H.323 signalling protocols operate between endpoints in an IP network, either indirectly via one or more gatekeepers, or directly. An endpoint can be a terminal or a gateway to another network. H.323 is an “umbrella” recommendation referring to various ITU-T recommendations, in particular Recommendations H.225.0 and H.245 (basic communication capabilities) and Recommendation H.450.1 (generic functional protocol for the support of supplementary services). Recommendation H.450.3 specifies the H.323 protocol in support of call diversion services.

NOTE - H.450.3 applies only to the 1998 version of H.323 (also known as H.323 version 2) and to later versions.

In both ISO/IEC 13873 (QSIG) and ITU-Recommendation H.450.3 (H.323), the call diversion supplementary services are Call Forwarding Unconditional (SS-CFU), Call Forwarding Busy (SS-CFB), Call Forwarding No Reply (SS-CFNR) and Call Deflection (SS-CD). These supplementary services apply during call establishment and provide diversion of an incoming call to another destination.

Interworking between QSIG and H.323 permits a call originating at a user of a PISN to terminate at a user of an IP network, or a call originating at a user of an IP network to terminate at a user of a PISN. This International Standard provides the following additional capabilities:

- a call originating from a PISN and destined for a user of an H.323 network to be diverted by the H.323 network to an alternative destination;
- a call originating from an H.323 network and destined for a user of a PISN to be diverted by the PISN to an alternative destination;
- a call destined for a user of a PISN to be diverted to an alternative destination where that alternative destination is in an H.323 network;
- a call destined for a user of an H.323 network to be diverted to an alternative destination where that alternative destination is in a PISN.

This International Standard is applicable to any interworking unit that can act as a gateway between a PISN employing QSIG and an IP network employing H.323.

2 Conformance

In order to conform to this International Standard, a gateway shall satisfy the requirements identified in the Implementation Conformance Statement (ICS) proforma in annex A.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 11572:2000, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit mode bearer services - Inter-exchange signalling procedures and protocol*

ISO/IEC 11579-1:1994, *Information technology - Telecommunications and information exchange between systems - Private integrated services network - Part 1: Reference configuration for PISN Exchanges (PINX)*

ISO/IEC 11582:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Generic functional protocol for the support of supplementary services - Inter-exchange signalling procedures and protocol*

ISO/IEC 13873:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call diversion supplementary services*

ISO/IEC 21409:2001, *Information technology - Telecommunications and information exchange between systems - Corporate telecommunication networks - Signalling interworking between QSIG and H.323 - Generic functional protocol for the support of supplementary services*

ITU-T Rec. H.225.0:1998 (or later edition), *Call signalling protocols and media stream packetization for packet-based multimedia communication systems*

ITU-T Rec. H.245:1998 (or later edition), *Control protocol for multimedia communication*

ITU-T Rec. H.323:1998 (or later edition), *Packet-based multimedia communications systems*

ITU-T Rec. H.450.1:1998, *Generic functional protocol for the support of supplementary services in H.323*

ITU-T Rec. H.450.3:1998, *Call diversion supplementary service for H.323*

4 Definitions

For the purposes of this International Standard, the following definitions apply.

4.1 External definitions

This International Standard uses the following terms defined in other documents:

- Call (ISO/IEC 21409)
- Corporate telecommunication Network (CN) (ISO/IEC 21409)
- Endpoint (ITU-T Rec. H.323)
- Gatekeeper (ITU-T Rec. H.323)
- IP network (ISO/IEC 21409)
- Private Integrated Services Network (PISN) (ISO/IEC 21409)
- Private Integrated services Network eXchange (PINX) (ISO/IEC 11579-1)

Additionally the definitions in ISO/IEC 13873 and ITU-T Recommendation H.450.3 apply as appropriate.

4.2 Other definitions

4.2.1 Association D : Signalling association between entity D and entity G.

4.2.2 Association E : Signalling association between entity E and entity G.

4.2.3 Association F : Signalling association between entity F and entity G.

4.2.4 Association G : Signalling association between entity G and entity H.

4.2.5 Entity A : Signalling entity at the PINX or H.323 endpoint serving the calling user (user A).

4.2.6 Entity B : Signalling entity at the PINX serving the diverting user (user B) or H.323 entity that invokes diversion on behalf of user B.

4.2.7 Entity B' : Signalling entity at the H.323 endpoint serving user B.

4.2.8 Entity C : Signalling entity at the PINX or H.323 endpoint serving the diverted-to-user (user C).

4.2.9 Entity D : Signalling entity at the PINX or H.323 endpoint serving an activating user.

4.2.10 Entity E : Signalling entity at the PINX or H.323 endpoint serving a deactivating user.

4.2.11 Entity F : Signalling entity at the PINX or H.323 endpoint serving an interrogating user.

4.2.12 Entity G : Signalling entity for activation / deactivation / interrogation at a PINX or H.323 endpoint serving a diverting endpoint.

4.2.13 Entity H : Signalling entity for restriction checking at a PINX or H.323 endpoint serving a diverted-to endpoint.

4.2.14 Gateway : A gateway as defined in H.323 specifically for the purpose of interworking with a network employing QSIG.

4.2.15 Leg A : Call segment that lies between entity A and the rerouting entity.

4.2.16 Leg B : Call segment that lies between the rerouting entity and entity B.

4.2.17 Leg B' : Call segment that lies between entity B and entity B'.

4.2.18 Leg C : Call segment that lies between the rerouting entity and entity C.

4.2.19 Rerouting entity : Signalling entity that initiates the rerouting of a call towards user C and clears the call towards user B.

4.2.20 Scenario A1 : Interworking arrangement in which entity A (PINX A) is in the PISN and the rerouting entity is in the IP network.

4.2.21 Scenario A2 : Interworking arrangement in which entity A (endpoint A) is in the IP network and the rerouting entity is in the PISN.

4.2.22 Scenario B1 : Interworking arrangement in which entity B (PINX B) is in the PISN and the rerouting entity is in the IP network.

4.2.23 Scenario B2 : Interworking arrangement in which entity B (diverting endpoint or its gatekeeper) is in the IP network and the rerouting entity is in the PISN.

4.2.24 Scenario C1 : Interworking arrangement in which entity C (PINX C) is in the PISN and the rerouting entity is in the IP network.

4.2.25 Scenario C2 : Interworking arrangement in which entity C (endpoint C) is in the IP network and the rerouting entity is in the PISN.

4.2.26 Scenario D1 : Interworking arrangement in which entity D (PINX D) is in the PISN and entity G (endpoint G) is in the IP network.

4.2.27 Scenario D2 : Interworking arrangement in which entity D (endpoint D) is in the IP network and entity G (PINX G) is in the PISN.

4.2.28 Scenario E1 : Interworking arrangement in which entity E (PINX E) is in the PISN and entity G (endpoint G) is in the IP network.

4.2.29 Scenario E2 : Interworking arrangement in which entity E (endpoint E) is in the IP network and entity G (PINX G) is in the PISN.

4.2.30 Scenario F1 : Interworking arrangement in which entity F (PINX F) is in the PISN and entity G (endpoint G) is in the IP network**.**

4.2.31 Scenario F2 : Interworking arrangement in which entity F (endpoint F) is in the IP network and entity G (PINX G) is in the PISN.

4.2.32 Scenario G1 : Interworking arrangement in which entity G (PINX G) is in the PISN and entity H (endpoint H) is in the IP network.

4.2.33 Scenario G2 : Interworking arrangement in which entity G (endpoint G) is in the IP network and entity H (PINX H) is in the PISN.

5 Acronyms

APDU	Application Protocol Data Unit
CN	Corporate telecommunication Network
ICS	Implementation Conformance Statement
IP	Internet Protocol
PINX	Private Integrated services Network eXchange
PISN	Private Integrated Services Network
SS-CD	Supplementary Service Call Deflection
SS-CFB	Supplementary Service Call Forwarding Busy
SS-CFNR	Supplementary Service Call Forwarding No Reply
SS-CFU	Supplementary Service Call Forwarding Unconditional

6 Service architecture

6.1 Service architecture for invocation and operation

6.1.1 ISO/IEC 13873 service architecture

The QSIG protocol for call diversion invocation and operation is based around four signalling entities or PINX types:

- entity A – the PINX serving the calling user (user A);
- entity B – the PINX serving the diverting user (user B);
- entity C – the PINX serving the diverted-to user (user C);
- rerouting entity – the PINX that initiates the rerouting of the call towards user C and clears the call towards user B.

Where a user is in another network, the role of entity A, entity B or entity C is performed by the other network, the gateway PINX or the two in combination. However, from the QSIG point of view the role is performed by the gateway PINX.

This can be represented diagrammatically as shown in figure 1.

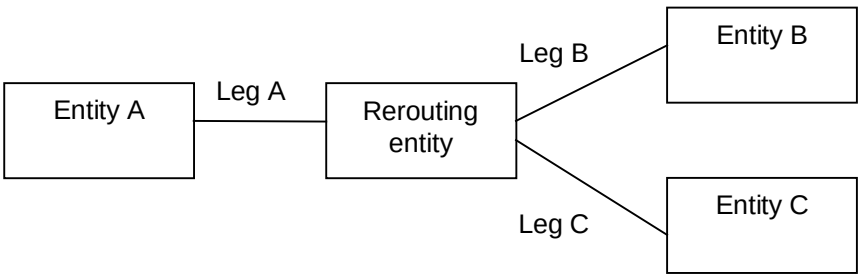

Figure 1 – Call diversion architecture for QSIG

From this it can be seen that there are three segments or “legs” to the call:

- leg A from entity A to the rerouting entity;
- leg B from the rerouting entity to entity B;
- leg C from the rerouting entity to entity C.

The QSIG protocol supports each of these three legs.

The rerouting entity is constrained to be collocated with (in the same PINX as) entity A or entity B (or both if entity A and entity B are collocated). In addition, entity C can be collocated with the rerouting entity (and therefore with entity A and/or entity B). When an entity is collocated with the rerouting entity, the leg of the call concerned is internal to the physical PINX and therefore the QSIG protocol for that leg does not apply.

6.1.2 H.450.3 service architecture

The architecture shown above for QSIG applies also to H.450.3, except that PINXs are replaced by H.323 entities as follows:

- entity A – the calling endpoint;
- entity B – the entity that invokes diversion on behalf of the diverting user;
- entity B' – the diverting endpoint;
- entity C – the diverted-to endpoint;
- rerouting entity – the entity that initiates the rerouting of the call towards user C and clears the call towards user B.

Where a user is in another network, the role of entity A, entities B and B' or entity C is performed by the other network, the gateway, or the two in combination. However, from the H.450.3 point of view the role is performed by the gateway.

This can be represented diagrammatically as shown in figure 2:

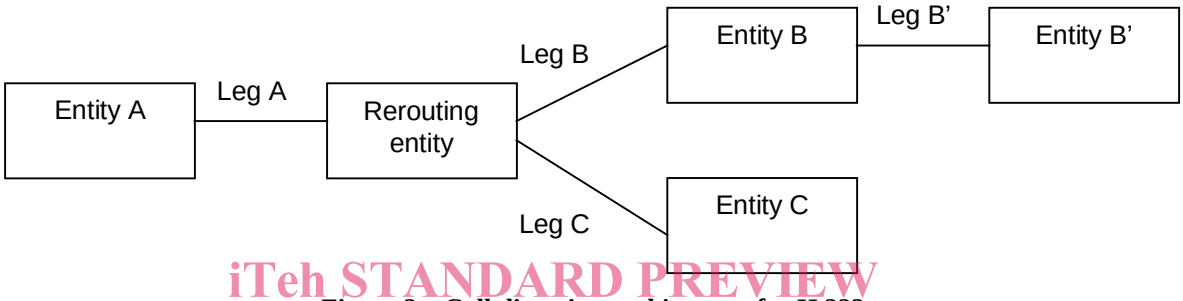

Figure 2 – Call diversion architecture for H.323

From this it can be seen that there are four segments or "legs" to the call:

- leg A from entity A to the rerouting entity;
- leg B from the rerouting entity to entity B;
- leg B' from entity B to entity B';
- leg C from the rerouting entity to entity C.

The H.450.3 protocol supports each of these four legs.

Entity B is either collocated with entity B' at the diverting endpoint or is located separately in a gatekeeper acting on behalf of the diverting endpoint, e.g. for situations where B' is switched off since B' can be a PC.

The rerouting entity can be collocated with entity A or entity B. Alternatively it can be at a separate device such as a gatekeeper or proxy.

6.1.3 Scenarios for interworking

The architectures for QSIG and H.450.3 are very similar. The only difference is the absence of entity B' and leg B' from the QSIG architecture. This is not a fundamental difference, but merely reflects the fact that entity B' and leg B' are outside the scope of QSIG and therefore no QSIG protocol is required for leg B'. Normally leg B' would correspond to the PISN access.

This means that the H.450.3 architecture is applicable to the inter-networking situation between an IP network and a PISN, where one or more of the users involved are served by the IP network and the others are served by the PISN.

In figure 2 interworking between H.450.3 and QSIG could theoretically occur on any of the four legs. However, interworking on leg B' is of less practical use (a network is unlikely to invoke diversion on behalf of a diverting user in another network), and also is not possible because there is no support for leg B' in QSIG. Therefore in practice the possible points of interworking occur on legs A, B and C.

For each of the three possible points of interworking, two scenarios arise, depending on which side of the interworking point the PISN lies. This gives 6 scenarios in total that need to be considered:

- Scenario A1: Entity A (PINX A) in PISN, rerouting entity in IP network;
- Scenario A2: Entity A (endpoint A) in IP network, rerouting entity in PISN;

- Scenario B1: Entity B (PINX B) in PISN, rerouting entity in IP network;
- Scenario B2: Entity B (diverting endpoint or its gatekeeper) in IP network, rerouting entity in PISN;
- Scenario C1: Entity C (PINX C) in PISN, rerouting entity in IP network;
- Scenario C2: Entity C (endpoint C) in IP network, rerouting entity in PISN.

It is possible for more than one scenario to apply to the same call. For example, if entity A and the rerouting entity are in a PISN and entities B and C are in the same IP network or different IP networks, interworking according to scenario B2 will apply on leg B and interworking according to scenario C2 will apply on leg C.

A point of interworking will be implemented in a gateway, which acts as both an H.323 endpoint from the point of view of the IP network and an end PINX from the point of view of the PISN.

Multiple scenarios can also occur because of multiple (chained) diversions.

6.1.4 Determination of the location of the rerouting entity when interworking

The particular scenario (or scenarios) that applies depends not only on the location of the users concerned but also on the location of the rerouting entity. In each of the scenarios it is possible to locate the rerouting entity within the gateway. However, functionally the rerouting entity is separate from the point of interworking and belongs to user B’s network. When this occurs, interworking occurs on leg A (scenario A1 or A2).

The possibility of siting the rerouting entity at the gateway arises when the gateway receives a rerouting request (QSIG or H.450.3 callRerouting invoke APDU) from entity B. Instead of creating a rerouting entity at the gateway, the gateway can choose to pass the rerouting request on into the other network towards entity A. In this case interworking occurs on leg B (scenario B1 or B2).

In either case, interworking can also occur on leg C (scenario C1 or C2) if entity C is not in the same type of network as the rerouting entity.

The gateway’s decision whether to provide the rerouting entity is an implementation matter. This can, but need not, take account of the address of user C. The behaviour of the rerouting entity, if provided at the gateway, is outside the scope of this International Standard and is assumed to be in accordance with the requirements of ISO/IEC 13873 (for rerouting requests received from the PISN) or in accordance with the requirements of H.450.3 (for rerouting requests received from the IP network).

6.2 Service architecture for activation, deactivation and interrogation

6.2.1 ISO/IEC 13873 service architecture

The QSIG protocol for call diversion activation, deactivation and interrogation is based around three signalling entities or PINX types:

- entity D – a PINX serving an activating user;
- entity E – a PINX serving a deactivating user;
- entity F – a PINX serving an interrogating user;
- entity G – a PINX serving a diverting user;
- entity H – a PINX serving a diverted-to user.

Where a user is in another network, the role of the entity concerned is performed by the other network, the gateway PINX or the two in combination. However, from the QSIG point of view the role is performed by the gateway PINX.

This can be represented diagrammatically as shown in figure 3.

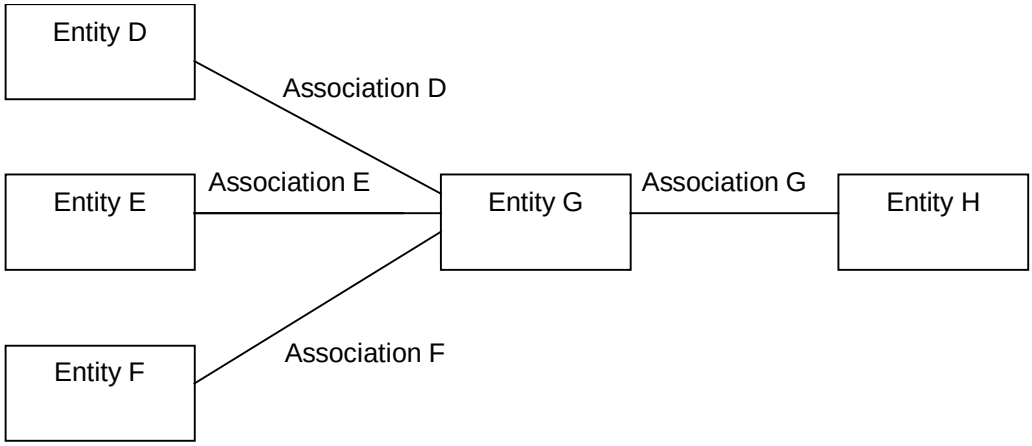

Figure 3 – Call diversion activation / deactivation / interrogation architecture for QSIG

From this it can be seen that there are four associations between entities:

- association D between entity D and entity G;
- association E between entity E and entity G;
- association F between entity F and entity G;
- association G between entity G and entity H.

Associations D, E and F apply to activation, deactivation and interrogation respectively. Association G applies to activation and allows entity G to check with entity H whether there are any restrictions that prevent activation of diversion.

The QSIG protocol supports each of these four associations.

6.2.2 H.450.3 service architecture

The architecture shown above for QSIG applies also to H.450.3, except that PINXs are replaced by H.323 entities as follows:

- entity D – an activating endpoint;
- entity E – a deactivating endpoint;
- entity F – an interrogating endpoint;
- entity G – a diverting endpoint or gatekeeper;
- entity H – a diverted-to endpoint.

Where a user is in another network, the role of the entity concerned is performed by the other network, the gateway, or the two in combination. However, from the H.450.3 point of view the role is performed by the gateway.

As for QSIG, there are four associations: D, E, F and G.

The H.450.3 protocol supports each of these four associations.

6.2.3 Scenarios for interworking

Because the architectures for QSIG and H.450.3 are the same, this architecture is applicable to the inter-networking situation between an IP network and a PISN, where one or more of the users involved are served by the IP network and the others are served by the PISN.

In figure 3, interworking between H.450.3 and QSIG can occur on any of the four associations.

For each of the four possible points of interworking, two scenarios arise, depending on which side of the interworking point the PISN lies. This gives 8 scenarios in total that need to be considered:

- Scenario D1: Entity D (PINX D) in PISN, entity G (endpoint G) in IP network;
- Scenario D2: Entity D (endpoint D) in IP network, entity G (PINX G) in PISN;
- Scenario E1: Entity E (PINX E) in PISN, entity G (endpoint G) in IP network;