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Source: **Siemens**

Title: **Proposal for H.323 Call Transfer**

Purpose: **Proposal for discussion**

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Overview

This contribution contains proposals about how call transfer supplementary service could be implemented to H.323. It includes desription of the service and messages flow scenarios based on QSIG Call Transfer supplementary service.

1 Call transfer

1.1 Service description

1.1.1 General

Call transfer is a supplementary service which enables a user to transfer an existing call from his terminal to another terminal.

To support supplementary services on H.323, the sequences are based on QSIG principles, which can be implemented on top of H.225.

1.1.2 Functional components

The various scenarios are described using these functional components:

- Single step transfer

This transfer is performed in a single-step, i. e. the transferring terminal does not have to place the existing call on hold before issuing the Single step transfer call service. The transferring terminal sends a FACILITY message to the transferred terminal containing the address of the transferred-to terminal. The transferred terminal then establishes a connection to the transferred-to terminal. The first call is retained until the first acknowledgement is received from the transferred-to terminal.

- Call hold

There are two kinds of call hold

- Near-end call hold

The holding terminal stops receiving user packets of the held terminal and stops sending user packets to the held terminal. The holding terminal infomes the held terminal by sending an NOTIFICATION message.There is no action at the held terminal.This procedure is not described in this document.

- Remote-end call hold

The HOLD message is sent to the held terminal requiring it to stop sending and receiving over that connection.The holding terminal is then able to reuse the bandwidth of the current transport connection. By receiving the HOLD message, the held endpoint will stop sending and receiving audio-video packets over the corresponding connection and sends back an HOLD ACKNOWLEDGE message to inform the holding terminal that it could now use the free bandwidth for another connection. Both terminals may also inform their gatekeepers about the held connection for the purpose of bandwidth management.

In case of gatekeeper routed signalling, the gatekeeper forwards the HOLD and HOLD ACKNOWLEDGE messages without any changes further to the receiving endpoints. It may also use that information for its bandwidth management.

A held connection may be retrieved by sending the RETRIEVE message.

- Consultation

The initiating terminal establishes a basic call to the terminal it wants to consult. This consultation may e.g. be used to prepare the transfer of a connection. The first connection could optionally be put on hold during consultation.

1.1.3 Gateway

For the interworking between networks supplying call transfer on top of H.323 and other networks (e.g. N-ISDN based networks) a gateway may be used. To transfer calls from the other network, the rerouting function of call transfer might be performed by the gateway.

1.1.4 Differences to QSIG

In QSIG the signalling of the call transfer supplementary service is done by network components. In H.323 environment tthe functionality should be in the terminals and can fully interact with terminals on the other side of a N-ISDN Gateway.

1.1.5 H.323-SplS-terminal

H.323-SplS-terminal is a terminal, which can support QSIG supplementary services based on H.225 described in this document.

1.2 Transferring-terminal decision

Depending on the indicated calling terminal capabilities the forwarding terminal decides which scenario to use.

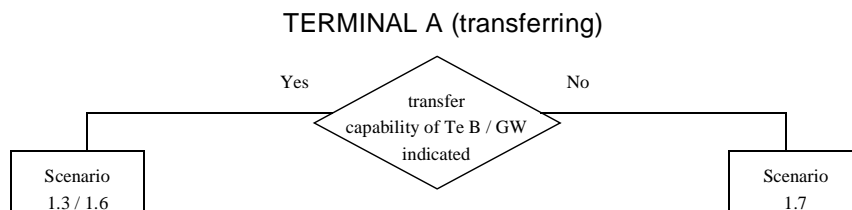TERMINAL A (transferring)

Figure 7 -1   Transferring terminal decision

1.3 Single step transfer (Te B has to be a H.323-SplS-terminal, or the gateway of B must be able to transfer calls)

1.3.1 Operational model

BEFORE SERVICE   AFTER SERVICE

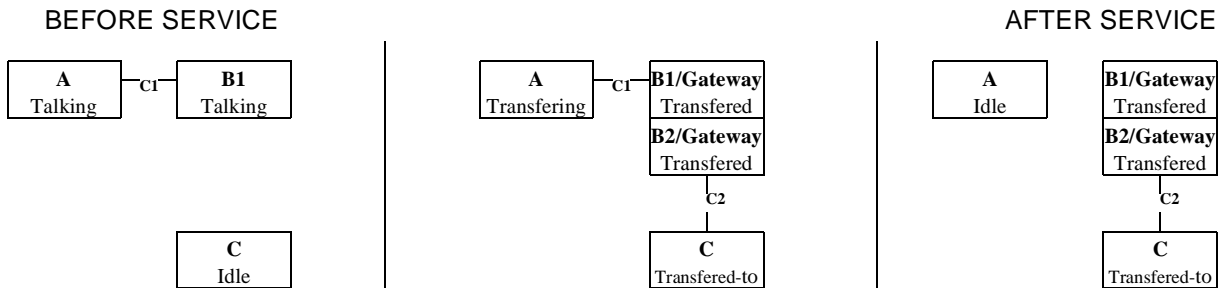|			
A Talking —C1— **B1** Talking	**A** Transfering —C1— **B1/Gateway** Transfered / **B2/Gateway** Transfered —C2— **C** Transfered-to	**A** Idle	**B1/Gateway** Transfered / **B2/Gateway** Transfered —C2— **C** Transfered-to
C Idle			

Figure 7 -2   Operational model for single step transfer

1.3.2 Description from user point of view:

User A (transferring party): communicating with B; selects C; Request B to connect to C (Media inherited?); transfer accepted; idle

User B (transferred party): communicating with A; receives notification of transfer;confirmes media; communicating with C;

User C (transferred to party): idle; receives notification of incoming call; accepts call; confirmes media; communicating with B

Table 7 - 1   Single step transfer

Row no.	User / Application action	H.323 API	Note	IP, H.225, QSIG, CSTA, H.245	Note	H.323 API	User / Application action
1	**MM Terminal A**			**Network**		**MM Terminal B**	
2				Active Basic Call between TE A and TE B Capabilities exchanged H.225 connection still exists UDP path for audio open			

3	Request terminal B to transfer call to C enter state: CT-Await-Identify-Respond			H.225 <FACILITY> ⟶
				
				Facility IE:
				    invoke
				      callTransferInitiate
				        connection Id = NULL
				        rerouteingNumber=address C
							Receive transfer_request

4	**MM Terminal B**			**Network**		**MM Terminal C**	
5				*establish TCP path for H.225 call signalling*			

Table 7 - 1   Single step transfer

Row no.	User / Application action	H.323 API	Note	IP, H.225, QSIG, CSTA, H.245	Note	H.323 API	User / Application action

6	Request for call establishment to User C Select Media User C address	⇓ **H.323 API** \<Make-call-request> - User C address; - Media - Bandwidth	1	H.225 \<SETUP> →
				
				Facility IE:
				    invoke
				        QSIG: callTransferSetup
				        conferenceID
				        connectionId = NULL
				    invoke
				        QSIG: callTransferUpdate
				        redirectionNumber
						⇑ **H.323 API** Make_call_indication	Receive H.225 setup_indication

7	Indication to Appl/ User B of MM Terminal C general availability	⇑ **H.323 API** \<Make_call_confirm>		H.225 \<CONNECT> ←
				
				Facility IE:
				    returnResult
				        QSIG: callTransferSetup
				        conferenceID
				    invoke
				        QSIG: callTransferUpdate
				        redirectionNumber
						⇓ **H.323 API** Make_call_response	Call accept by User C or by Application C

8	**MM Terminal A**			**Network**		**MM Terminal B**	
9				*close logical channels*			

10	Receive H.225 release_indication	⇑ **H.323 API** Clear_call_indication		H.225 \<RELEASE COMPLETE> ←
				
				Facility IE:
				    returnResult
				    callTransferInitiate
				    conferenceID
						⇑ **H.323 API** Clear_call_confirm (BC state active=> BC state idle)	release call to TE A

11	**MM Terminal B**			**Network**		**MM Terminal C**	
12				*exchange terminal capabilities* *open logical channels (H.245)*			

1The same conferenceID as for the first call is used

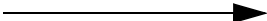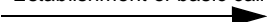## 1.3.3 Failing case of single step transfer

1.3.3.1 Description from user point of view:

User A (transferring party):communicating with B; selects C; Request B to connect to C (Media inherited?); unsuccessful transfer; communicating with B

User B (transferred party):communicating with A; receives notification of transfer; unsuccessful transfer; communicating with A;

User C (transferred to party): idle; unsuccessful call establishment from B; idle

Figure 7 -3   Failing case

Ro w no.	User / Application action	H.323 API	N o t e	IP, H.225, QSIG, CSTA, H.245	N o t e	H.323 API	User / Application action
13	MM Terminal A			Network		MM Terminal B	
14				Active Basic Call between TE A and TE B Capabilities exchanged H.225 connection still exists UDP path for audio open			

15	Request ter-minal B to trans-fer call to C			H.225 <FACILITY>
				
				Facility IE:
				  invoke
				   callTransferInitiate
				    conferenceID
				    connectionID = NULL
				    rerouteingNumber=address C
							Receive transfer_r equest

16	MM Terminal B			Network		MM Terminal C	
17	Request for call-estab-lish-ment to TE C			Establishment of basic call fails			
18	MM Terminal A			Network		MM Terminal B	

19				H.225 <FACILITY>
				
				Facility IE:
				  returnError
				   callTransferInitiate			

20				A communicating with B			

1.4 Remote end call hold

1.4.1 Operational model

BEFORE SERVICE   AFTER SERVICE

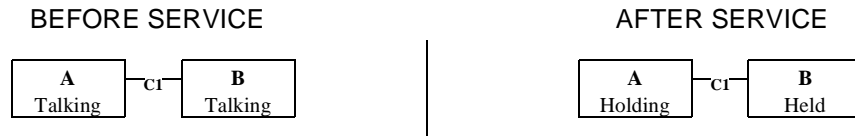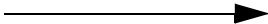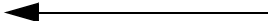| A Talking |—c1—| B Talking | | A Holding |—c1—| B Held |

Figure 7 -4   Operational model for Remote end call hold

1.4.2 Description from user point of view:

User A: communicating with B; B on Hold

User B: communicating with A; put on hold; (music on hold, video on hold)

Table 7 - 2   Remote end call hold

Row no.	User / Application action	H.323 API	Note	IP, H.225, QSIG, CSTA, H.245	Note	H.323 API	User / Application action
21	MM Terminal A			Network			MM Terminal B
22				Active Basic Call between TE A and TE B Capabilities exchanged H.225 connection still exists UDP path for audio open			

23	request to put Te B on hold			H.225 <FACILITY> →
				
				Facility IE:
				    invoke
				        hold
							Receive hold request

24	stop sending / receiving user packet			H.225 <FACILITY> ←
				
				Facility IE:
				    returnResult
				        holdAcknowldge
							send hold acknowledge-ment
							stop sending / receiving user pack-ets

1.5 Consultation

1.5.1 Operational model

BEFORE SERVICE   CONSULTATION
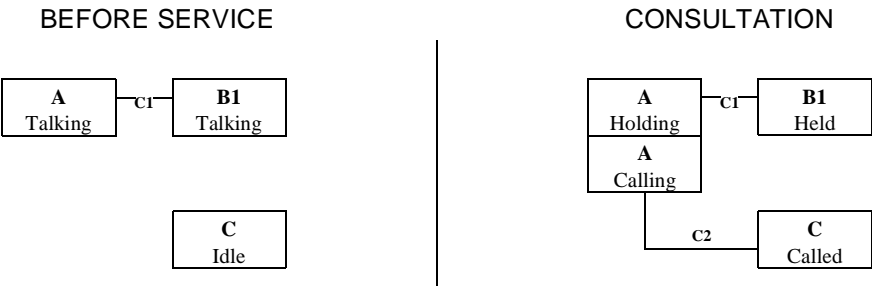
Figure 7 -5   Operational model for consultation

1.5.2 Description from user point of view:

User A: communicating with B; B on Hold (optional); User selects C and Media; requests connection to C; consultation active

User B: communicating with A; put on hold (optional); consultation active

User C: idle; receives notification of incoming call; accepts call; confirmes media; consultation active

Table 7 - 3   Consultation

Row no.	User / Application action	H.323 API	Note	IP, H.225, QSIG, CSTA, H.245	Note	H.323 API	User / Application action
25	MM Terminal A			Network		MM Terminal B	
26				Active Basic Call between TE A and TE B Capabilities exchanged H.225 connection still exists UDP path for audio open			
27				*Call hold (1.4) optional*			
28	MM Terminal A			Network		MM Terminal C	
29	Request for call-estab-lish-ment to TE C			[1]Establish Basic Call to C ⟶			
30	MM Terminal A			Network		MM Terminal C, B (if not held)	
31				Consultation active			

1 The same conferenceID as for the first call is used

1.6 Transfer with consultation (Te B has to be a H.323-SpIS-terminal, or the Gateway of B must be able to transfer calls)
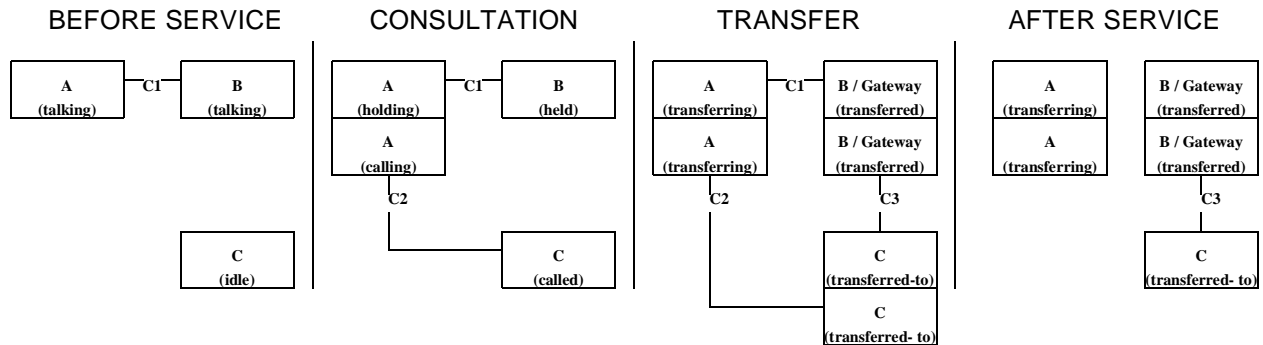
1.6.1 Operational model

Figure 7 -6   Operational model for transfer with consultation
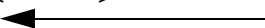
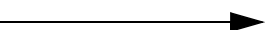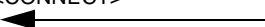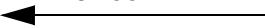### 1.6.2 Description from user point of view:

User A: communicating with B; B on Hold (optional); User selects C and Media; requests connection to C;

Consultation Active; Request B to connect to C (Media inherited?); Transfer accepted; idle

User B: communicating with A; receives notification of transfer; confirmes media?; communicating with C

User C: idle; receives notification of incoming call; accepts call; confirmes media; communicating with A

receives notification of incoming call; accepts call; confirmes media; communicating with A

Table 7 - 4   Transfer with consultation

Row no.	User / Application action	H.323 API	Note	IP, H.225, QSIG, CSTA, H.245	Note	H.323 API	User / Application action
32	MM Terminal A			Network		MM Terminal B	
33				Active Basic Call between TE A and TE B Capabilities exchanged H.225 connection still exists UDP path for audio open			
34	MM Terminal A			Network		MM Terminal C	
35				*Consultation (1.5)*			
36	MM Terminal A			Network		MM Terminal C	
37				Obtain ConnectionID from Party C			

38	Request for call establishment to User C Select Media User C address	⇓ **H.323 API** <Make_call-request>
		- User C address;
		- Media
		- Bandwidth
			1	H.225 <FACILITY> ⟶
				
				Facility IE:
				    invoke
				        request connectionId for Transfer			

Row no.	User / Application action	H.323 API	Note	IP, H.225, QSIG, CSTA, H.245	Note	H.323 API	User / Application action

39				H.225 <FACILITY> (←)
				
				Facility IE:
				  returnResult
				  connectionId			

40	**MM Terminal A**			**Network**		**MM Terminal B**	

41				H.225 <FACILITY> (→)
				
				Facility IE:
				  invoke
				    callTransferInitiate
				    connection Id = NULL
				    rerouteingNumber=address C
							Receive transfer_request

42	**MM Terminal B**			**Network**		**MM Terminal C**	
43				*establish TCP path for H.225 call signalling*			

44	Request for call establishment to User C Select Media User C address	⇓**H.323 API** <Make_call-request>
		- User C address;
		- Media
		- Bandwidth
			2	H.225 <SETUP> (→)
				
				Facility IE:
				  invoke
				    QSIG: callTransferSetup
				    conferenceID
				    connectionId
				  invoke
				    QSIG: callTransferUpdate
				    redirectionNumber
						⇑**H.323 API** Make_call_indication	Receive H.225 setup_indication

45	Indication to Appl/ User B of MM Terminal C general availability	⇑**H.323 API** <Make_call_confirm>		H.225 <CONNECT> (←)
				
				Facility IE:
				  returnResult
				    QSIG: callTransferSetup
				    conferenceID
				  invoke
				    QSIG: callTransferUpdate
				    redirectionNumber
						⇓**H.323 API** Make_call_response	Call accept by User C or by Application C

46	**MM Terminal A**			**Network**		**MM Terminal B**	
47				*close logical channels*			

48	Receive H.225 release_indication	⇑**H.323 API** Clear_call_indication		H.225 <RELEASE COMPLETE> (←)
				
				Facility IE:
				  returnResult
				  callTransferInitiate
				  callIdentity
						⇑**H.323 API** Clear_call_confirm (BC state active=> BC state idle)	release call to TE A

1 The same conferenceID as for the first call is used

2 The same conferenceID as for the first call is used

1.7 Transfer with joining (only Te A has to be a H.323-SpIS-terminal)

1.7.1 Operational model

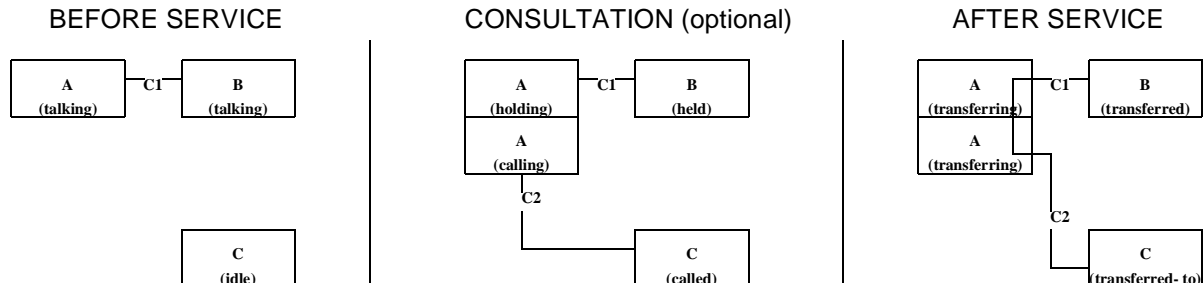BEFORE SERVICE   CONSULTATION (optional)   AFTER SERVICE

Figure 7 -7   Operational model for transfer with joining
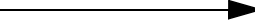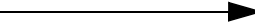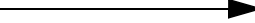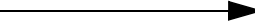
1.7.2 Description from user point of view:

User A: communicating with B; B on Hold (optional); User selects C and Media; requests connection;

Consultation Active; return on call to B (if on Hold)Transfer Join; idle

User B: communicating with A; receive transfer notification; communicating with C

User C: idle; receives notification of incoming call; accepts call; confirmes media; receive transfer notification; communicating with B

Table 7 - 5   Transfer with joining

Row no.	User / Application action	H.323 API	Note	IP, H.225, QSIG, CSTA, H.245	Note	H.323 API	User / Application action
49	MM Terminal A			Network		MM Terminal B	
50				Active Basic Call between TE A and TE B (conferenceID=1) Capabilities exchanged H.225 connection still exists UDP path for audio open			
51	MM Terminal A			Network		MM Terminal C	
52	Request for call-estab-lish-ment to Te C			[1]Establish Basic Call to C →			

Row no.	User / Application action	H.323 API	Note	IP, H.225, QSIG, CSTA, H.245	Note	H.323 API	User / Application action

53	Send transfer confir- mation		2	H.225 <FACILITY> →
				
				Facility IE:
				  invoke
				    callTransferComplete
				      endDesignation=primaryEnd
				  Interpretation Apdu=discardAny
				  UnrecognisedInvokePdu
							Receive transfer_r equest

54		**MM Terminal A**		**Network**		**MM Terminal B**	

55	Send transfer confir- mation			H.225 <FACILITY> →
				
				Facility IE:
				  invoke
				    callTransferComplete
				      endDesignation=secondaryEnd
				  Interpretation Apdu=discardAny
				  UnrecognisedInvokePdu
							Receive transfer_r equest

56	Join connec- tion to B with connec- tion to C		3				

57				H.225 <FACILITY> →
				
				Facility IE:
				  invoke
				    callTransferUpdate
				      redirectionNumber
				  Interpretation Apdu=discardAny
				  UnrecognisedInvokePdu			

58		**MM Terminal A**		**Network**		**MM Terminal C**	

59				H.225 <FACILITY> →
				
				Facility IE:
				  invoke
				    callTransferUpdate
				      redirectionNumber
				  Interpretation Apdu=discardAny
				  UnrecognisedInvokePdu			

1 The same conferenceID as for the first call is used

2 Te A must be sure, that Te B is allowed to talk to Te C

3 There must be some action in the Terminal. like closing the window for video and muting the loudspeaker.