Bluetooth
Hands-Free Profile
Application Guideline

Ver1.0a

Oct. 20, 2004

CCAP

(Car - Communication - Application - Promotion)

Car – Communication – Application – Promotion(CCAP)

The following companies are represented in Car-Communication-Application-Promotion group.

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Revision History

Revision	Date	Comments
0.x	Oct. – 04 – 2001	Very first preliminary draft (only HFP)
0.7	Dec. – 11 – 2001	Second draft (based on HFP ver0.96)
0.8	Mar. – 11 – 2002	3rd draft -Changed basic Philosophy(Table format changed from text base) -Changed Sequence charts(corrected errors)
0.9	June – 13 – 2002	4th draft -Changed basic philosophy (Requested by AMI-C etc.) -Changed sequence chart (Requested by AMI-C etc.) -Local rule drawn out. (To be mentioned in Part2)
0.95	Oct. – 02 – 2002	5th draft (based on HFP ver.1.0VD) -Changed basic philosophy > It is newly noted that there are registration mode and normal mode. This notation is to clarify that inquiry scan is executed only in registration mode and ACL connection is established only in normal mode. > Recommendation that keeps an ongoing call for a certain duration when SLC link loss occurred is deleted. Instead, it is left to the implementation of the AG how long the ongoing call should be kept after the SLC link loss occurred. > All sentences are examined and corrected. -Changed Parameters > Page scan parameters for the AG are deleted, considering power consumption of the AG > Two parameters for abnormal sequences were deleted (AG waiting time at link loss)
0.96	Dec. - 11 - 2002	6th draft -The name of Chapter 7 was changed from Appendix to For example(Use case). -Appendix A (Local rule) was added. -Appendix B(Phone Book) was added.
1.0	Jun. - 20 - 2003	Released (based on HFP ver.1.0) -Added some Usage Scenarios -Added '5.12 Call setup' -Added the sheets for switching Hands-Free Mode when originated/accepted a call by AG -Added the sequence of Service Level Connection setup -Detailed on Three Way Calling (SEND0/1) -'AT+BRSF' for Registration and Connection setup sequence -Editorial changes throughout the document

1.0a	Oct. - 20 - 2004	Revised 6.2.1 Registration sequences - “LMP detach” after “service level connection release” is changed to optional (a broken line).

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AMI-C for overall review and input to Sections 4, and 5.
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1. Introduction

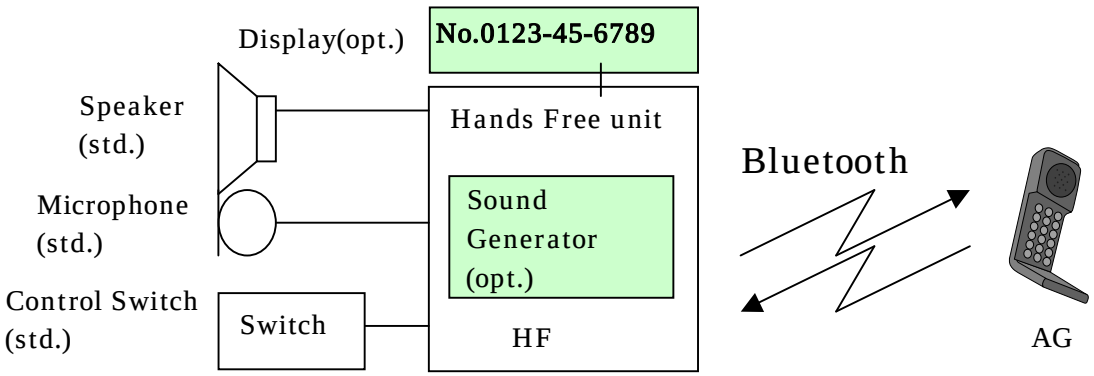
The Car-Communication-Application-Promotion group (CCAP) is concerned that Car-WG profiles may not provide sufficient definition to assure interoperability of Bluetooth devices supporting these profiles. CCAP believes that this application guide for the Bluetooth Hands-Free applications will improve the interoperability between handheld devices and the car, and help implementers understand the Hands-free profiles for user convenience. This guideline provides:

- Recommended values of parameters
- Recommended sequence charts
- Basic philosophy
- Option usage
- New scenarios not included in the HFP

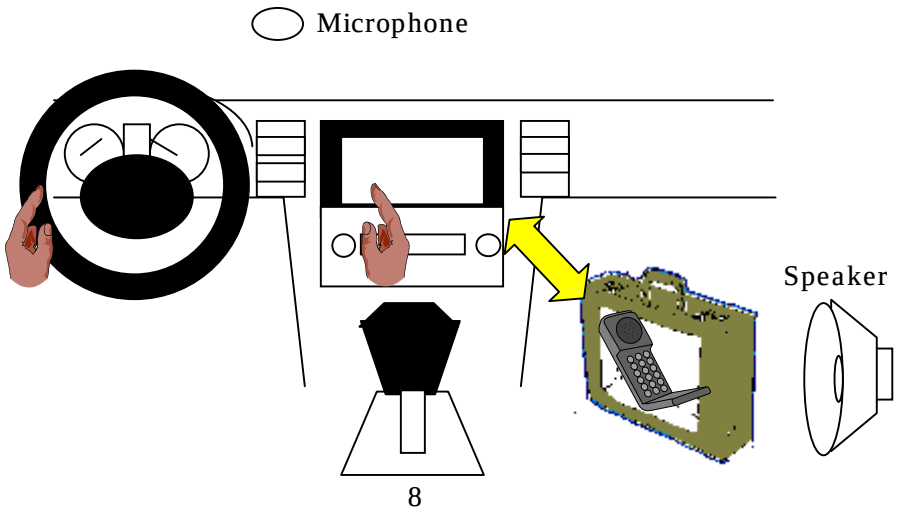
The intent is that this guideline be applied to the application layer above the Hands-free Profile (HFP). The CCAP may also provide additional guidelines in the future for the Phone Access Profile(PAP), SIM Access Profile (SAP) and future versions of these profiles.

1.1. Target system

The figure below shows a system diagram that this guideline specifies. The minimum functionality of the hands-free unit (HF) is a speaker, microphone and control switch. The Display and Sound Generator are optional.

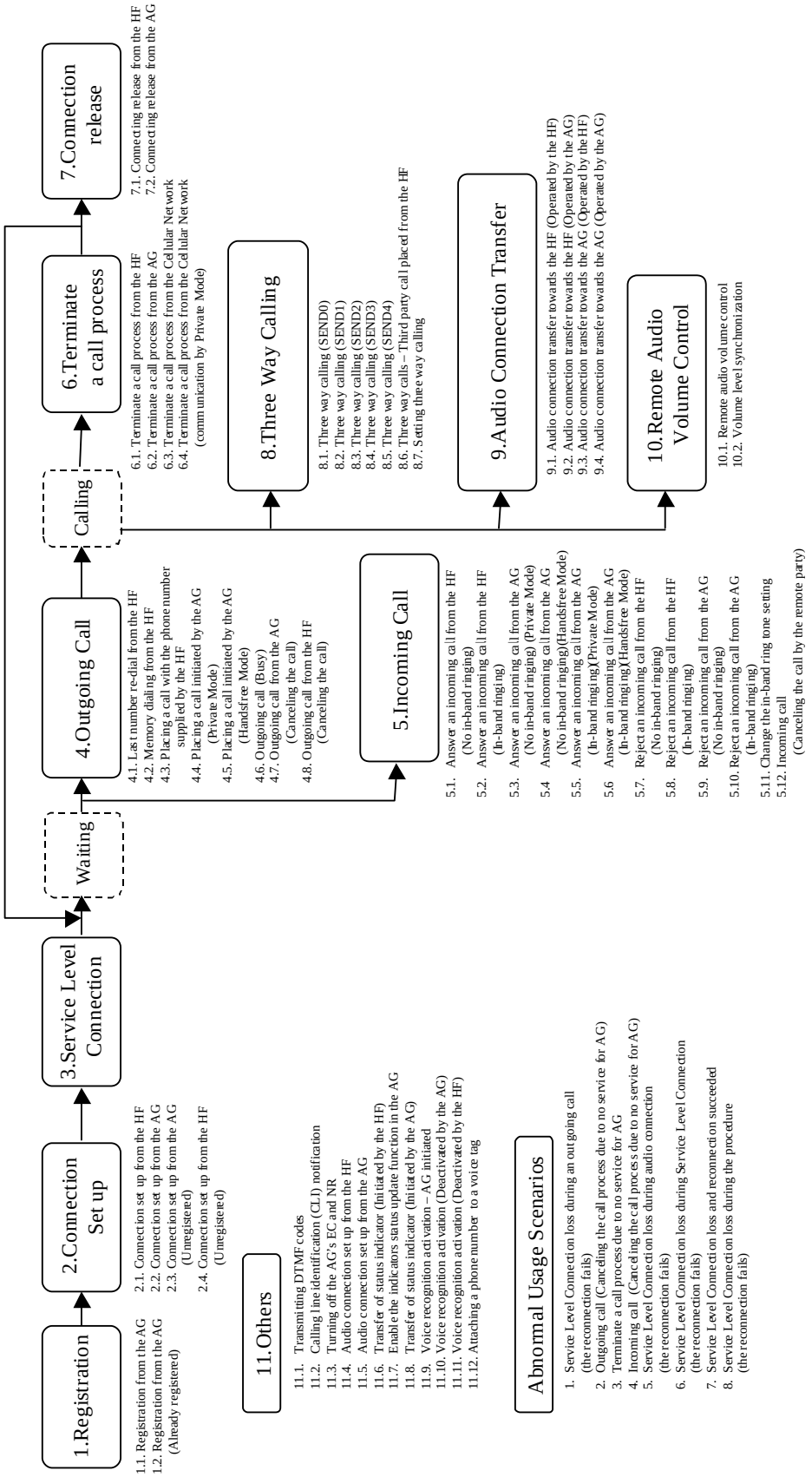


1.2. Example of the system



2. State transition assumed with Application Guideline

Following figure represents the state transition diagram that this guideline assumes when the AG(cellular phone) and the HF(hands-free Unit) operate with each other according to the Hands-free Profile.



3. Usage scenarios

This section presents usage scenarios that illustrate specific behaviors of the AG and HF when operating in compliance with the HFP

The objectives in showing these usage scenarios are :

- To clarify the features of the profile so as to improve the HFP for readers understanding
- To prevent readers from misunderstanding the sequence charts and parameters and thus ensure interoperability

The first table shows the proposed normal usage scenarios and the second table the abnormal scenarios. The scenarios that are not defined in the current version of the HFP are colored yellow.

Normal / Additional Usage Scenarios

Scenario Category	Scenario Name	Initial Status			uppo n HF	uppo n AG	Scenario Description	HFP ection
		LC[4]	AC*[3]	Call				
Registration*[1]	Registration from the AG	?	X	X	M	M	The AG discovers the HF, and the AG and the HF register the other side.	-
	Registration from the AG (Already registered)	X	X	X	M	M	The AG tries to register the HF, but the AG has already been registered in the HF.	-
Connection set up	Connection set up from the HF	X	X	X	M	M	The HF sets up the connection to the registered AG.	4.2
	Connection set up from the AG	X	X	X	M	M	The AG sets up the connection to the registered HF.	4.2
	Connection set up from the AG (Unregistered)	X	X	X	M	M	The AG tries to set up the connection to the HF, but the AG has not been registered in the HF.	4.2
	Connection set up from the HF (Unregistered)	X	X	X	M	M	The HF tries to set up the connection to the AG, but the HF has not been registered in the AG.	4.2
	Service level connection setup	X	X	X	M	M	The HF or the AG sets up the Service Level Connection	4.2
Outgoing call	Last number re-dial from the HF	E	?	X	O	M	Last number re-dialing is initiated by the HF. The AG starts outgoing call, using the last dialed number.	4.15
	Memory dialing from the HF	E	?	X	O	M	Memory dialing is initiated by the HF. The AG starts outgoing call, using the phone number stored in the AG	4.14
	Placing a call with the phone number supplied by the HF	E	?	X	O	M	Placing a call with the phone number is initiated by the HF. The AG starts the outgoing call, using the phone number	4.13
	Placing a call initiated by the AG (Private Mode)	E	?	X	O	M	The AG initiates the outgoing call.	.
	Placing a call initiated by the AG (Hands free Mode)	E	?	X	O	O	The AG initiates the outgoing call and the call is transferred to the HF.	.
	Outgoing call (Busy)	E	?	X	O	M	Outgoing call is initiated by the HF, but the network is in the state of busy.	.
	Outgoing call from the AG (Canceling the call)	E	?	X	O	M	Outgoing call is initiated by the AG, but the outgoing call is cancelled.	.
	Outgoing call from the HF (Canceling the call)	E	?	X	O	M	Outgoing call is initiated by the HF, but the outgoing call is cancelled.	.
Incoming call	Answer an incoming call from the HF (No in-band ringing)	E	?	X	M	M	The HF answers the incoming call with no in-band ringing.	4.8.2
	Answer an incoming call from the HF (In-band ringing)	E	?	X	M	O	The HF answers the incoming call with in-band ringing.	4.8.1
	Answer an incoming call from the AG (No in-band ringing)(Private Mode)	E	?	X	M	M	The AG answers the incoming call with no in-band ringing.	4.8.3
	Answer an incoming call from the AG (No in-band ringing)(Hands free Mode)	E	?	X	M	O	The AG answers the incoming call with no in-band ringing and the call is transferred to the HF.	4.8.3
	Answer an incoming call from the AG (In-band ringing)(Private Mode)	E	?	X	M	O	The AG answers the incoming call with in-band ringing.	4.8.3
	Answer an incoming call from the AG (In-band ringing)(Hands free Mode)	E	?	X	M	O	The AG answers the incoming call with in-band ringing and the call is transferred to the HF.	4.8.3
	Reject an incoming call from the HF (No in-band ringing)	E	?	X	M	O	The HF rejects the incoming call with no in-band ringing.	4.9.1
	Reject an incoming call from the HF (In-band ringing)	E	?	X	M	O	The HF rejects the incoming call with in-band ringing	4.9.1
	Reject an incoming call from the AG (No in-band ringing)	E	?	X	M	O	The AG rejects the incoming call with no in-band ringing.	4.9.2
	Reject an incoming call from the AG (In-band ringing)	E	?	X	M	O	The AG rejects the incoming call with in-band ringing.	4.9.2
	Change the in-band ring tone setting	E	?	X	M	O	The AG informs the HF whether the AG sends in-band ring tone or not.	4.8.4
	Incoming call (Canceling the call by the remote party)	E	?	X	M	M	Incoming call comes to the HF, but the incoming call is cancelled by the remote party.	4.8
Terminate a call process	Terminate a call process from the HF	E	?	E	M	M	A call process is terminated from the HF.	4.10.1
	Terminate a call process from the AG	E	?	E	M	M	A call process is terminated from the AG	4.10.2
	Terminate a call process from the cellular network	E	E	E	M	M	A call process is terminated from the cellular network.	4.10.2
	erminate a call process from the cellular network (communication by Private Mod	E	X	E	M	M	A call process is terminated from the cellular network.	4.10.2
Connection release	Connection release from the HF	E	?	?	M	M	The Service Level Connection is released from the HF	4.3
	Connection release from the AG	E	?	?	M	M	The Service Level Connection is released from the AG	4.3
Three way calling	Three way calling (SEND 0)	E	E	E	O	O	From the HF, the held call is released.	4.17
	Three way calling (SEND 1)	E	E	E	O	O	From the HF, the active call is released and the other call is accepted.	4.17
	Three way calling (SEND 2)	E	E	E	O	O	From the HF, the active call is placed on hold and the other call is accepted.	4.17
	Three way calling (SEND 3)	E	E	E	O	O	From the HF, the held call is added to the conversation.	4.17
	Three way calling (SEND 4)	E	E	E	O	O	From the HF, two calls are connected and the subscriber is disconnected from the both calls.	4.17
	Three way calls - Third party call placed from the HF	E	E	E	O	O	The current call is put on hold and the HF is connected to the directed terminal.	4.17
	Setting three way calling	E	?	?	O	O	Three way calling is set from the HF.	4.16
Audio connection transfer	Audio connection transfer towards the HF (Operated by the HF)	E	?	E	M	M	The audio connection is transferred from the AG to the HF, operated by the HF	4.11
	Audio connection transfer towards the HF (Operated by the AG)	E	?	E	M	M	The audio connection is transferred from the AG to the HF, operated by the AG	4.11
	Audio connection transfer towards the AG (Operated by the HF)	E	E	E	M	M	The audio connection is transferred from the HF to the AG, operated by the HF.	4.12
	Audio connection transfer towards the AG (Operated by the AG)	E	E	E	M	M	The audio connection is transferred from the HF to the AG, operated by the AG.	4.12
Remote audio volume control	Remote audio volume control	E	?	?	O	M	The HF's volume is controlled by the AG	4.23.1
	Volume level synchronization	E	?	?	O	M	The HF informs the AG of the volume level.	4.23.2
Others	Transmitting DTMF codes	E	E	E	O	M	During an ongoing call, the HF transmits DTMF codes to the cellular network via the AG.	4.22
	Calling line identification (CLI) notification	E	?	?	O	M	The HF enables the AG to notify the calling line identification.	4.18
	Turning off the AG's EC and NR	E	?	?	O	O	The HF turns off the AG's EC and NR.	4.19
	Audio connection set up from the HF	E	X	X	M	M	The audio connection is set up from the HF (Not depending on the call)	4.6
	Audio connection set up from the AG	E	X	X	M	M	The audio connection is set up from the AG (Not depending on the call)	4.6
	Transfer of status indicator (Initiated by the HF)	E	?	?	M	M	The HF gets the status indicator of the AG.	4.2.1
	Enable the indicators status update function in the AG.	E	?	?	M	M	The HF requests the AG to notify the status indicator.	4.2.1
	Transfer of status indicator (Initiated by the AG)	E	?	?	M	M	The AG notifies its status indicator to the HF	4.5
	Voice recognition activation - AG initiated	E	?	X	O	O	The AG activates the voice recognition function in the AG.	4.20.2
	Voice recognition activation (Deactivated by the AG)	E	?	X	O	O	The HF activates the voice recognition function in the AG, and its function is deactivated by the AG	4.20.3
	Voice recognition activation (Deactivated by the HF)	E	?	X	O	O	The HF activates the voice recognition function in the AG, and its function is deactivated by the HF.	4.20.3
	Attaching a phone number to a voice tag	E	?	X	O	O	The HF requests a phone number from the AG and attaches the phone number to a voice tag.	4.21

Abnormal Usage Scenarios

Scenario Category	Scenario Name	Initial Status			Support in HF	Support in AG	Scenario Description	HFP Section
		SLC*	AC*3	Call				
Abnormal	Service Level Connection loss during an ongoing call (the reconnection fails)	E	E	E	O	O	Service Level Connection loss during an ongoing call occurs and the reconnection fails	-
	Outgoing call (Canceling the call process due to no service for AG)	E	?	X	O	O	An outgoing call is cancelled due to no service for AG	-
	Terminate a call process due to no service for AG	E	E	E	O	O	A call process is terminated due to no service for AG	-
	Incoming call (Canceling the call process due to no service for AG)	E	?	X	O	O	An incoming call is cancelled due to no service for AG	-
	Service Level Connection loss during audio connection (the reconnection fails)	E	E	X	O	O	Service Level Connection loss during audio connection occurs and the reconnection fails	-
	Service Level Connection loss during Service Level Connection (the reconnection fails)	E	X	X	O	O	Service Level Connection loss during Service Level Connection occurs and the reconnection fails	-
	Service Level Connection loss and reconnection succeeded	E	X	X	O	O	Service Level Connection loss during Service Level Connection occurs and the reconnection succeeds.	-
	Service Level Connection loss during the procedure (the reconnection fails)	E	?	?	O	O	Service Level Connection loss during the procedure occurs and the reconnection fails	-

Note: Usage Scenarios colored yellow are not defined in the HFP.

E : Exist M: Mandatory
X : Not Exist O: Option
?: Both case are assumed

*1 Registration from the HF is not depicted because inquiry from the HF is not defined in the HFP.
*2 SLC: Service Level Connection
*3 AC: Audio Connection

4. Basic philosophy

This section states Bluetooth connection philosophy that provides a basis for the sequence charts presented in section 6.

The objectives of this section are to:

- Help readers understand the sequence charts
- Provide guidance for sequences that are not contained in the HFPV1.0.

The tables in this section, have a column headed “HFP” in which the corresponding section in the Hands-Free Profile document is indicated. A dash (“-”) in the “HFP” column means that there is no corresponding description in the HFP.

4.1. Recommendations for GAP

Recommendations for GAP

Item	HFP	Recommendation	Reason
Inquiry Scan (registration mode)	-	It is recommended that neither the AG nor the HF execute inquiry scans in a normal mode. Rather, the AG and the HF would execute inquiry scans only in the registration mode, which is usually entered by explicit user input.	From a security point of view, it is not desirable that other devices can easily obtain information to be identified on both the AG and HF.
No ACL Connection status (normal mode)	-	When there is not an ACL connection, it is recommended that both the AG and HF page scan.	Both the AG and the HF may establish an ACL connection if necessary.
ACL connection status (normal mode)	-	When an ACL connection exists, it is recommended that the AG take a low power consumption mode (i.e. park mode, sniff mode, or hold mode). The details are described in “Recommendations for No-audio connection status”.	It is desirable that the HF support all of park mode, sniff mode or hold mode so that the AG use power conserving mode(s) preserving its battery life.

(Note)
Both the HF and AG can be enabled to use a registration mode, in addition to supporting normal mode. Inquiry scan by the HF and AG can be performed in the registration mode only.

(Example)
After being powered on, a HF device should periodically alternately perform paging and page scan so that the HF can establish an ACL connection with the AG. In this case, the AG is preferable to be operated in page scan mode.
If an ACL connection exists but the HF has not taken any action for a certain duration, the AG may release the established ACL connection to enter power conserving mode(s)s. In this case, it is not recommended that the HF execute further paging to the AG.

4.2. Recommendation for SDP

Recommendation for SDP

Item	HFP	Recommendation	Reason
SDP	-	It is recommended that both the AG and HF get the Service Record on the other device, every time when each device tries to establish an ACL connection.	Service Record on the AG and the HF may be change.

4.3. Recommendations for "No-audio" connection status

Recommendations for "No-audio" connection status (1/2)

Item	HFP	Recommendation	Reason
Normal Status	-	When any audio connection does not exist, it is recommended that the AG and HF have an RFCOMM connection set up and The AG is in power conserving mode.	In order for the HF to receive an incoming call, it is desirable that the RFCOMM connection be kept. Power conserving mode(s) is desirable to reduce power consumption for the AG.
Master-slave role switch	-	The Bluetooth role of the AG (master or slave) is implementation dependent. It is recommended that the request for a role switch to/from a master or slave be initiated by the AG.	To reduce power consumption for the AG.
Park mode	-	It is recommended that the transition to park mode be initiated by the AG.	
Sniff mode	-	It is recommended that both the AG and HF support sniff mode. Sniff mode is used, if park mode is not supported by either the AG or HF.	To ensure a power consumption reduction, when park mode is not supported by both devices.
		It is recommended that the transition sniff mode be initiated by the AG.	
Hold mode Pending (TBD)	-	It is recommended that both of the AG and the HF support a hold mode. The hold mode is adopted, if neither a park mode nor sniff mode is not enabled to be supported in either AG nor HF.	To ensure power consumption save, in case that neither a park mode nor sniff mode is not enabled to be performed.
		It is recommended a hold mode be initiated from the AG.	

(Note)

Pending(TBD) It is recommended that the HF support all of the park mode, sniff mode and hold mode and also the AG be enable to support one of those three modes at least.

Recommendations for “No-audio” connection status (2/2)

Item	HFP	Recommendation	Reason
ACL link reconnection for an unrequested release in park mode or sniff mode	-	If an AG and HF operating power conserving mode has an ACL connection, including RFCOMM connection and a link loss causes the ACL connection to be dropped, it is recommended that the HF initiates re-establishing the ACL link connection. Detecting of the link loss and release of the ACL link connection, is implementation dependent. An example would be the monitoring of HCI's Disconnection Complete event parameters, namely 0x08 (Connection timeout). When a link loss causes the release of the established ACL link connection, it is recommended that the AG does page scanning and the HF does both page scan and paging alternatively. If the ACL link is established again, it is recommended that the HF unit not believe previous AG status is valid. It is recommended that the HF issue initialization commands during the Service Level Connection establishment procedure (AT+CIND=?, etc.)	To ensure a reconnection to perform the unrequested ACL link release in either a park mode or sniff mode
Case of “no support of power conserving mode”	-	If none of power conserving mode is supported in the AG or HF, the AG may release the established ACL link connection to reduce power consumption. If the HF has already established the ACL link connection but there have not been any calls or data traffic for a certain duration, the AG may release the ACL link connection. In this case, it is recommended the HF execute a page scan after detecting the ACL link connection release and the AG should perform page scanning. Furthermore it is recommended that the HF not page after detecting the ACL link connection release by the AG unless a call from the HF is initiated.	To cope with the case that there is not any power saving mode(s) supported by both AG and HF

4.4. Recommendation for Service Level Connection

Recommendation for Service Level Connection

Item	HFP	Recommendation	Reason
Service Level reconnection for an unrequested release	4.2.3	When a link loss happens to release the established Service Level Connection without a request from the AG or HF, the HF reinitiates the Service Level Connection. [Defined in HFP 4.2.3] If the Service Level Connection is established again, the HF unit shall not believe that the Service Level Connection state from the previous connection is valid. [Defined in HFP 4.2.3] It is recommended that the HF issue initialization commands during the Service Level Connection establishment procedure (AT+CIND=?, etc.) [Undefined in HFP] It is implementation dependent that the method for detecting the Service Level Connection release led by a link loss. One example method is through monitoring the status in one of HCI's Disconnection Complete event's parameters, namely 0x08 (Connection timeout). [Undefined in HFP] When a link loss happens to release a Service Level Connection it is recommended that the AG execute a page scan and the HF execute both a page scan and a paging, respectively. [Undefined in HFP]	To ensure reconnection following unrequested Service Level Connection release

4.5. Recommendations for normal / additional sequence

Recommendations for normal / additional sequence (1/2)

Item	HFP	Recommendation	Reason
Timing of audio connection set up in outgoing call	-	When the AG sets up an outgoing call based on a request from the HF and there is not audio connection, it is recommended that the AG establish an audio connection before setting up the outgoing call to the cellular network.	The HF can confirm outgoing call status by detecting tones (ring back tone, busy tone, and so forth).
Timing of audio connection release in a terminating call and rejecting an incoming call with in-band ringing	-	When the user initiates the termination of a call or rejects an incoming call with in-band ringing at both the AG and HF, it is recommended that the AG release the established audio connection before either terminating an ongoing call or rejecting an incoming call.	To avoid any uncomfortable noise in the HF
AG timing of audio connection set up in incoming call (no in-band ringing, audio absent)	-	When there is an incoming call with no in-band ringing and there is not an audio connection and the HF requests that the call be answered, it is recommended that the AG establish an audio connection before answering the incoming call to the cellular network.	To avoid missing the beginning of the call.
HF timing of audio switching in incoming call (no in-band ringing, audio present)	-	When there is an incoming call with no in-band ringing and there is an audio connection, the HF outputs the local ring tone. To answer the incoming call from the HF, it is recommended that the HF switch its internal audio path from the sound generator path to the Bluetooth audio path when the HF receives +CIEV (call=1) from the AG.	To define the timing to switch the audio path in the HF.
HF timing of audio switching in incoming call (no in-band ringing, audio absent)	-	When there is an incoming call with no in-band ringing and there is not an audio connection, a local ring tone comes from either the HF or the AG. To answer the incoming call from the HF, it is recommended that the HF switch its internal audio path from the sound generator path to the Bluetooth audio path when the audio connection is established.	

Recommendations for normal / additional sequence (2/2)

Item	HFP	Recommendation	Reason
Stopping the local ring tone when canceling an incoming call (no in-band ringing) or rejecting an incoming call (no in-band ringing).	-	When an incoming call with no in-band ringing is terminated by either canceling the incoming call or rejecting the incoming call from either of the AG or HF, the local ring tone should be stopped. It is recommended that the local ring tone be stopped when the HF receives +CIEV (call_setup=0).	To define the timing to stop the local ring tone in the HF.
Stopping the local ring tone when answering an incoming call from the AG	-	When an incoming call with no in-band ringing is answered from the AG, the local ring tone should be stopped. It is recommended that the local ring tone be stopped when the HF receives +CIEV (call_setup=0).	

4.6. Recommendations for abnormal sequences

Recommendations for abnormal sequences

Item	HFP	Recommendation	Reason
Service Level Connection link loss during a call	4.2.3	When a Service Level Connection link loss occurs during a call, it is recommended that the HF try to establish a new Service Level Connection [Defined in HFP 4.2.3]. (see Note below)	-
Service Level Connection link loss during an audio connection	-	When a Service Level Connection link loss occurs during the establishment of an audio connection and no call exists, it is recommended that the HF try to establish a new Service Level Connection and the AG wait for the service level reconnection to complete for the defined time (Twaitslc).	To re-establish of the audio connection following Service Level Connection link loss
Service Level Connection link loss during a Service Level Connection	-	If a Service Level Connection link loss occurs while no calls are active, it is recommended that the HF initiates the establishment of a new Service Level Connection. If a Service Level Connection is established again, the HF unit shall not believe that the Service Level Connection state from previous connection is valid. It is recommended that the HF issue initialization commands in the Service Level Connection establishment procedure (AT+CIND=?, etc.)	To re-establish the Service Level Connection in the case of link loss

(Note)
When a Service Level Connection link loss is detected, the AG may take one of the actions below:

- terminate the ongoing call immediately
- keep the ongoing call active for a certain duration (it's implementation dependant)
  (For example, some users may set specific time parameters on the AG, which define the duration until the ongoing call is terminated)
- maintain the ongoing call.

When a new Service Level Connection is established and there is an ongoing call, it is the AG that is responsible for choosing whether the call is transferred from the AG to the HF or not. This is left as an implementation choice for the AG design.(It should be noted that the existed ongoing call is not always the same as the call before the link loss). Following implementations are examples.

(1) The ongoing call may be transferred to HF by user judgment and operation.
(2) If the existed ongoing call is same as the one before the link loss by AG judgment, the audio link connection may be transferred to HF autonomously.
  - User may choose whether the audio link connection is transferred to HF autonomously or not.

5. Parameters

This section describes the CCAP recommendations for parameters and ranges.
The objective is to realize better connectivity between the AG and the HF.
The parameters indicated in this section are shown according to the scenario categories.

5.1. Registration

HF registration parameters

Item	Parameter	Value, range	Reason	Spec
Inquiry scan	Inquiry_scan_interval	Less than or equal to 1.28 sec	For fast connectivity	HCI 4.7.21
	Inquiry_scan_window	More than or equal to 11.25 msec		
Page scan	Page_scan_interval	Less than or equal to 1.28 sec		HCI 4.7.19
	Page_scan_window	More than or equal to 11.25 msec		
Device name	Name_length	Less than or equal to 20 characters	The AG can show the device name of the HF.	GAP 3.2.2
	Unicode	US-ASCII printable code + blank		
Link policy setting	Master slave switch	Support	The AG can freely become a master or a slave and realize low power consumption.	HCI 4.6.9
	SCO packets	HV1 *	For better audio quality	
Link supervision timeout	Link_supervision_timeout	Less than or equal to 5sec	To detect a link loss in the defined time.	HCI 4.7.43
Security	Security mode	Security mode 3 (It is recommended that the HF accept any security mode 1,2,3 the AG uses)	To ensure security	GAP 5.2
	Passcode length	Greater than or equal to 4	To ensure minimum security	GAP 3.2.3
	Passcode character code	0x30-0x39	The user can easily enter the Passcode.	

* It is also recommended to support HV2 and HV3 considering multiple profiles.

AG registration parameters

Item	Parameter	Value, range	Reason	Spec
Page scan	Page_scan_Interval	-	-	HCI 4.7.19
	Page_scan_Window	-		
Device name	Name_length	Less than or equal to 12	The HF can show its device name.	GAP 3.2.2
	Device name	US-ASCII printable code + blank		
Link policy setting	Master slave switch	Support	The AG can freely become a master or a slave and realize low power consumption.	HCI 4.6.9
	SCO packets	HV1 *	For better audio quality	HCI 4.6.9
Link supervision timeout	Link_supervision_timeout	Less than or equal to 5 sec	To detect a link loss in a defined time.	HCI 4.7.43
Security	Security mode	Security mode 3 (It is recommended that the AG accept any security mode 1,2,3 the HF uses)	To ensure security	GAP 5.2
	Passcode	AG shall accept the fixed passcode the HF is adopting	The HF may have only fixed passcode.	GAP 3.2.3
	Passcode length	Basically, the fixed passcode of the HF is used. If passcode of the AG is used, its length is greater than or equal to 4.	User can easily enter the Passcode	
	Passcode character code	Basically, the fixed passcode of the HF is used. If passcode of the AG is used, the character codes for the passcode is from 0x30 to 0x39.	To ensure the user entering the passcode	

* It is also recommended to support HV2 and HV3 considering multiple profiles.

5.2. Connection set up

AG, HF park, sniff, hold parameters

Item	Parameter	Value, range	Reason	Spec
Park	Beacon_max_interval	Less than or equal to 1 sec	For fast connectivity	HCI 4.6.4
Sniff	Sniff_max_interval	Less than or equal to 1 sec	For fast connectivity	HCI 4.6.1
Hold	Hold_mode_max_interval	Less than or equal to 1 sec	For fast connectivity	HCI 4.6.4

5.3. Outgoing call

Busy timeout time

Item	Parameter	Value, range	Reason	Spec
Busy timeout time	Tbusy	5 sec	To stop sending busy tone from the AG in the defined time	HFP 4.13

5.4. Incoming call

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.5. Terminate a call process

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.6. Connection release

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.7. Three way calling

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.8. Audio connection transfer

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.9. Remote audio volume control

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.10. Others

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.11. Abnormal sequences

Waiting time in loss during Service Level Connection

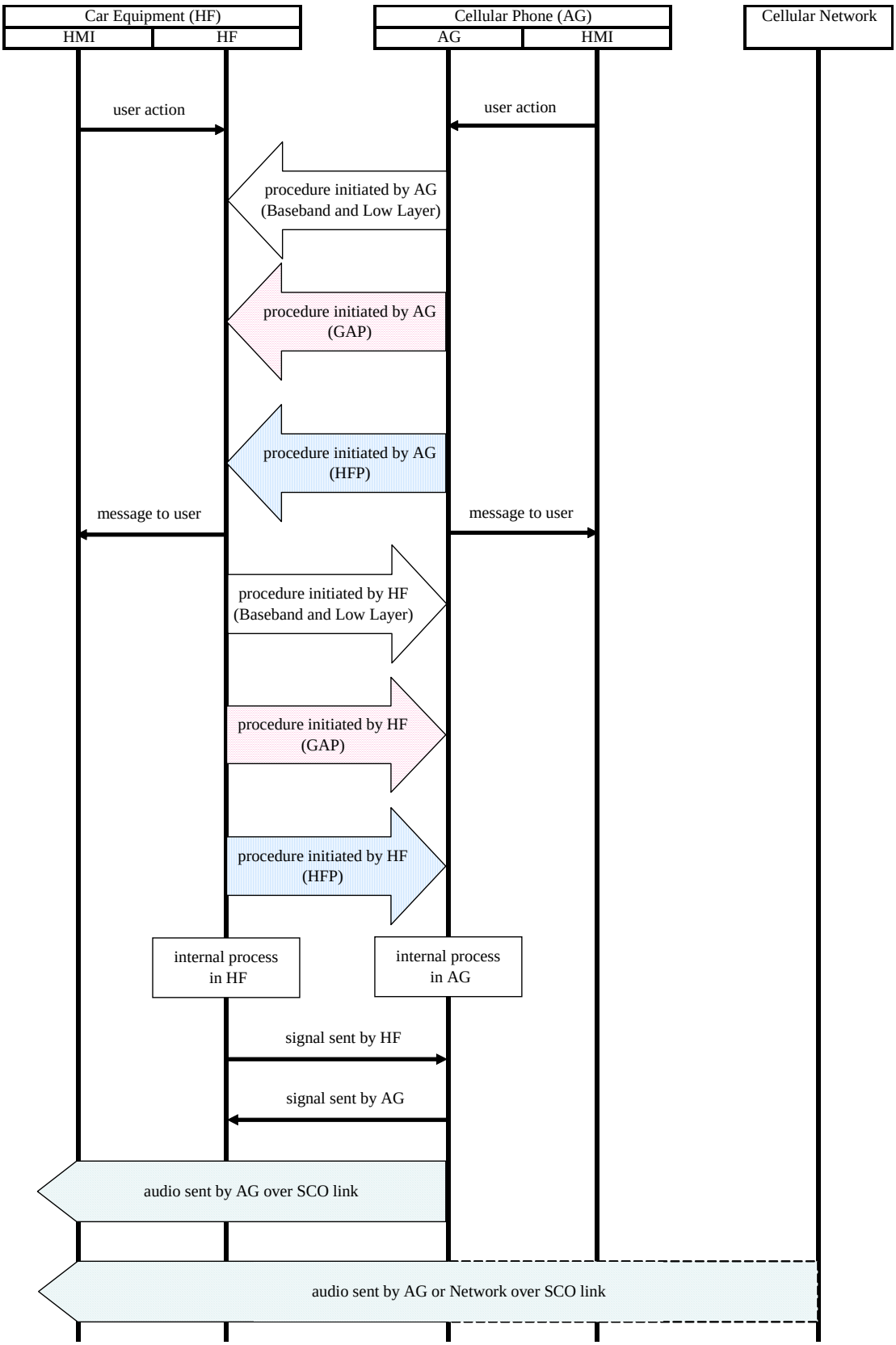
Item	Parameter	Value, range	Reason	Spec
Waiting time in loss during Service Level Connection	Twaitslc	60 sec	To reinitiate Service Level Connection in the defined time.	-

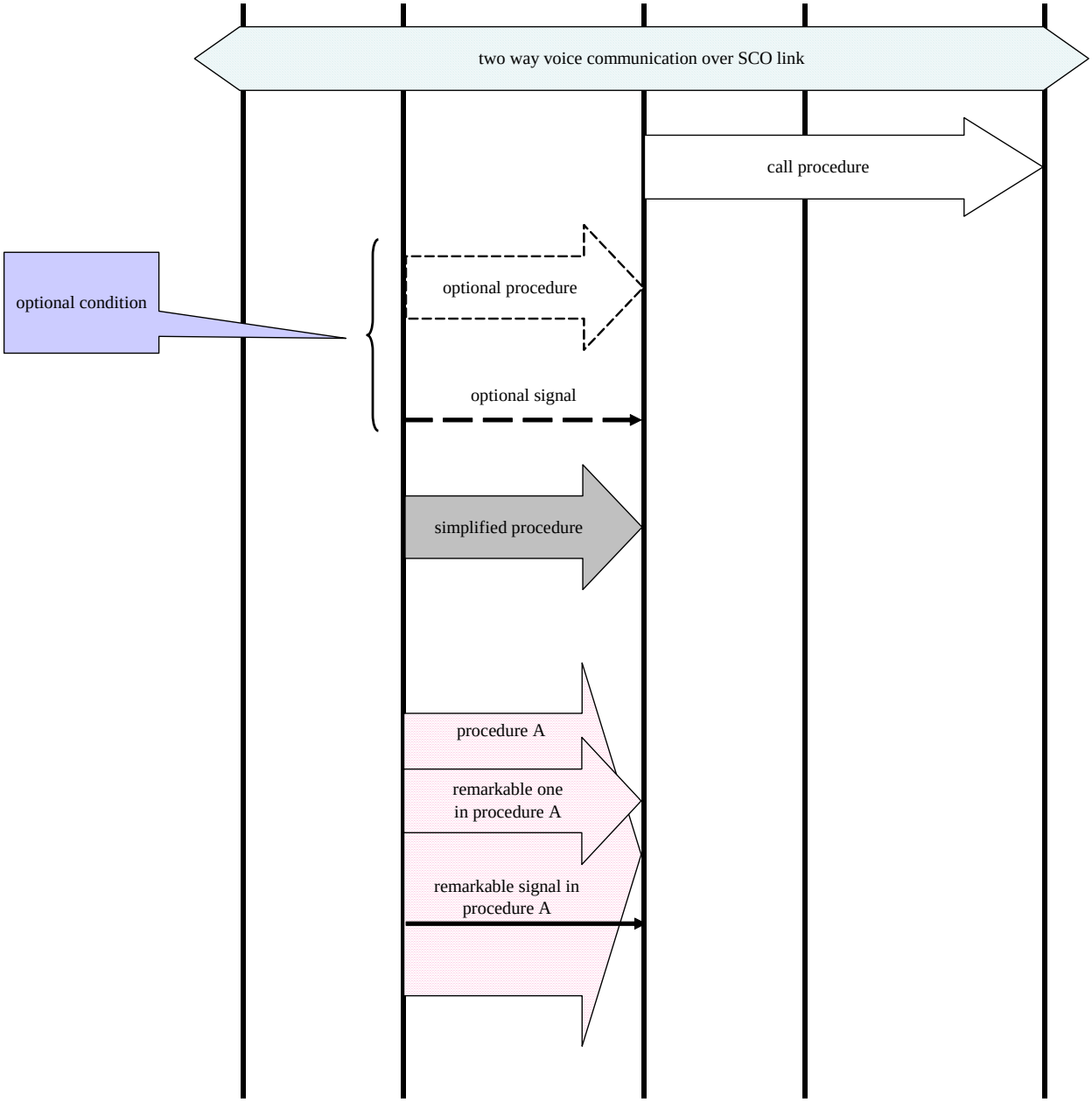
5.12. Call set up

Item	Parameter	Value, range	Reason	Spec
+CIND	“call_setup” indicator	It is desirable that the HF supports both “call_setup” and “callsetup” as a call setup status indicator. It is also recommended the HF work correctly even if the AG support neither “call_setup” nor “callsetup”.	For backward compatibility with previous versions of the profile	HFP 4.24.2

6. Sequence chart

6.1. Conventions used in sequence charts

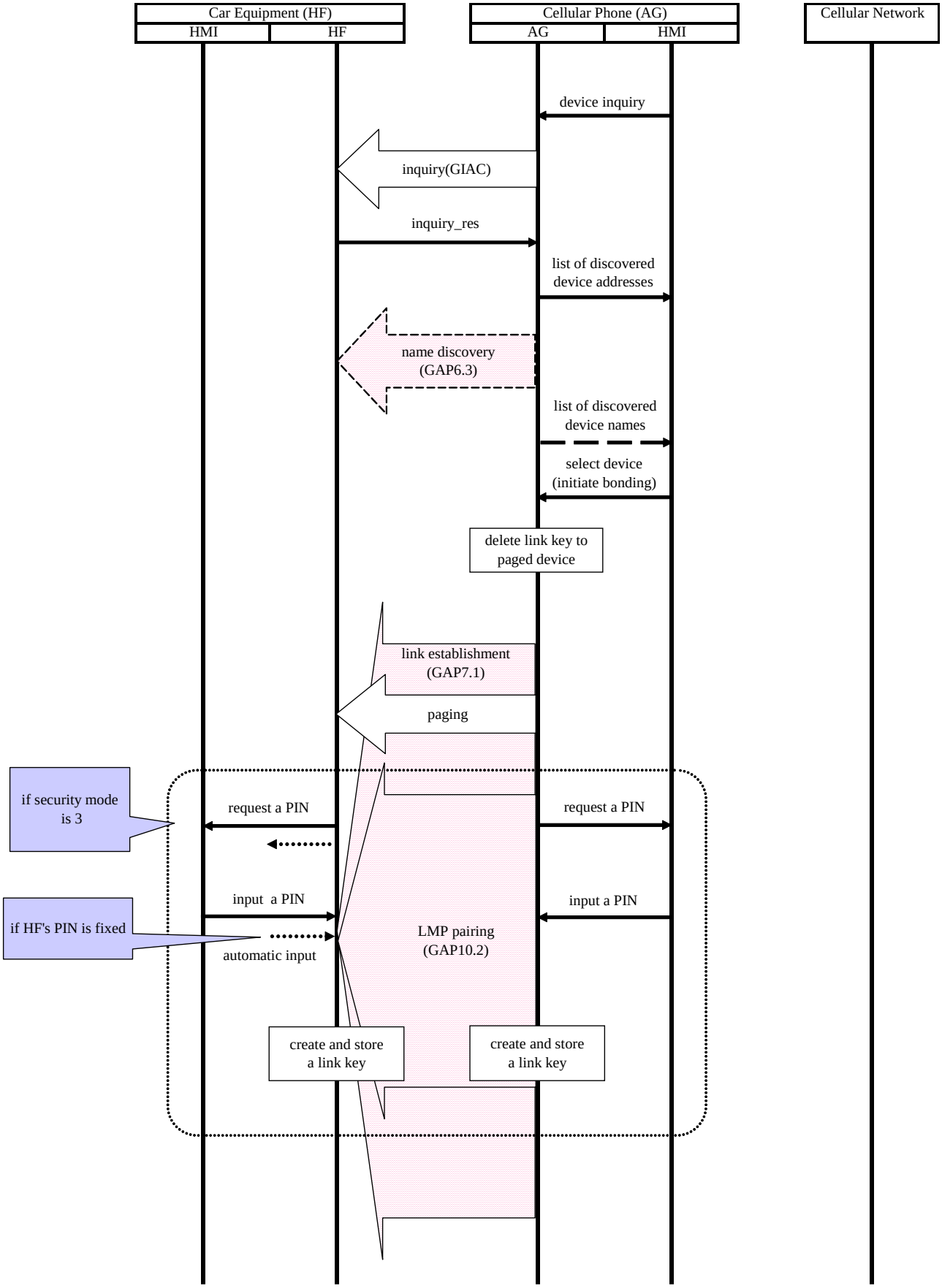


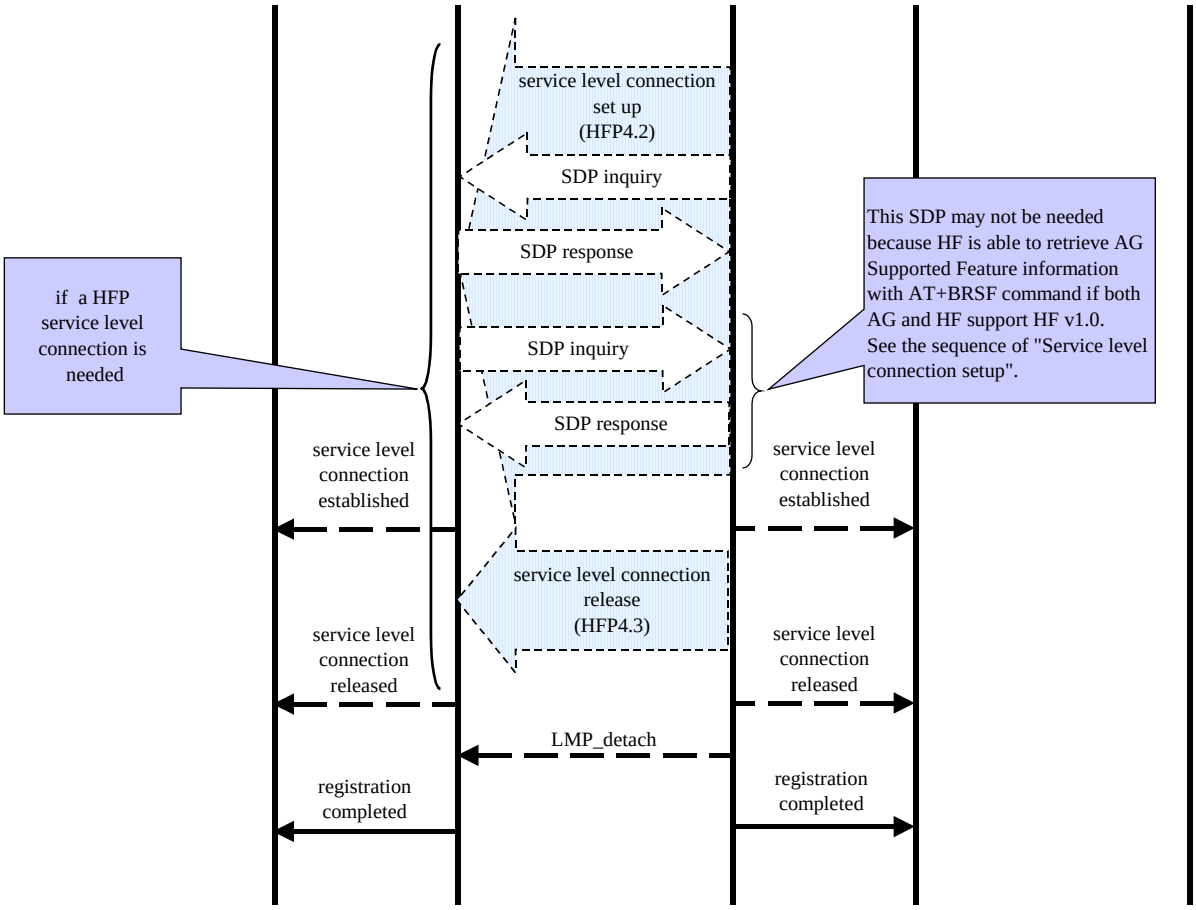

two way voice communication over SCO link
call procedure
optional condition
optional procedure
optional signal
simplified procedure
procedure A
remarkable one
in procedure A
remarkable signal in
procedure A

6.2. Normal/Additional Usage Scenarios

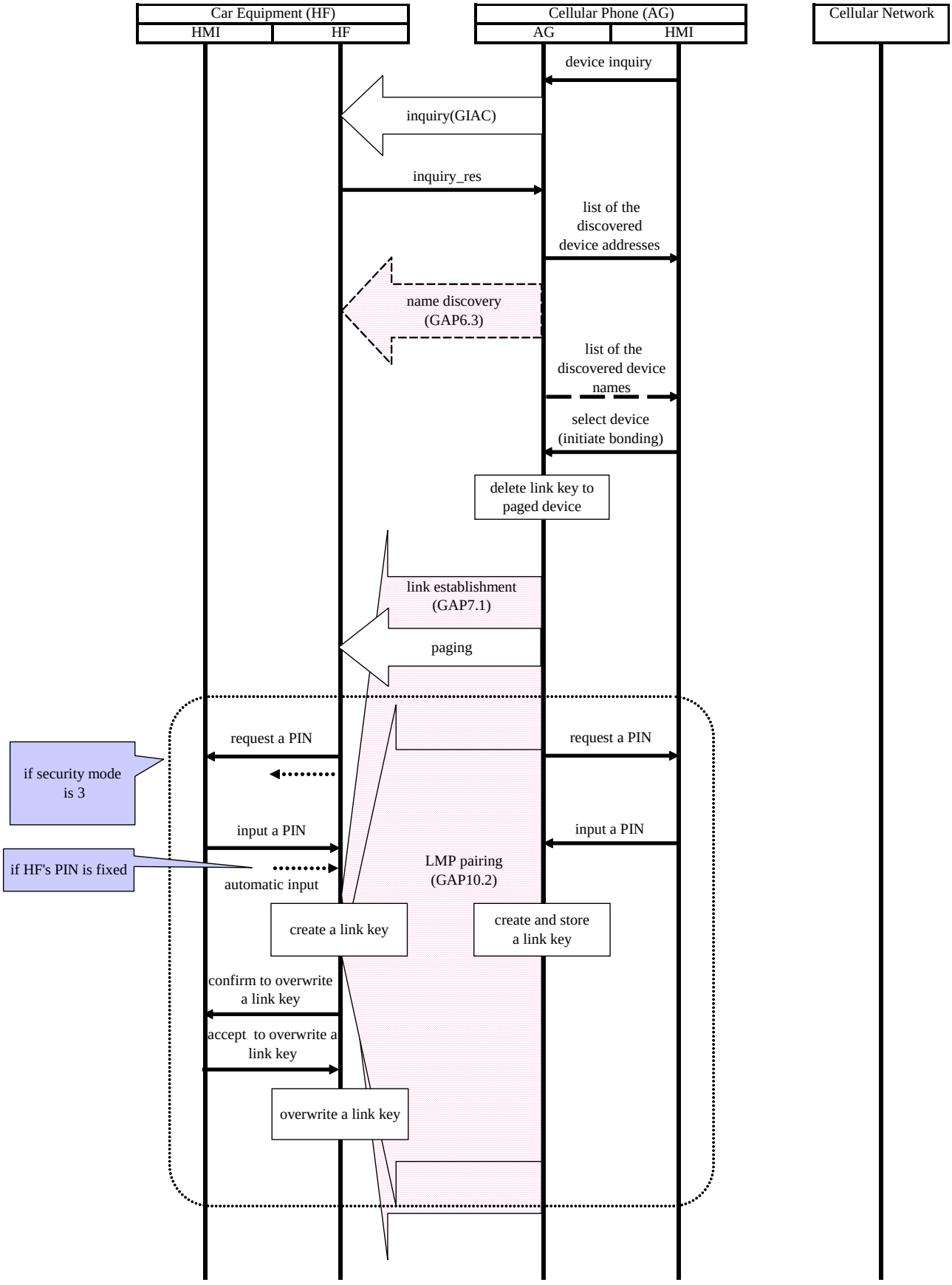
6.2.1. Registration

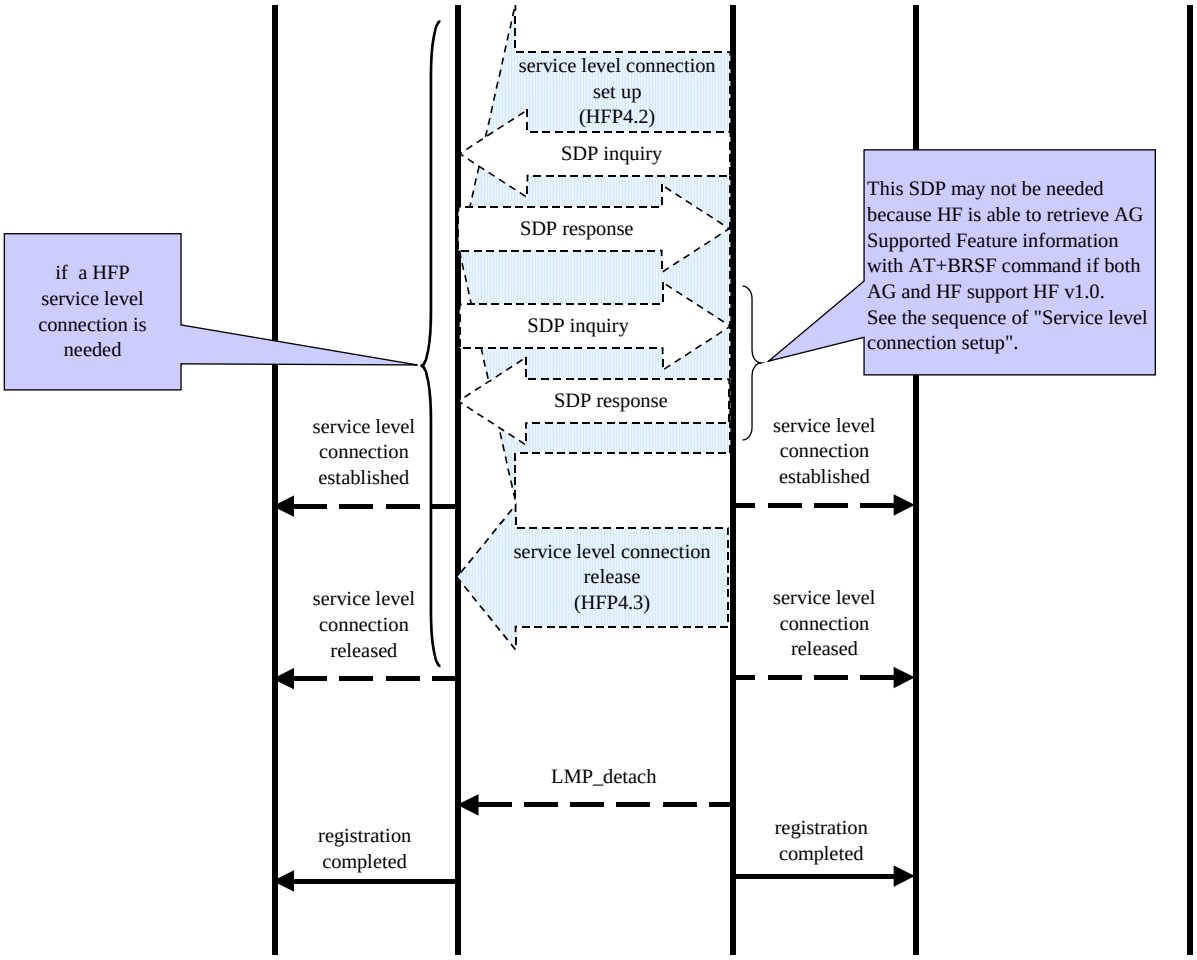
6.2.1.1. Registration from the AG




service level connection set up (HFP4.2)
SDP inquiry
SDP response
SDP inquiry
SDP response
if a HFP service level connection is needed
This SDP may not be needed because HF is able to retrieve AG Supported Feature information with AT+BRSF command if both AG and HF support HF v1.0. See the sequence of "Service level connection setup".
service level connection established
service level connection established
service level connection release (HFP4.3)
service level connection released
service level connection released
LMP_detach
registration completed
registration completed

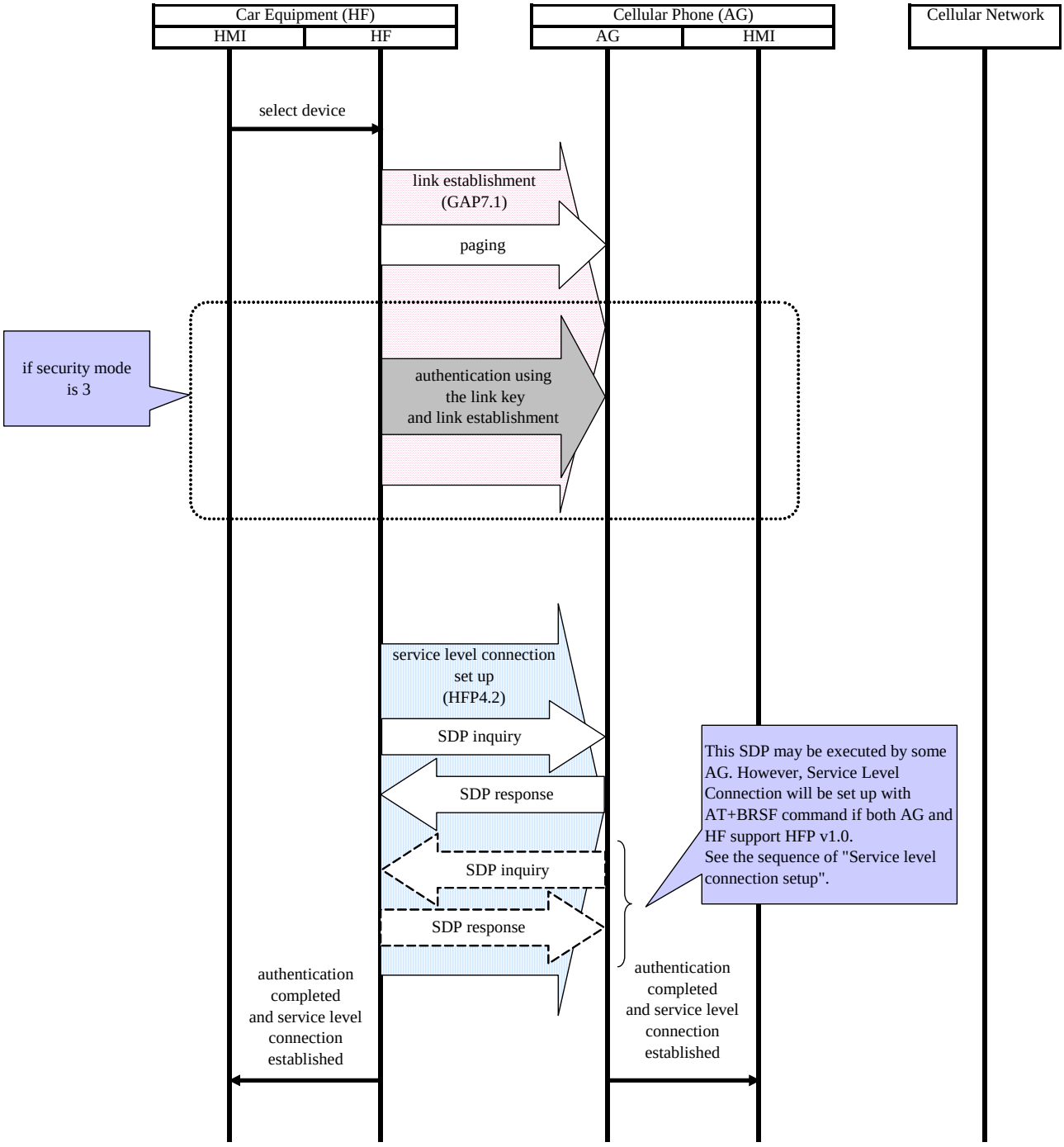
6.2.1.2. Registration from the AG (Already registered)



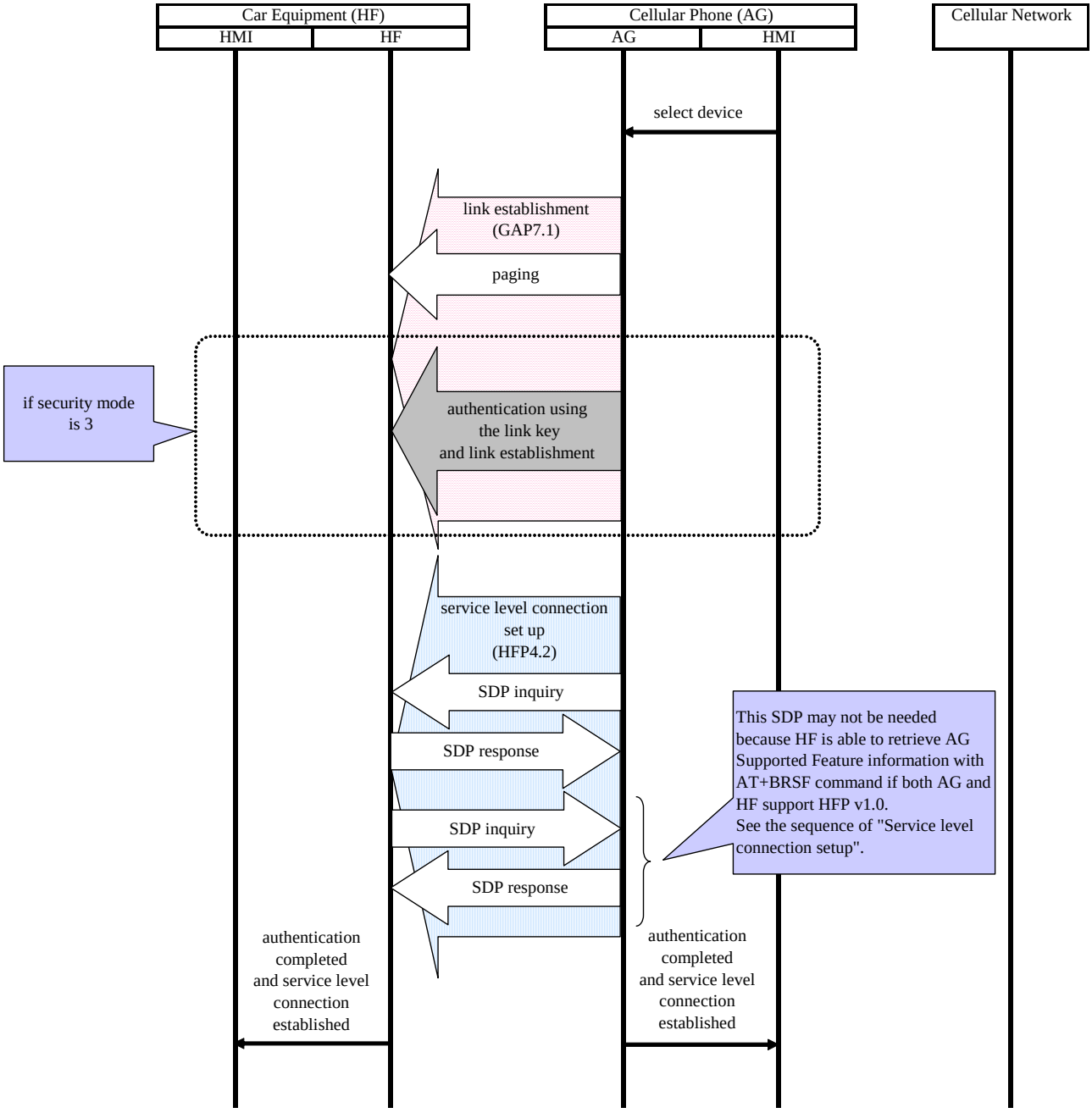

service level connection set up (HFP4.2)
SDP inquiry
SDP response
SDP inquiry
SDP response
if a HFP service level connection is needed
This SDP may not be needed because HF is able to retrieve AG Supported Feature information with AT+BRSF command if both AG and HF support HF v1.0. See the sequence of "Service level connection setup".
service level connection established
service level connection established
service level connection release (HFP4.3)
service level connection released
service level connection released
LMP_detach
registration completed
registration completed

6.2.2. Connection set up

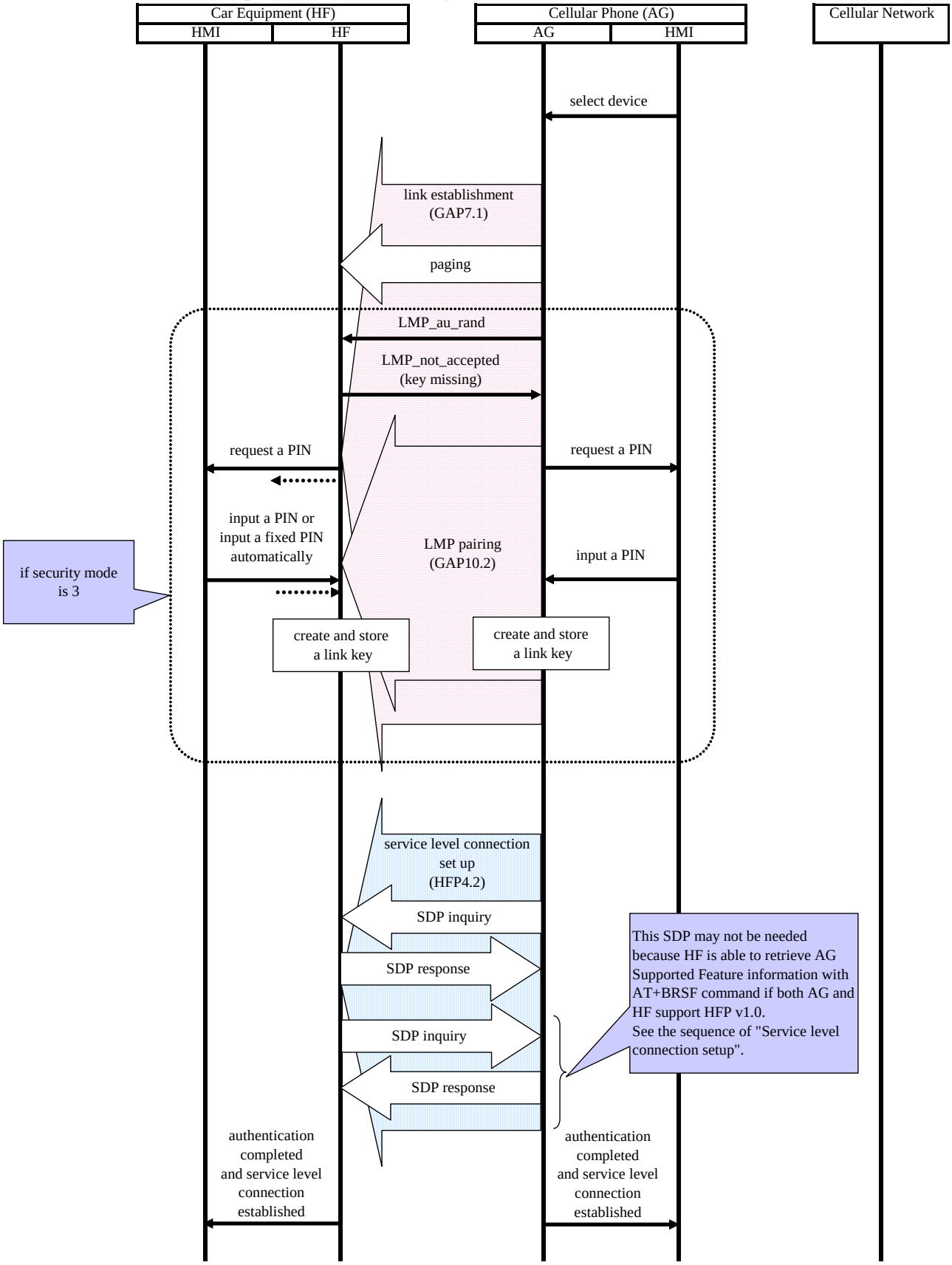
6.2.2.1. Connection set up from the HF



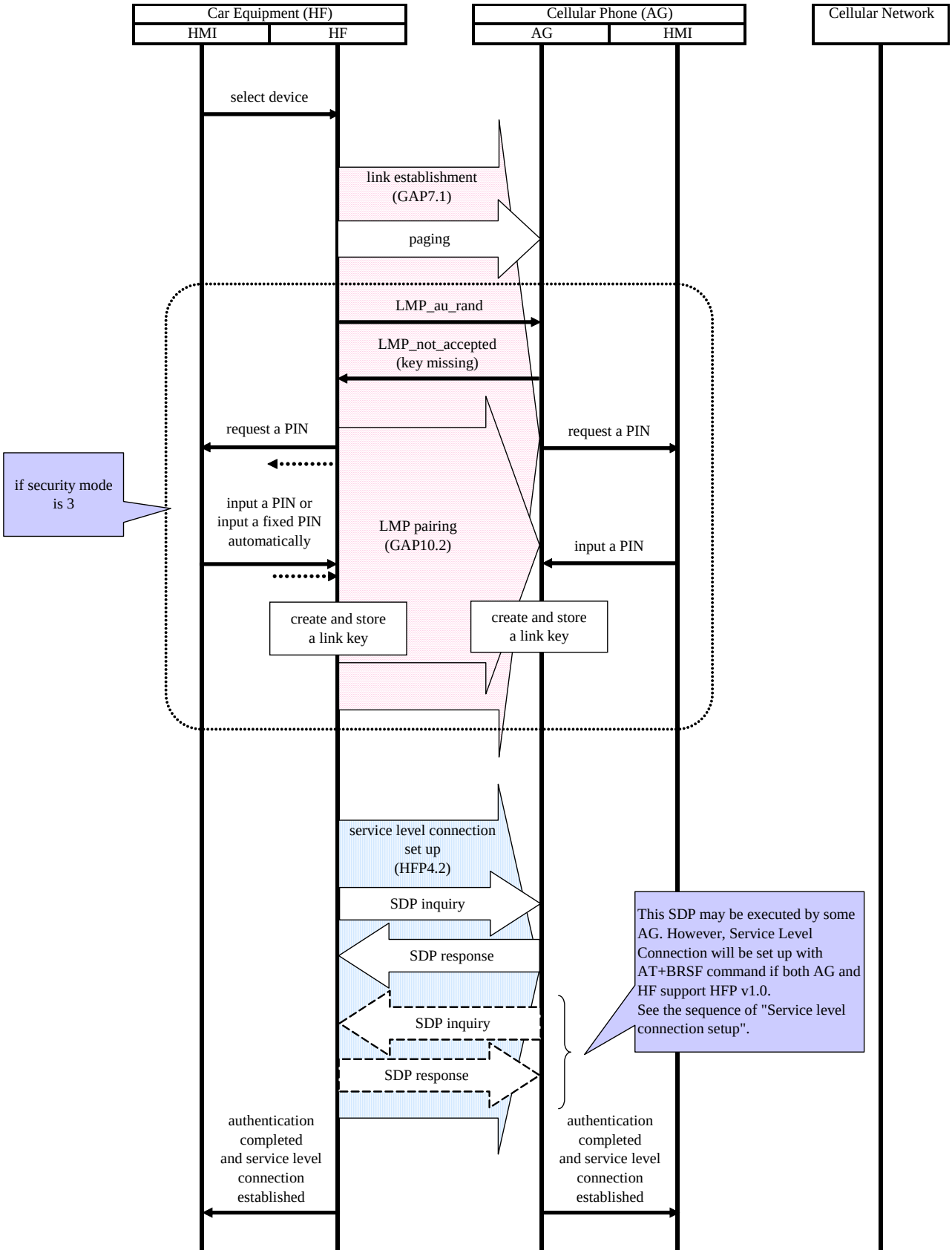
6.2.2.2. Connection set up from the AG



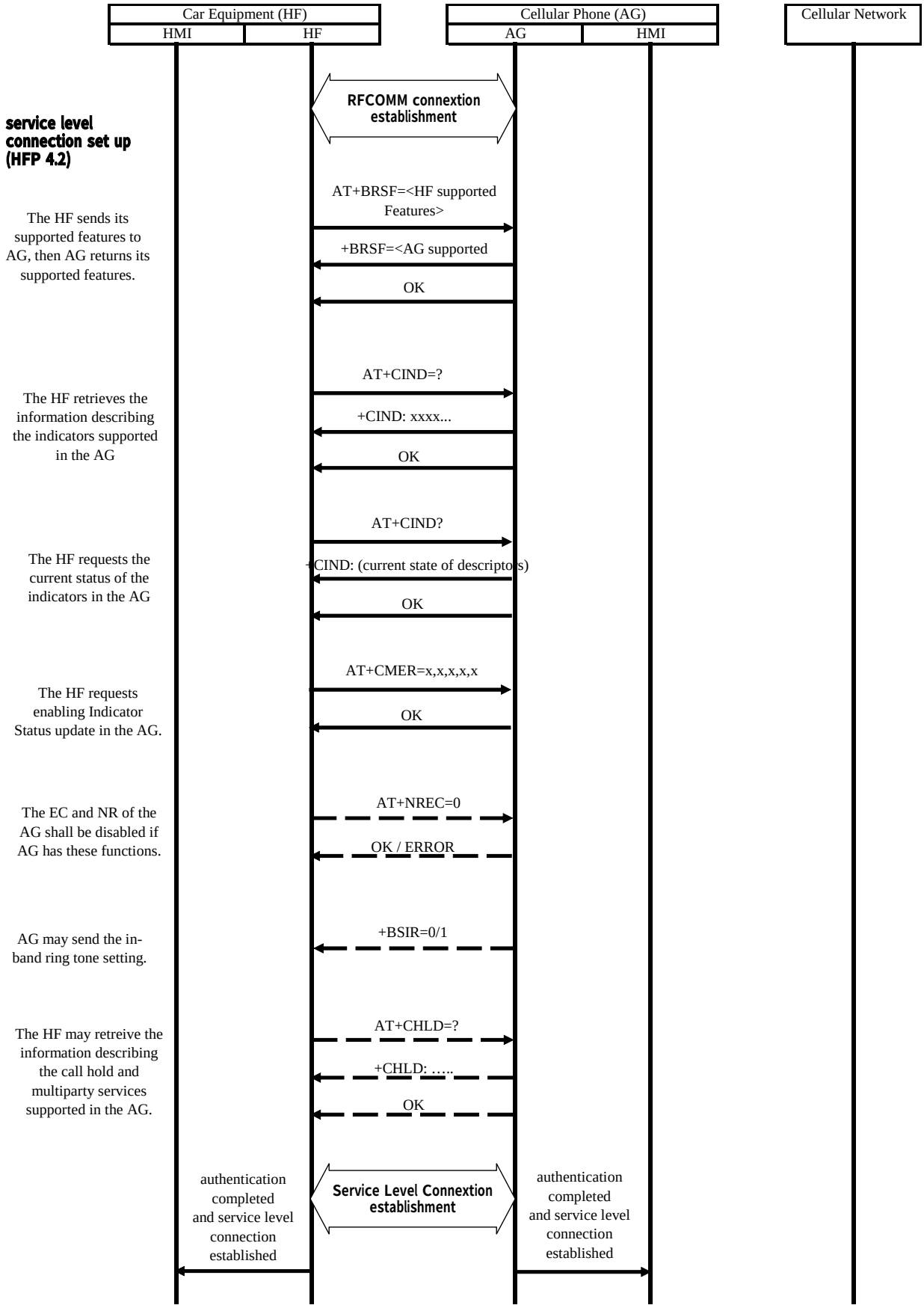
6.2.2.3. Connection set up from the AG (Unregistered)



6.2.2.4. Connection set up from the HF (Unregistered)

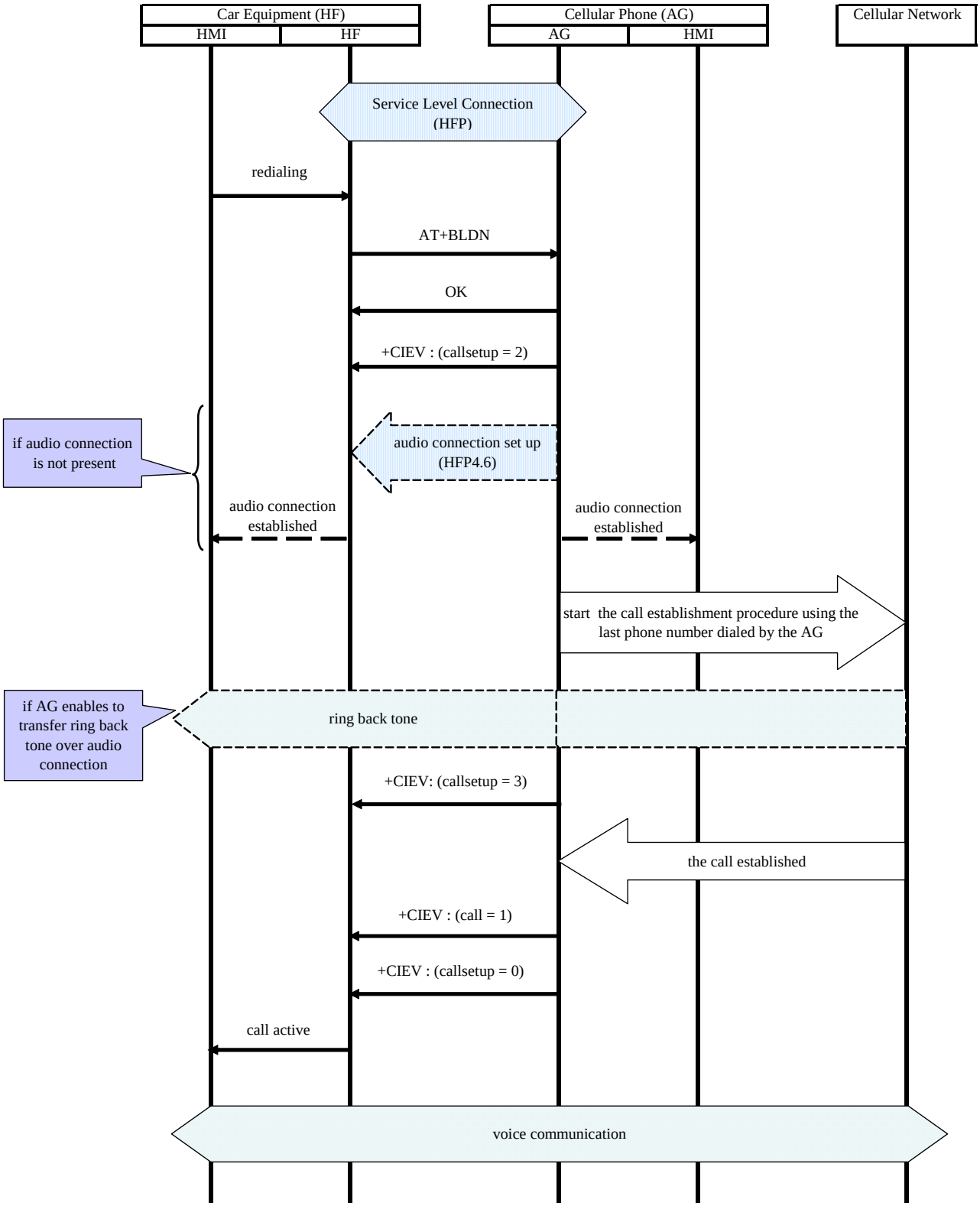


6.2.3. Service level connection setup

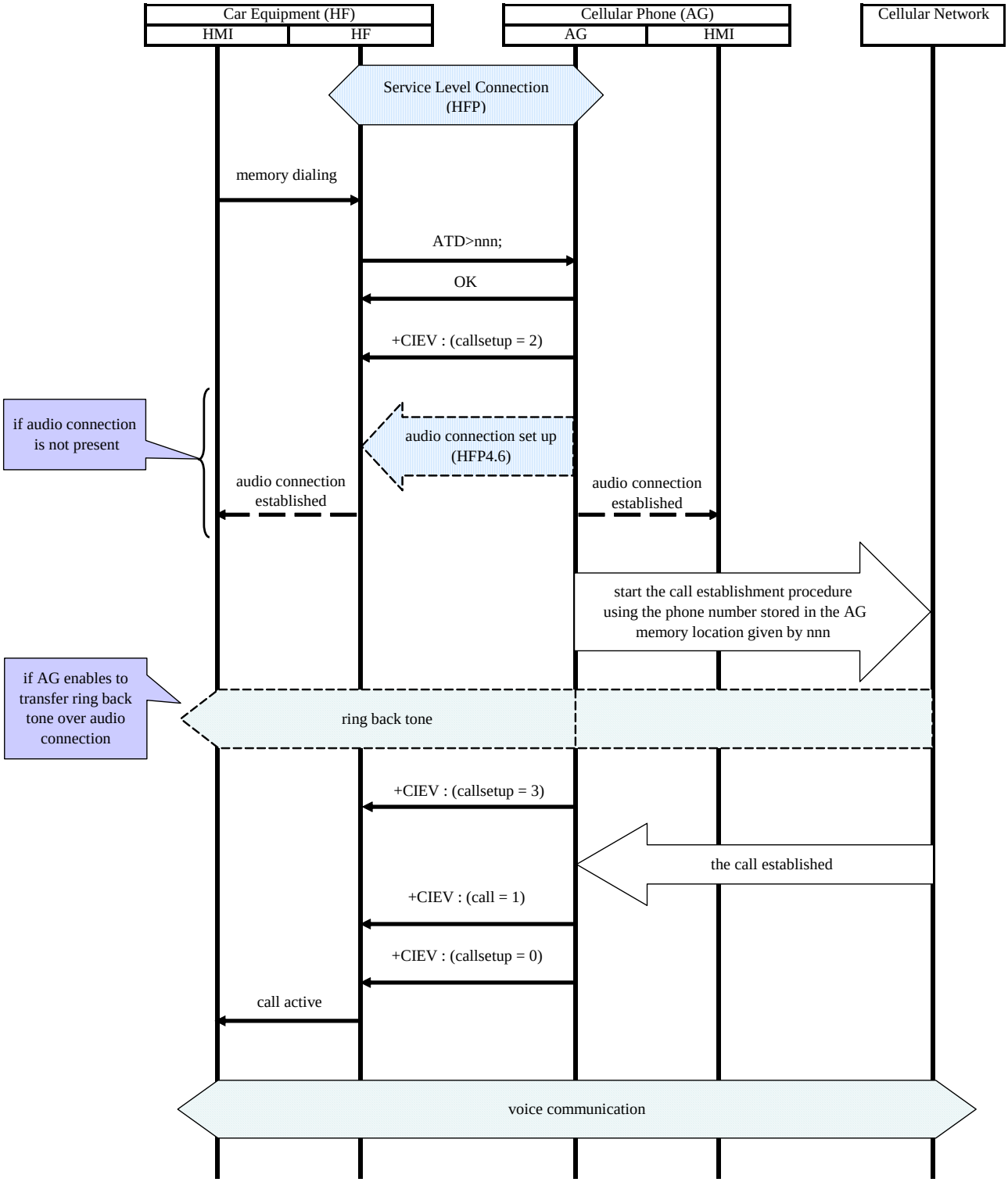


6.2.4. Outgoing call

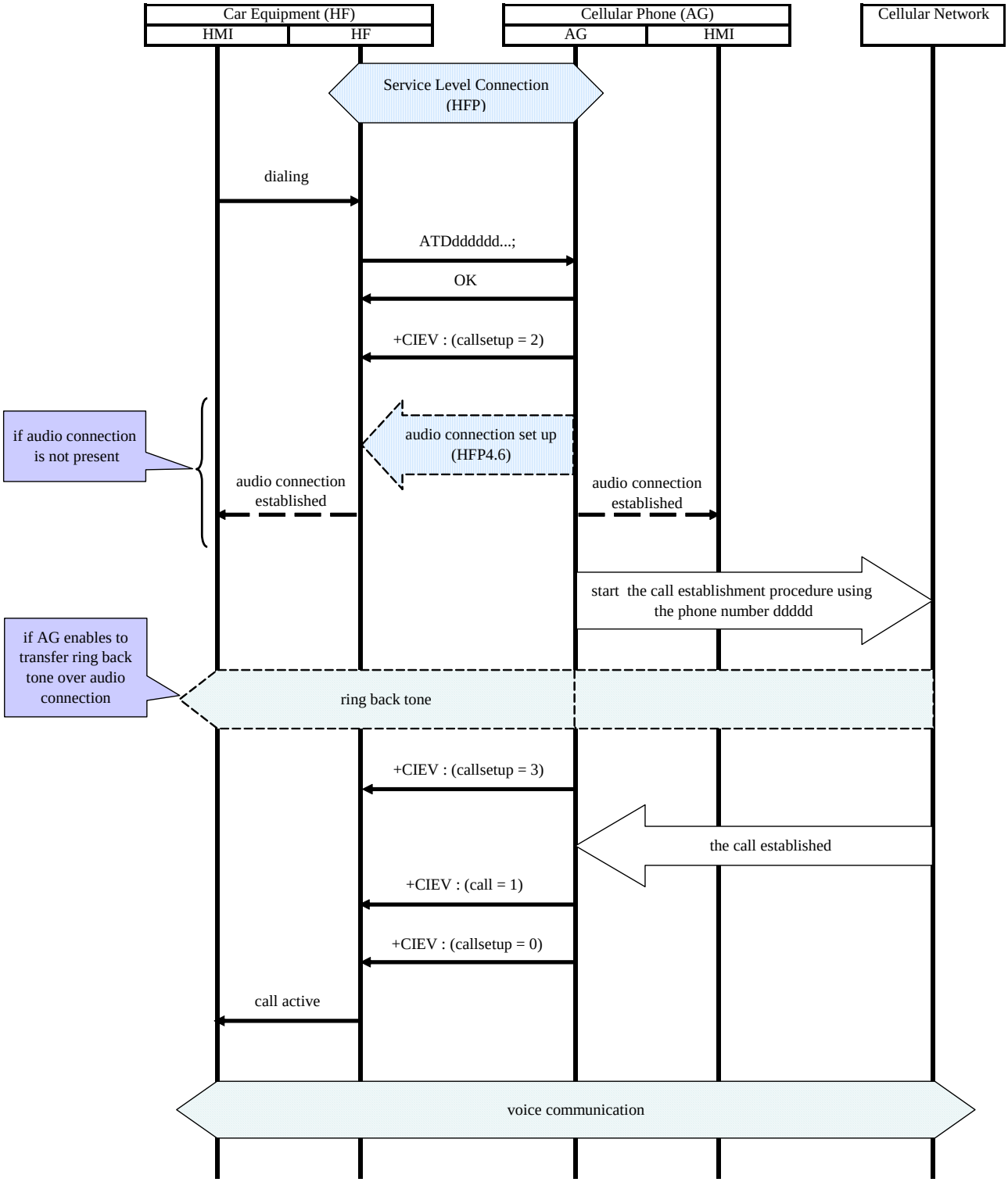
6.2.4.1. Last number re-dial from the HF



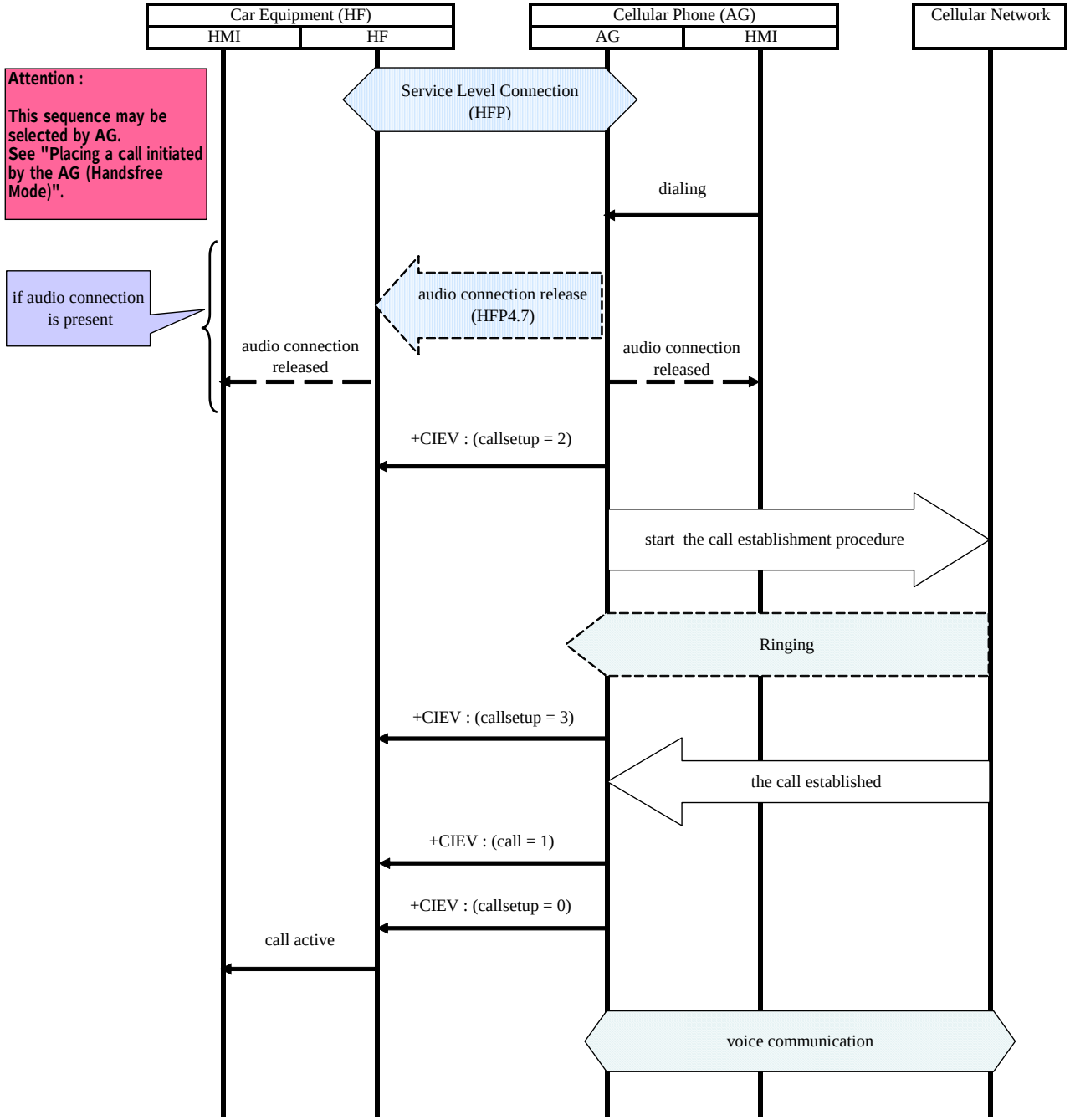
6.2.4.2. Memory dialing from the HF



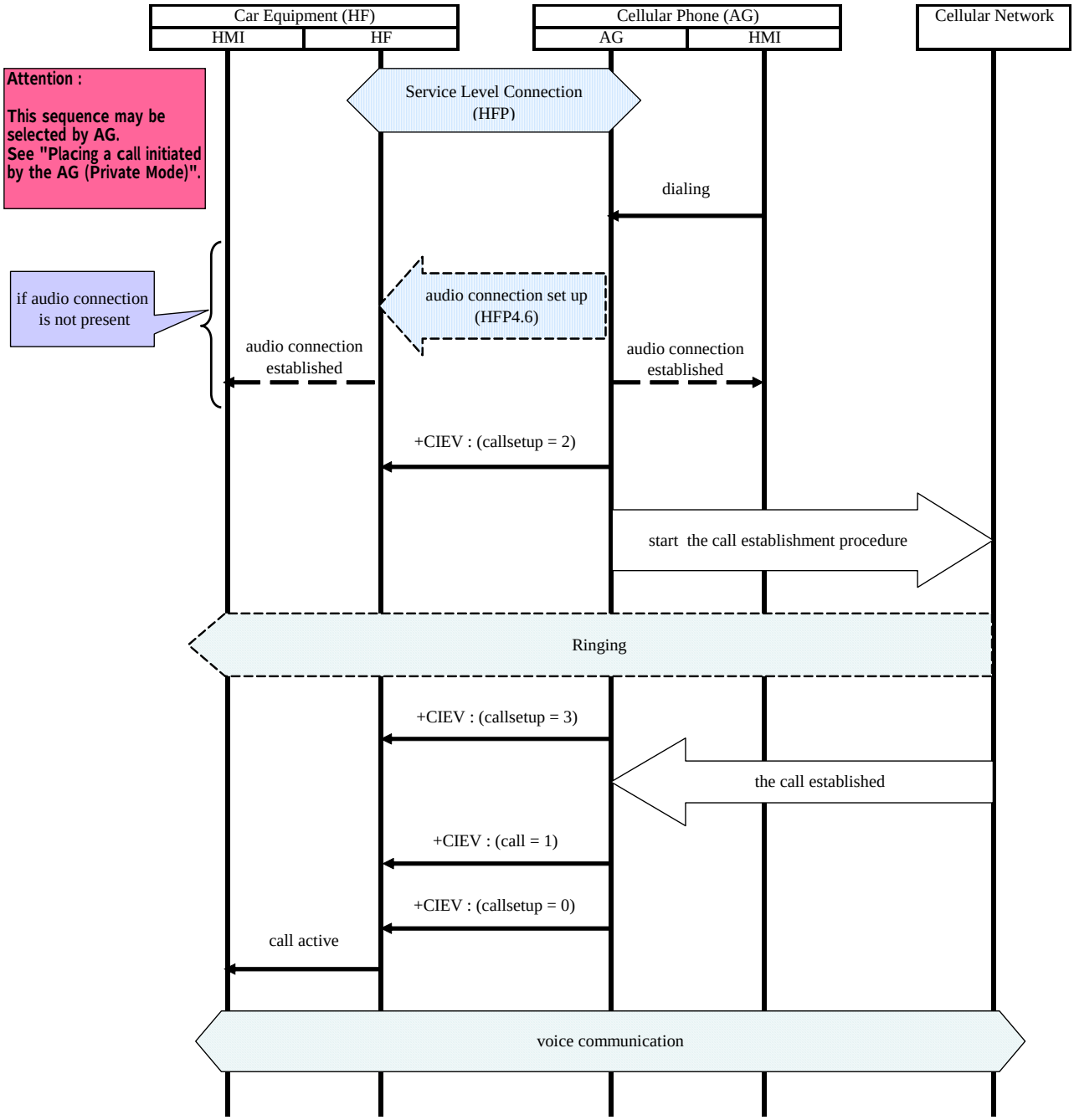
6.2.4.3. Placing a call with the phone number supplied by the HF



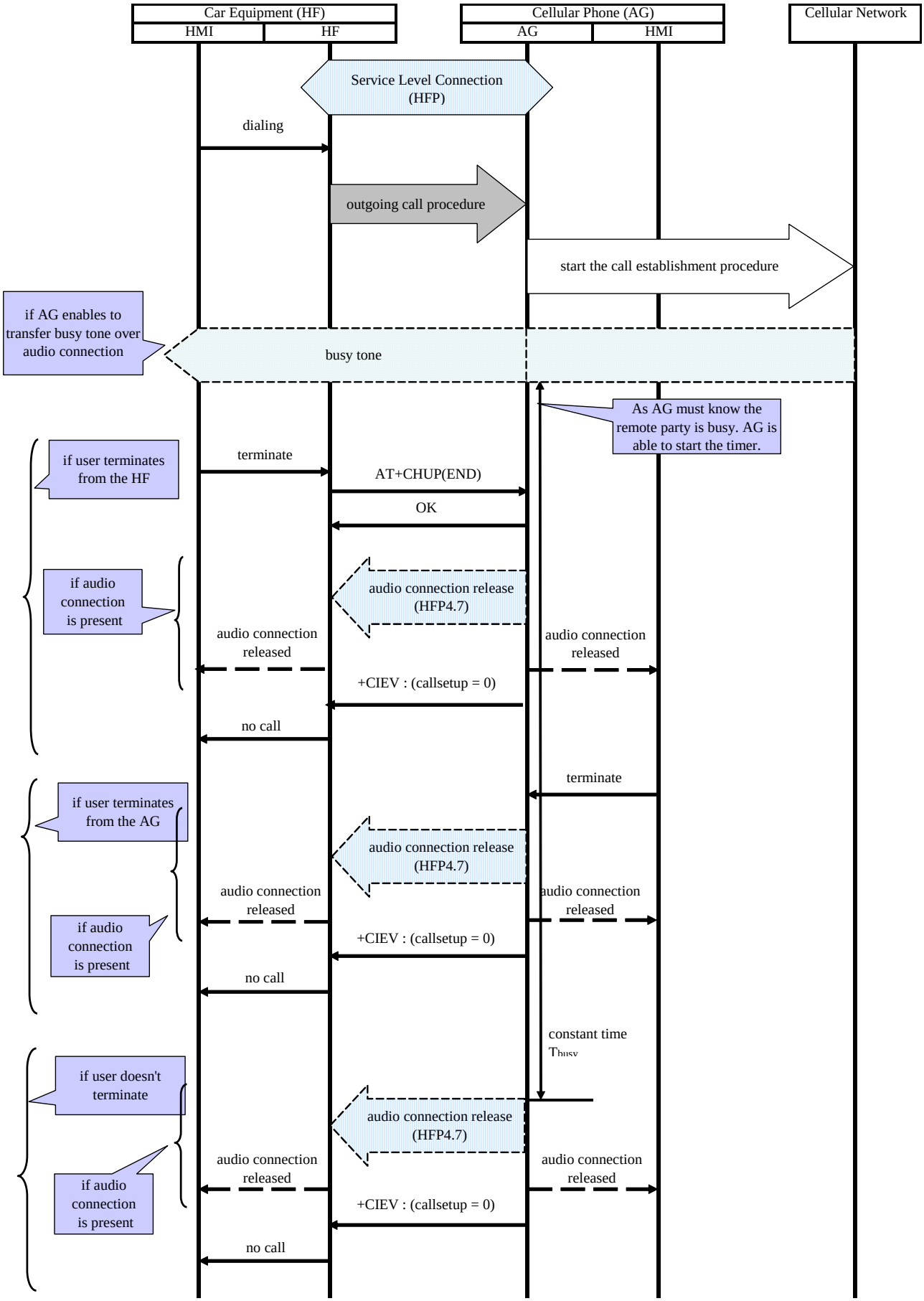
6.2.4.4. Placing a call initiated by the AG (Private Mode)



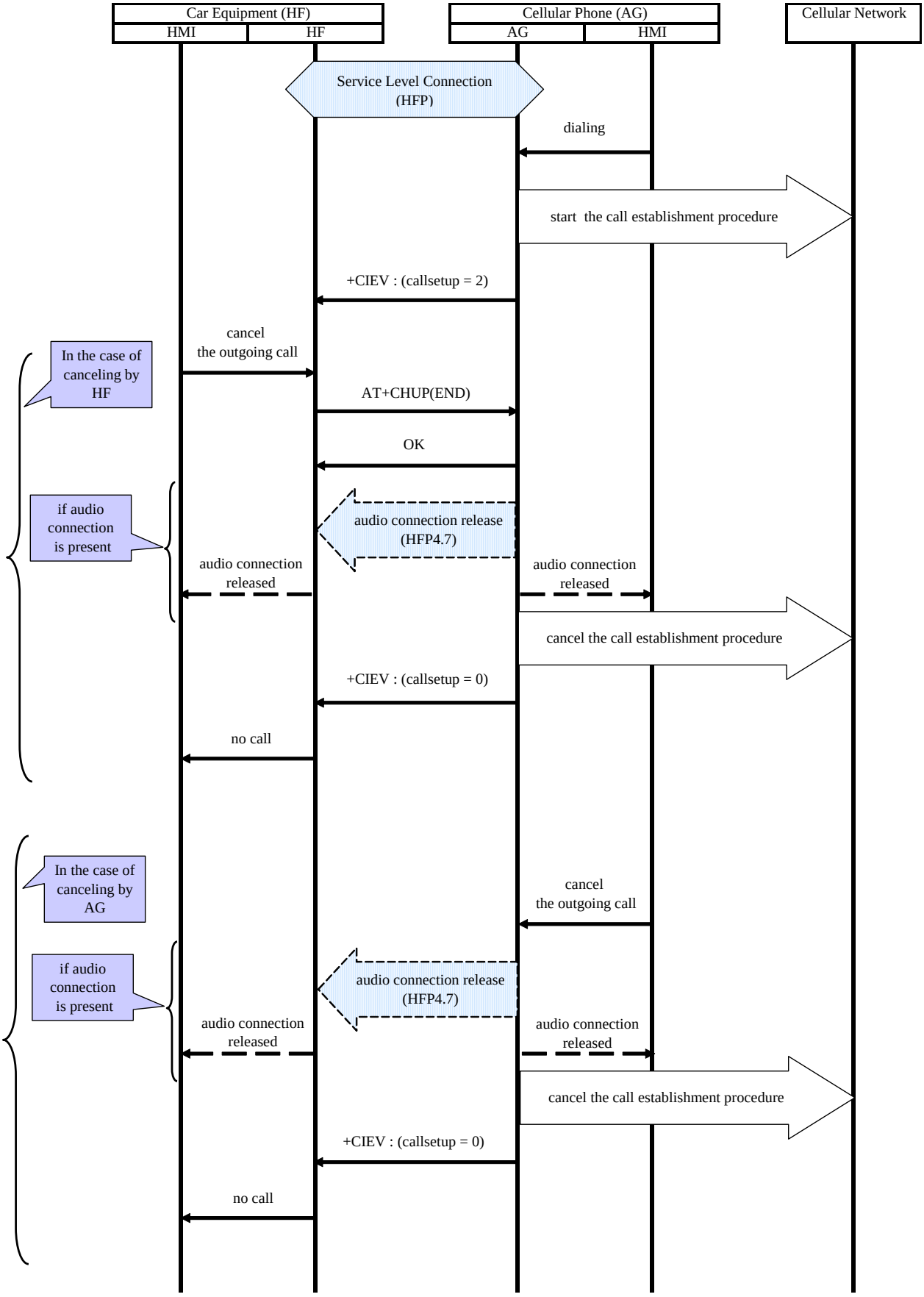
6.2.4.5. Placing a call initiated by the AG (Handsfree Mode)



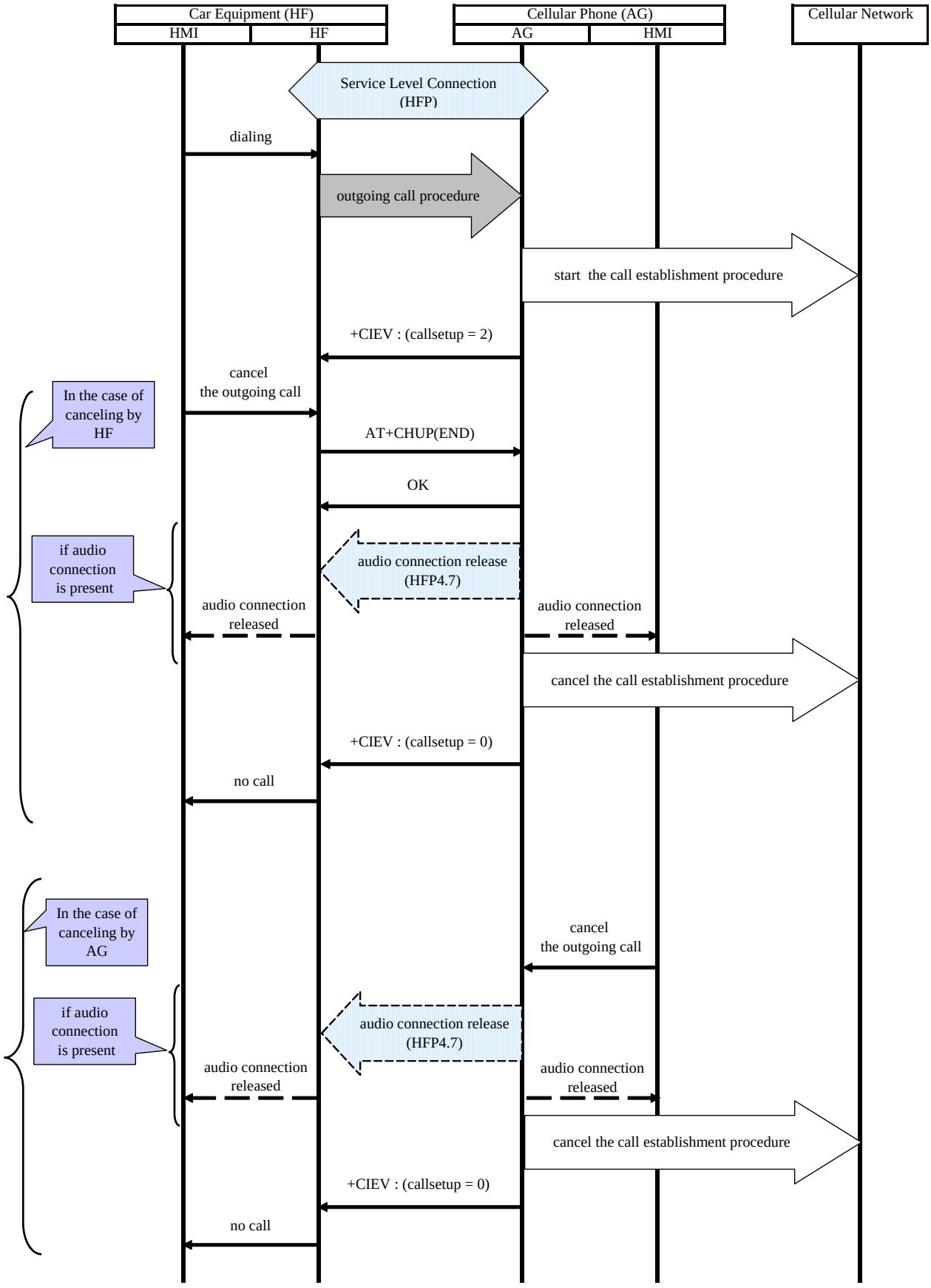
6.2.4.6. Outgoing call (Busy)



6.2.4.7. Outgoing call from the AG (Canceling the call)

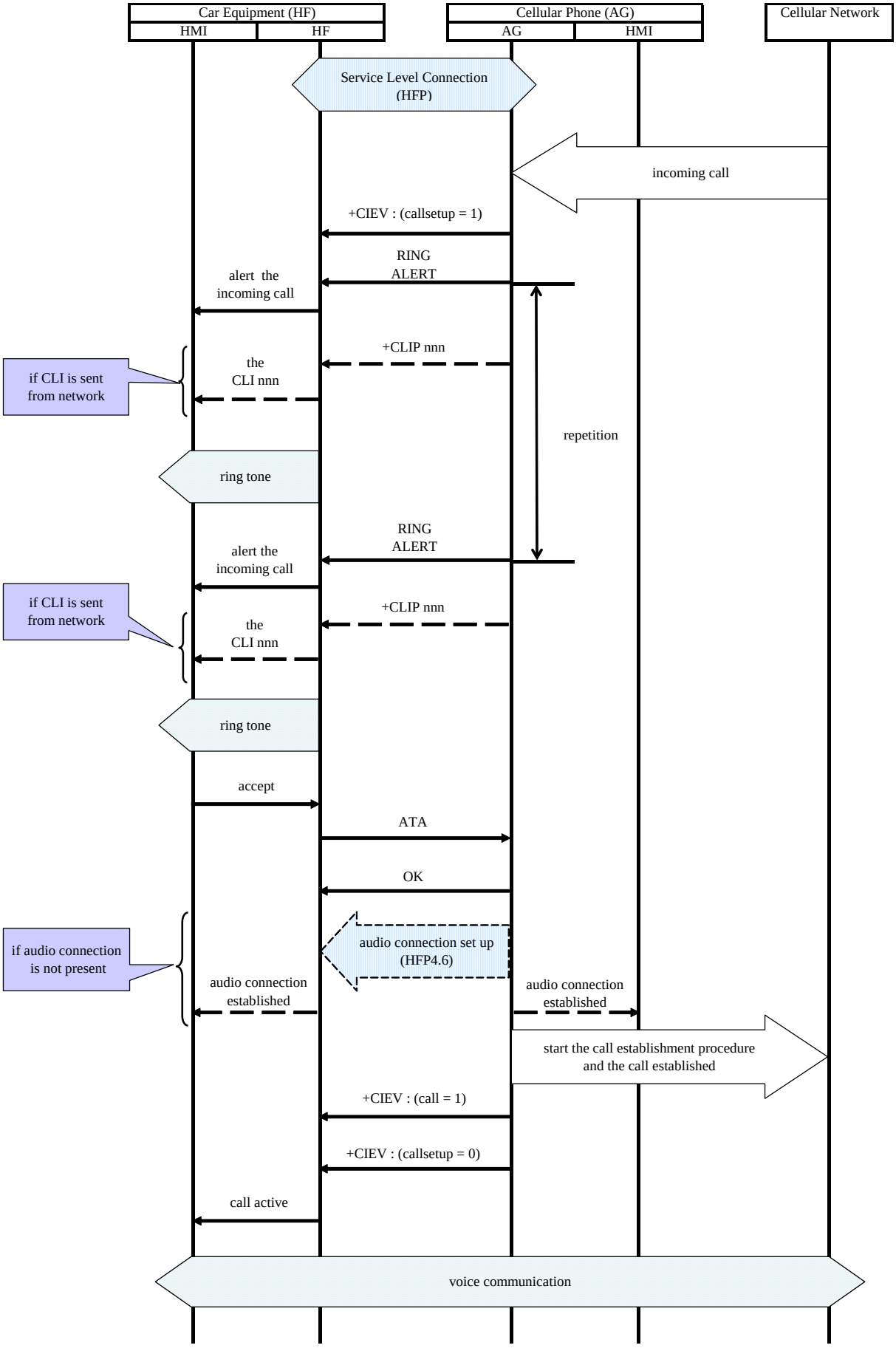


6.2.4.8. Outgoing call from the HF (Canceling the call)

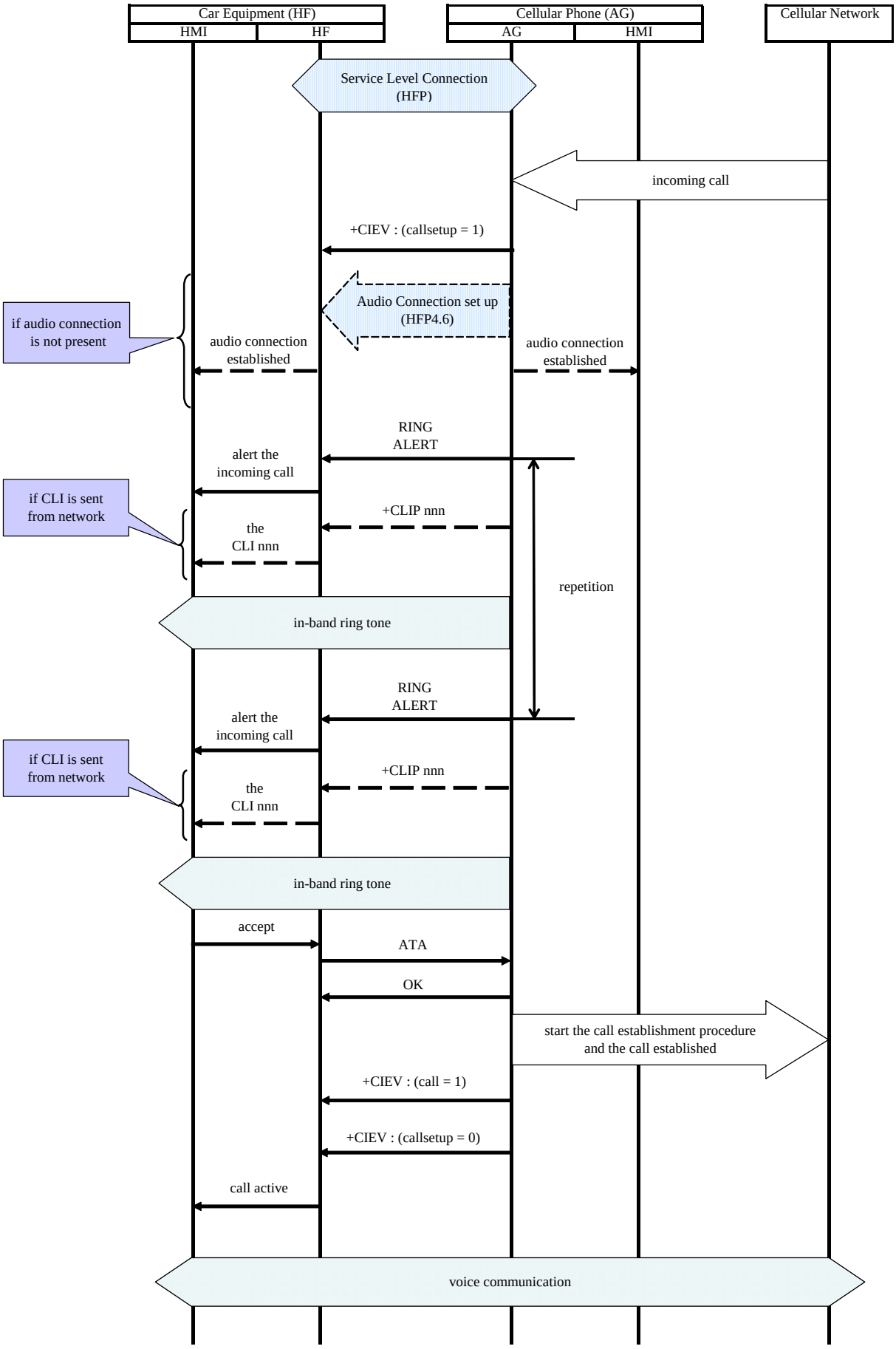


6.2.5. Incoming call

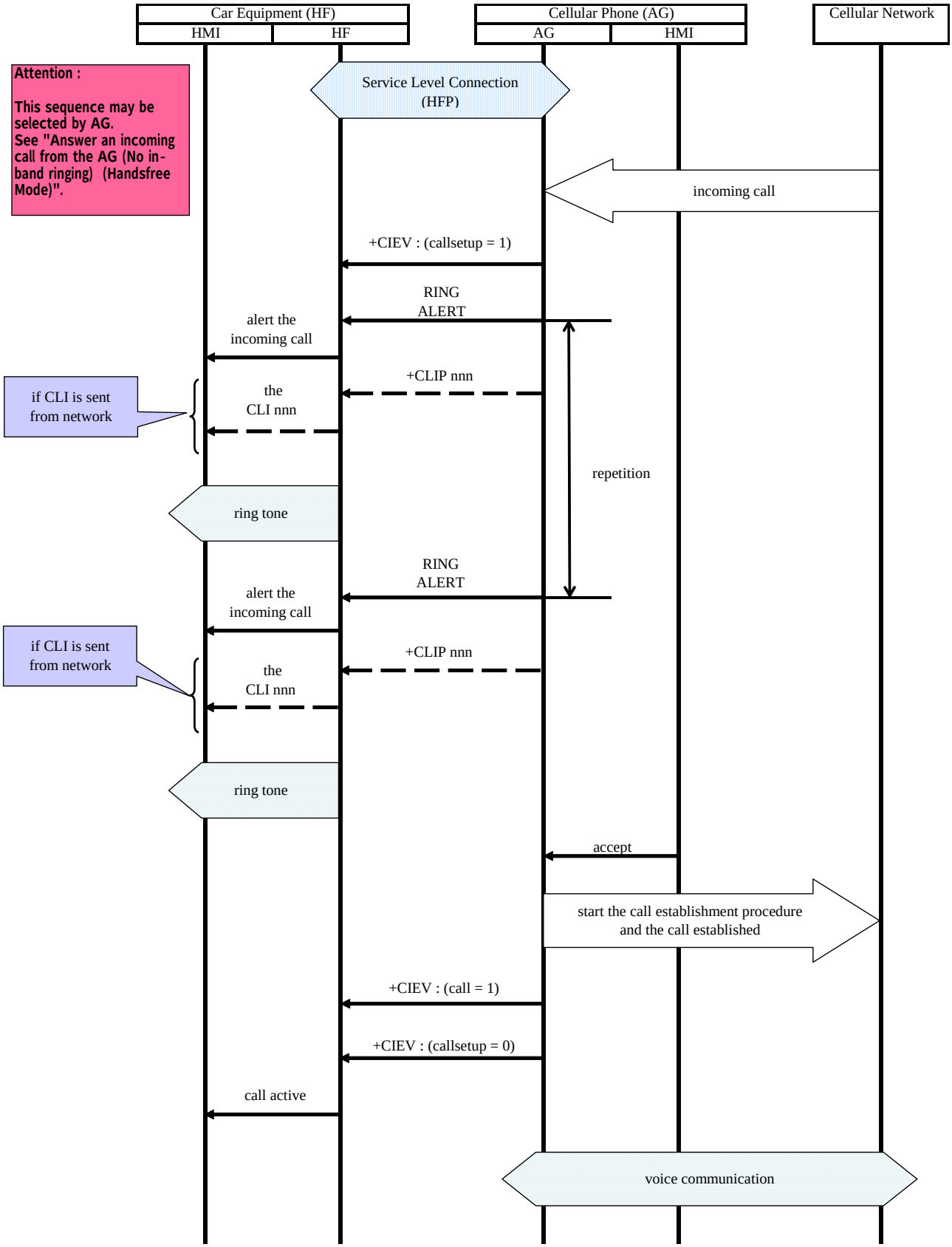
6.2.5.1. Answer an incoming call from the HF (No in-band ringing)



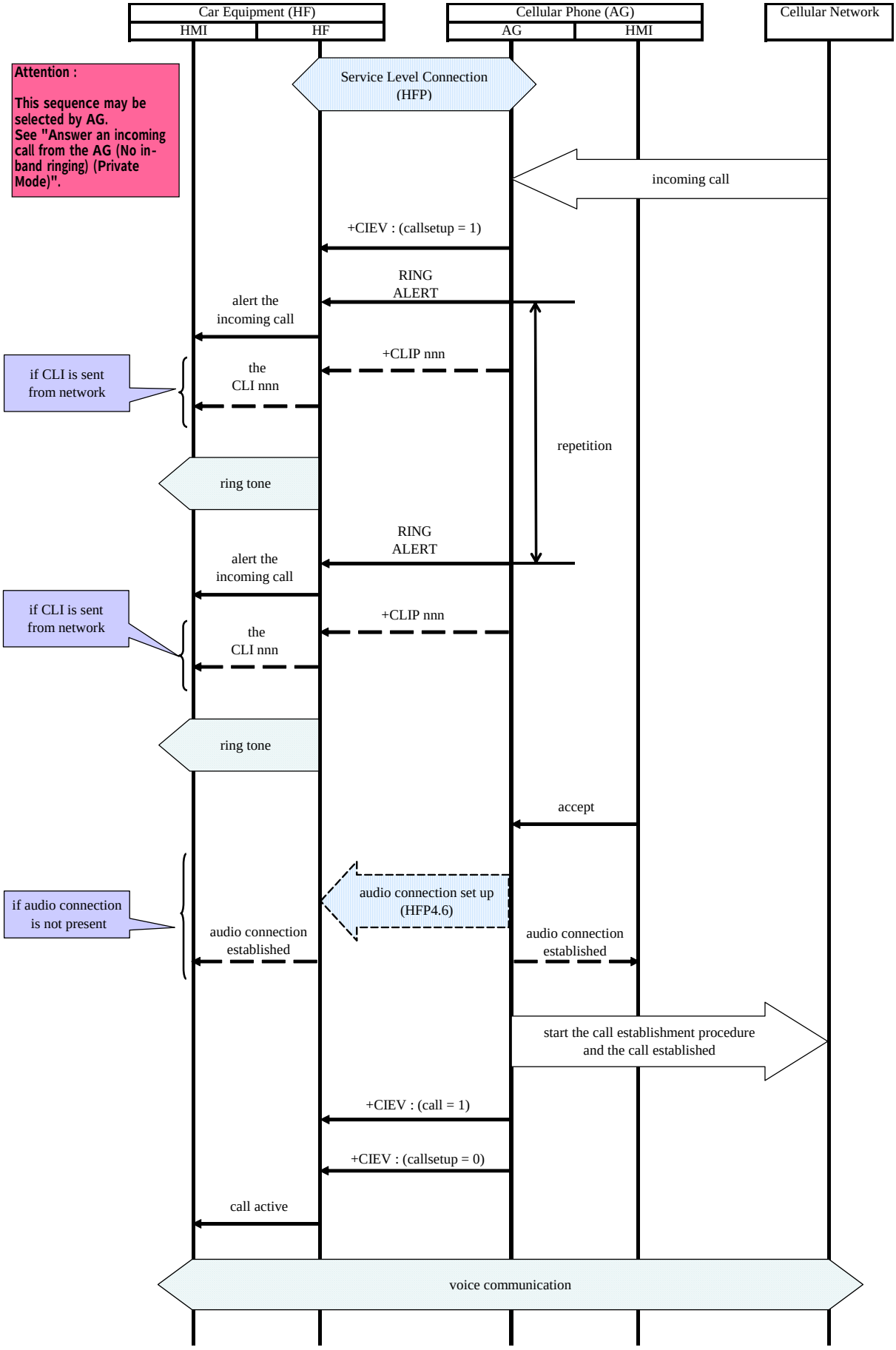
6.2.5.2. Answer an incoming call from the HF (In-band ringing)



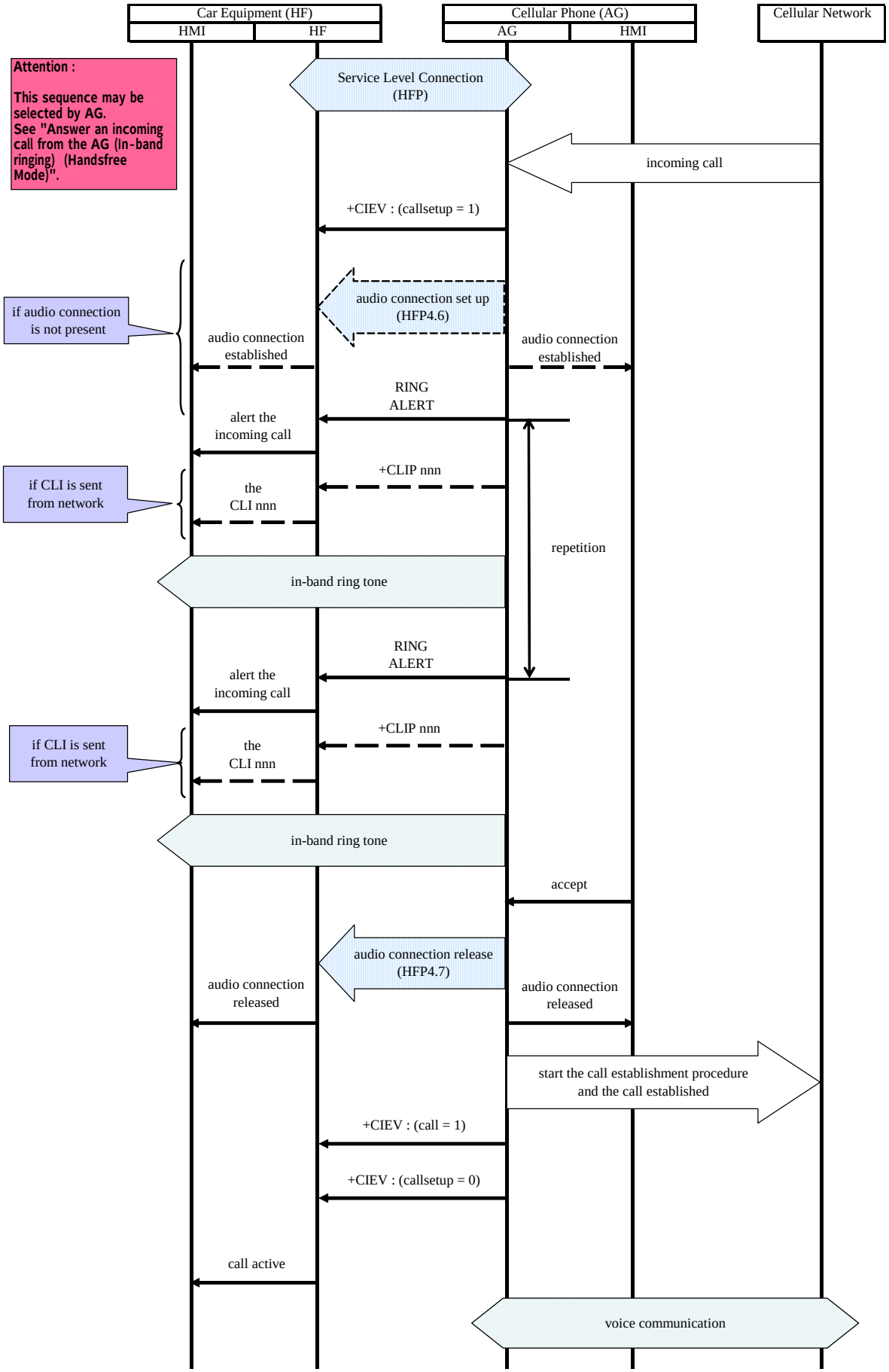
6.2.5.3. Answer an incoming call from the AG (No in-band ringing) (Private Mode)



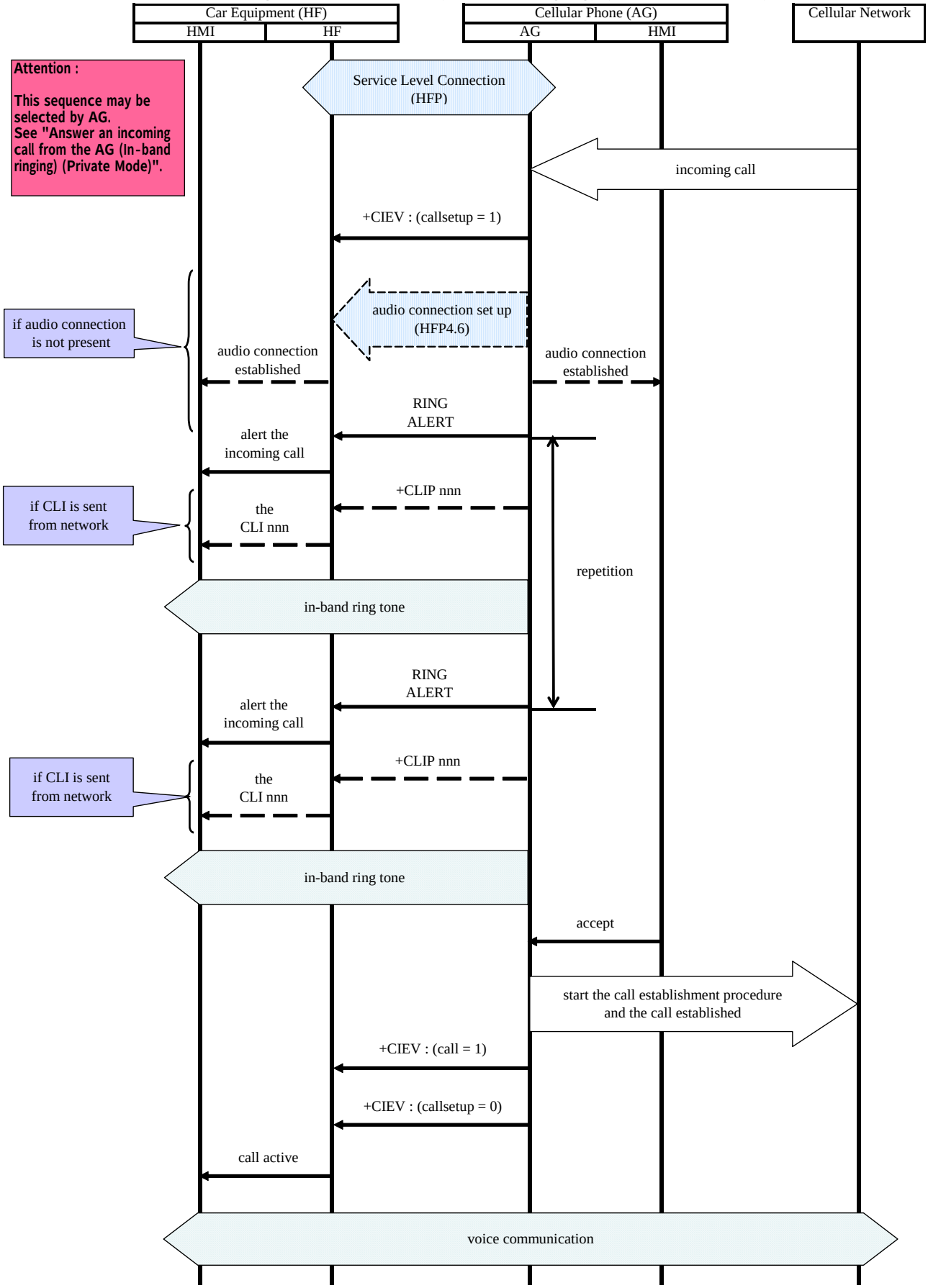
6.2.5.4. Answer an incoming call from the AG (No in-band ringing) (Handsfree Mode)



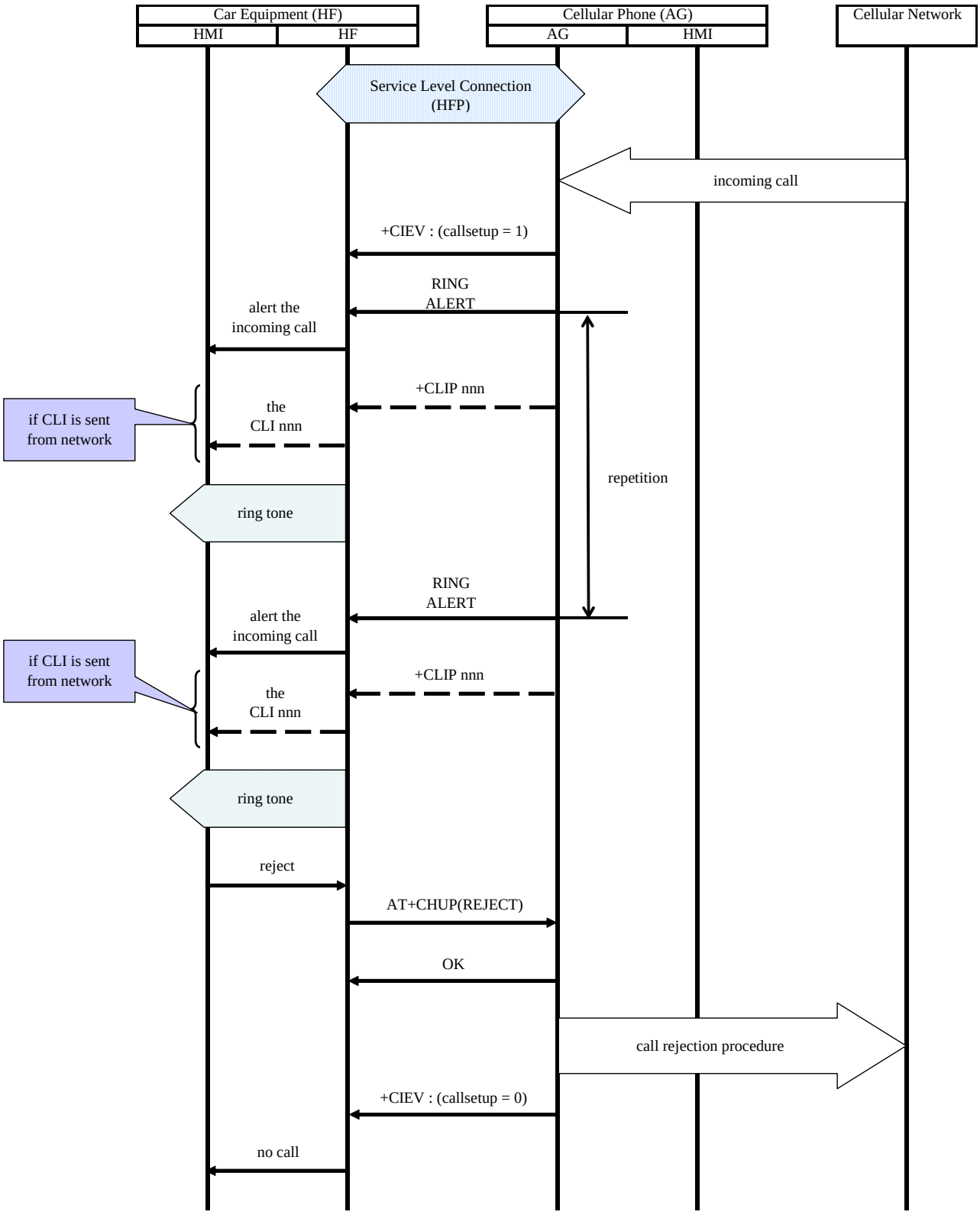
6.2.5.5. Answer an incoming call from the AG (In-band ringing) (Private Mode)



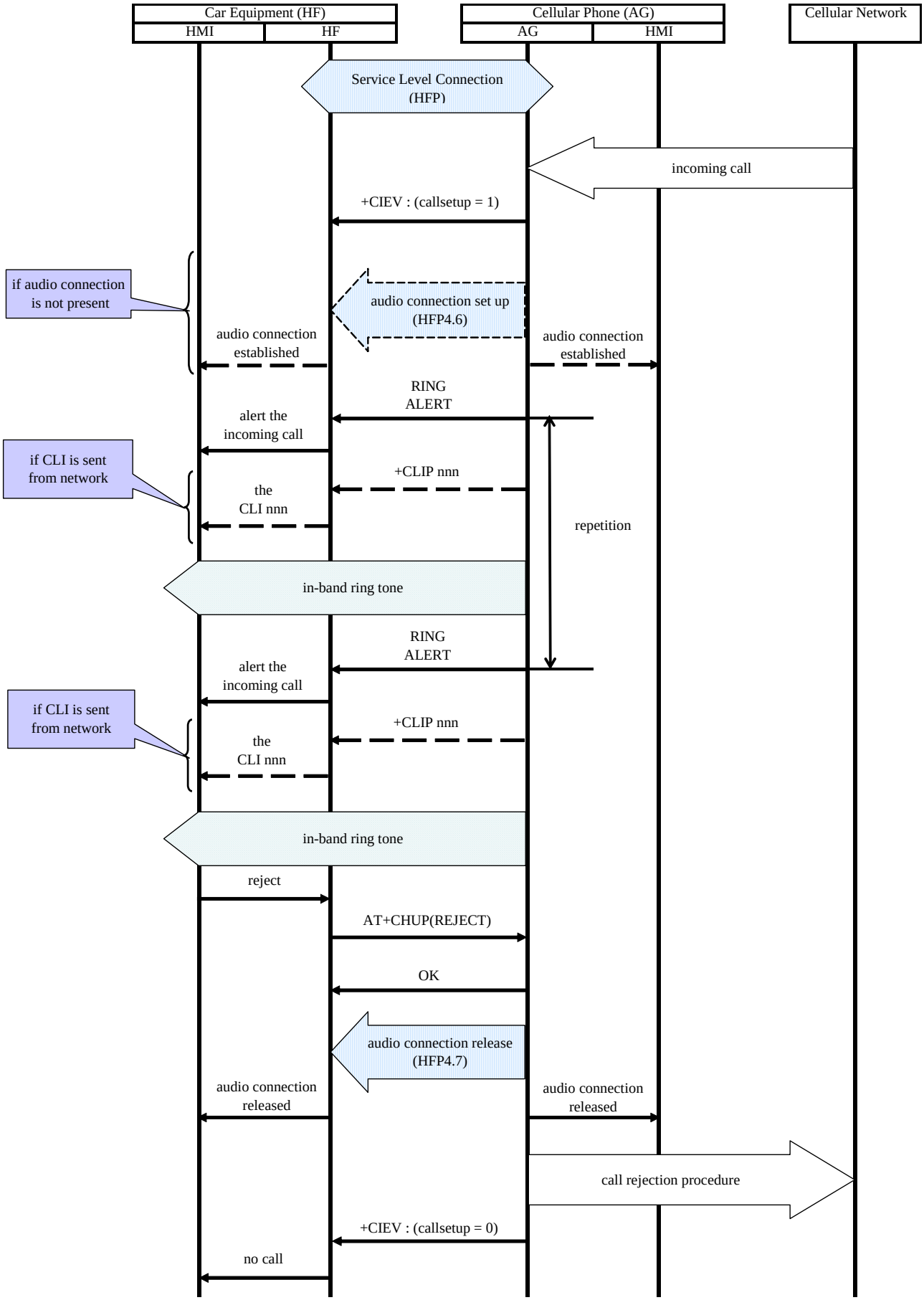
6.2.5.6. Answer an incoming call from the AG (In-band ringing) (Handsfree Mode)



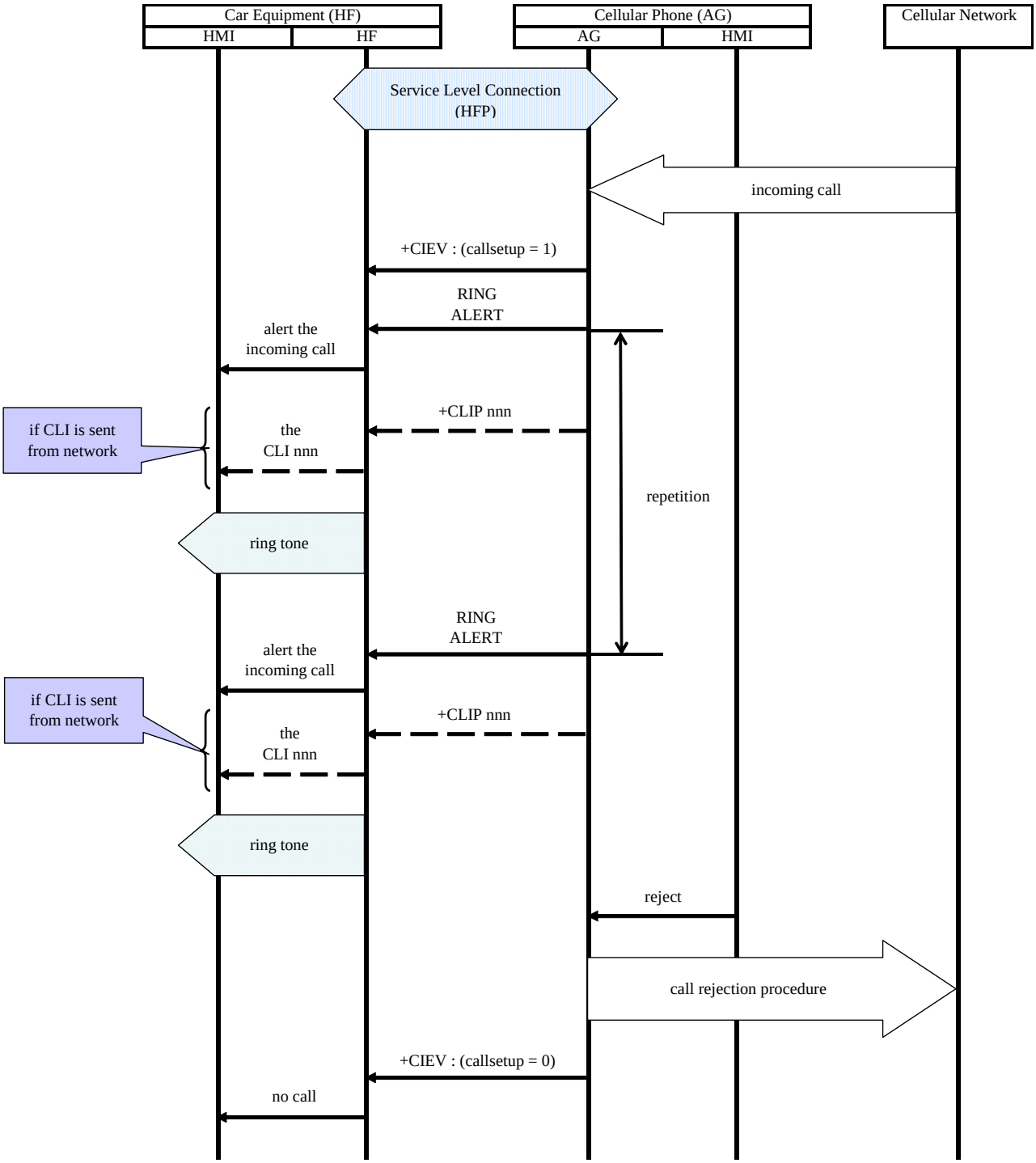
6.2.5.7. Reject an incoming call from the HF (No in-band ringing)



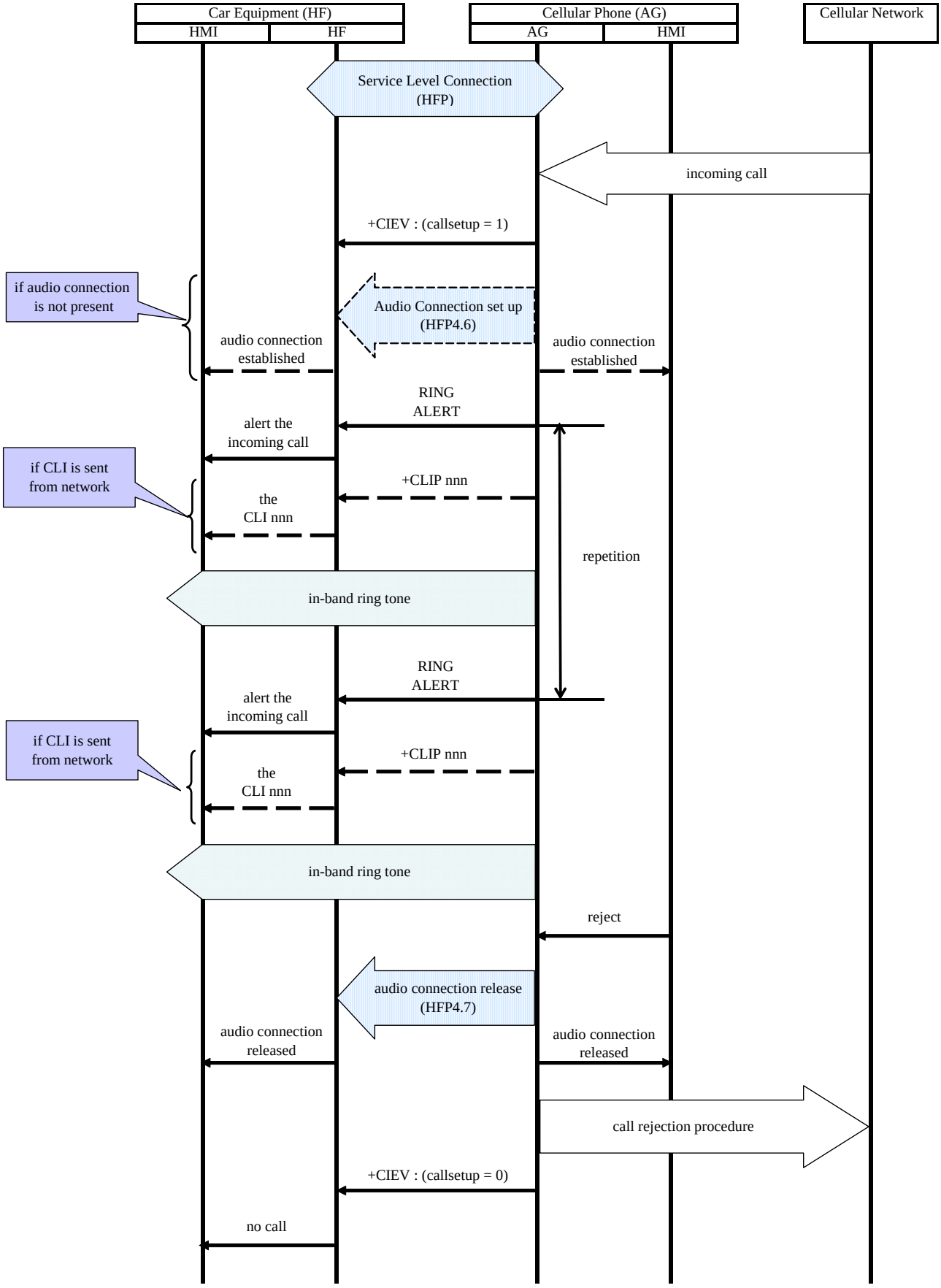
6.2.5.8. Reject an incoming call from the HF (In-band ringing)



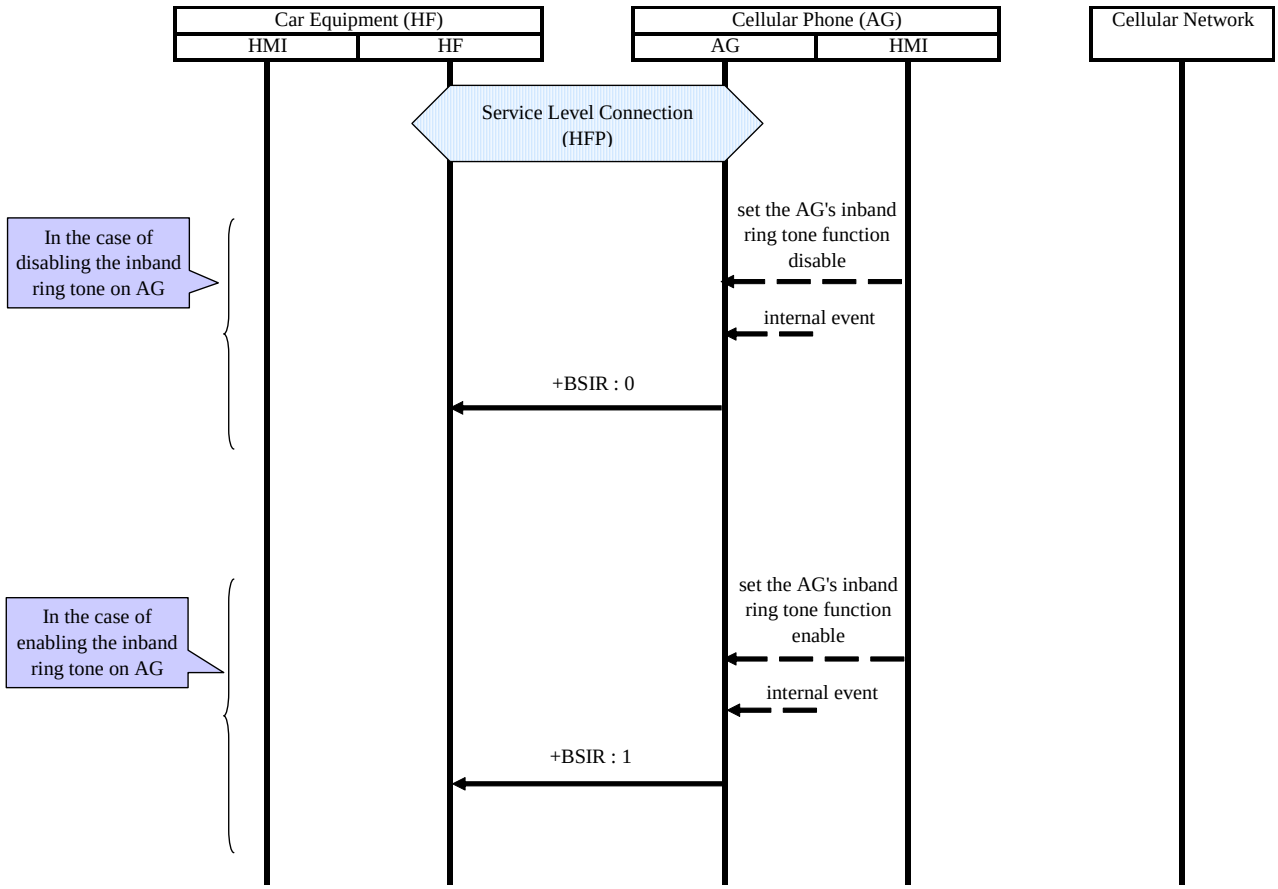
6.2.5.9. Reject an incoming call from the AG (No in-band ringing)



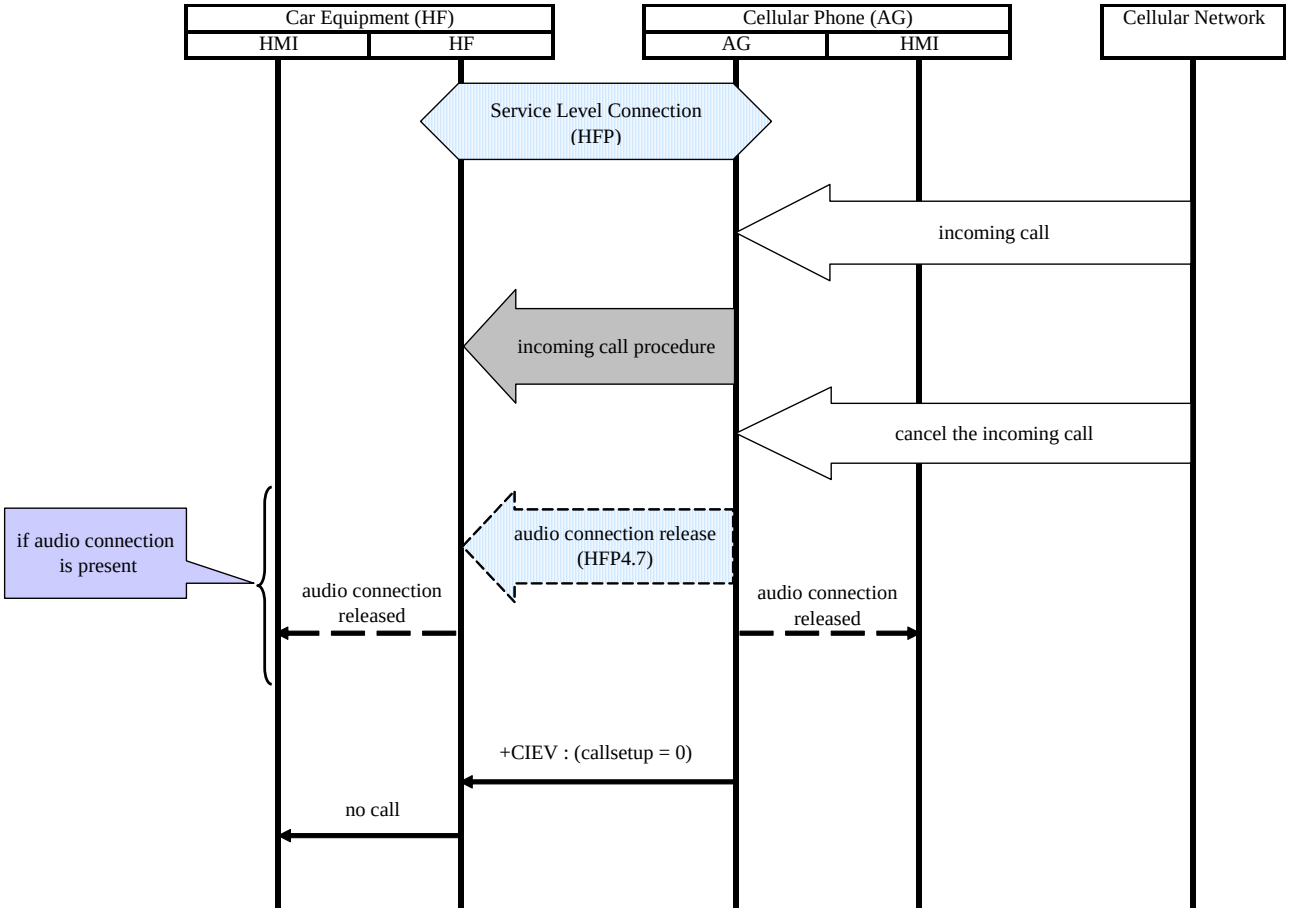
6.2.5.10. Reject an incoming call from the AG (In-band ringing)



6.2.5.11. Change the in-band ring tone setting

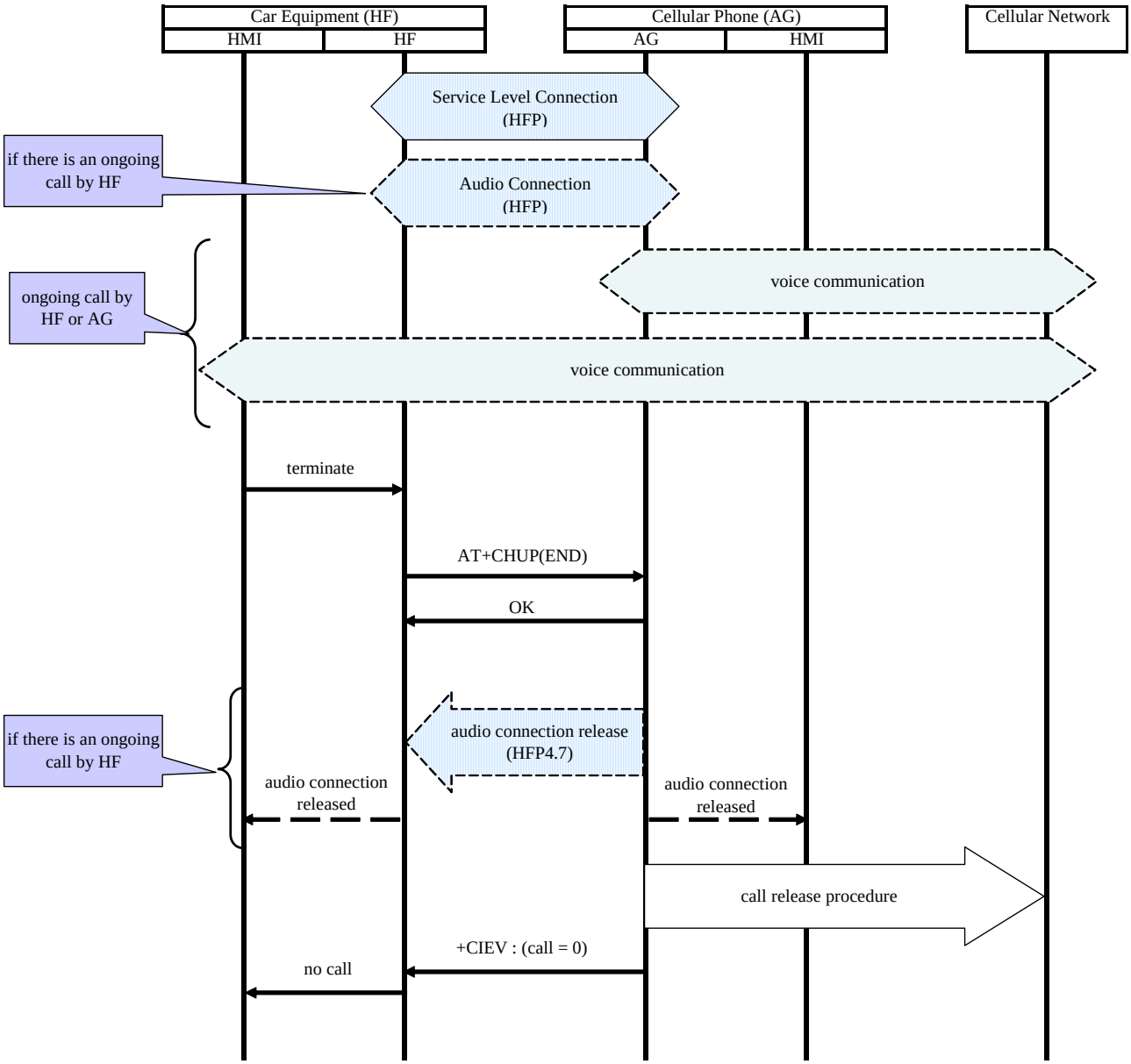


6.2.5.12. Incoming call (Canceling the call by the remote party)

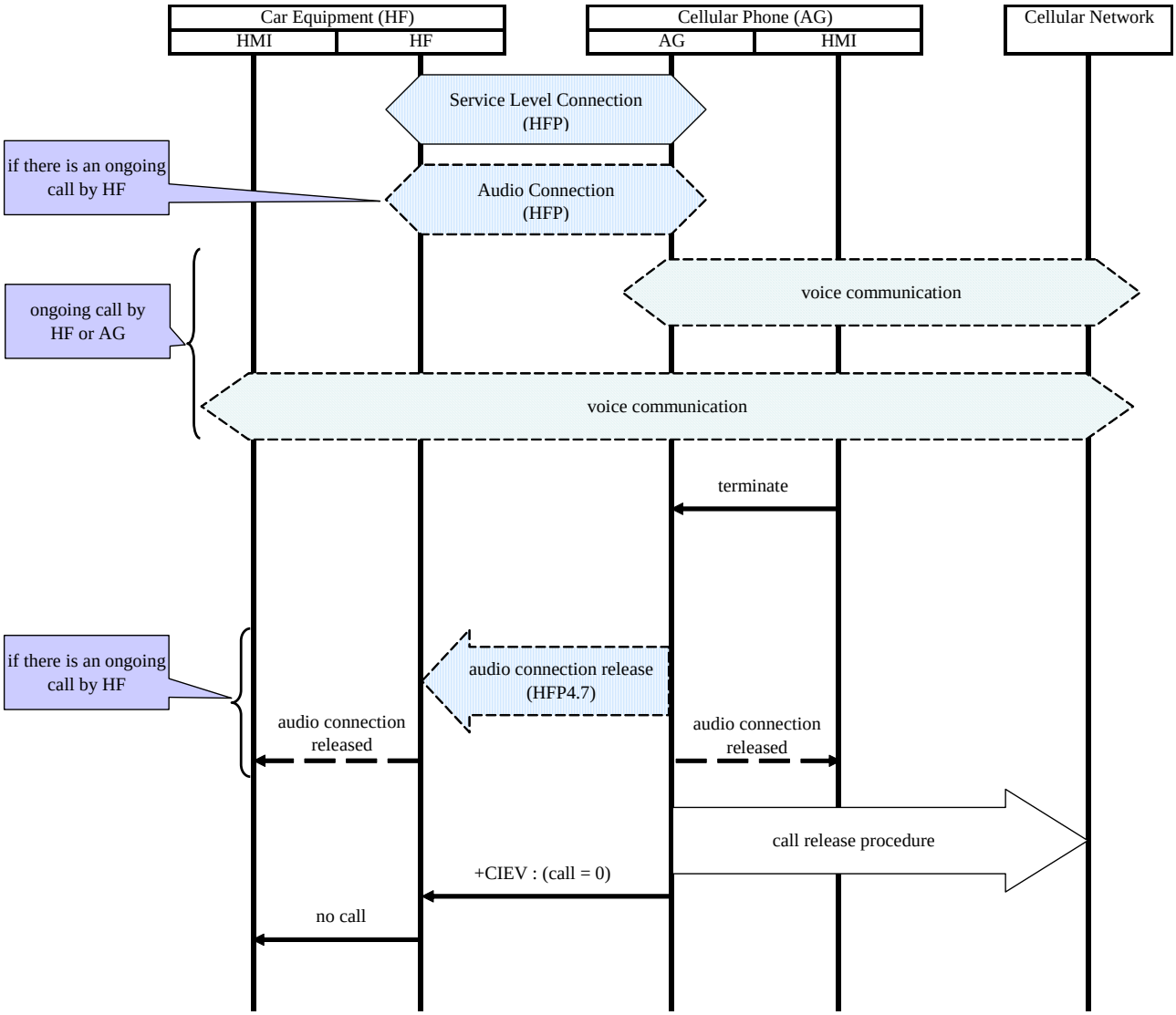


6.2.6. Terminate a call process

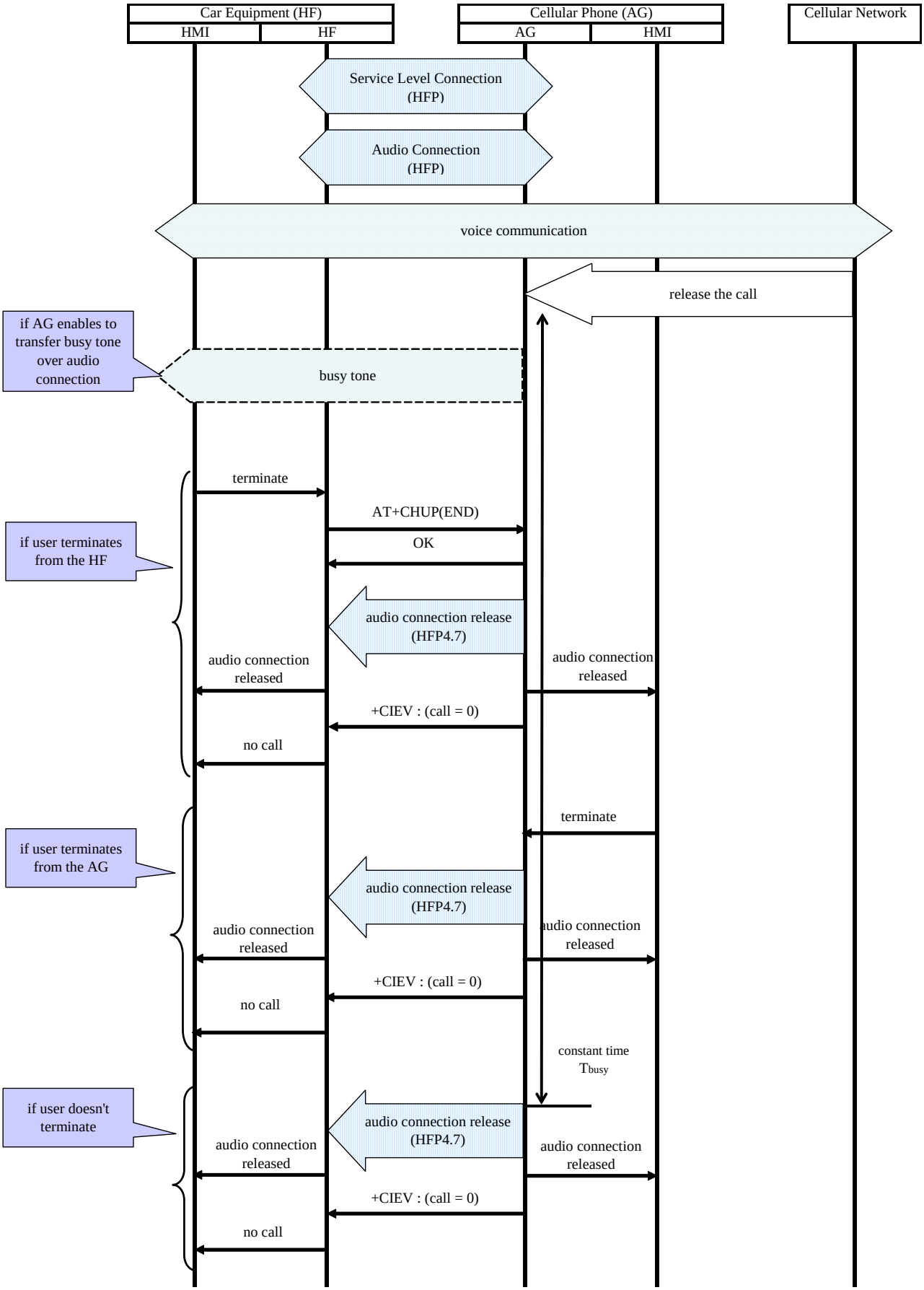
6.2.6.1. Terminate a call process from the HF



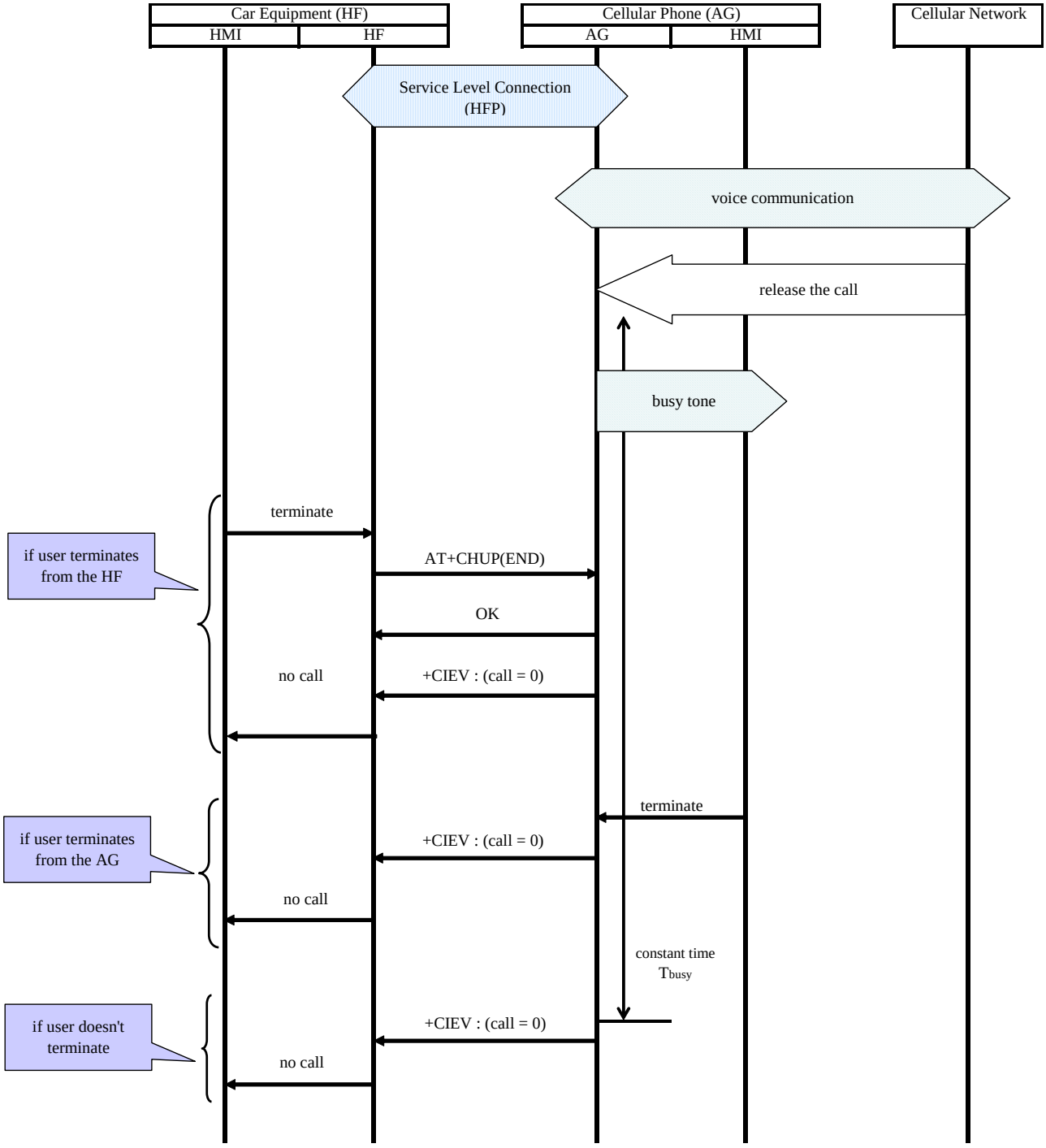
6.2.6.2. Terminate a call process from the AG



6.2.6.3. Terminate a call process from the cellular network

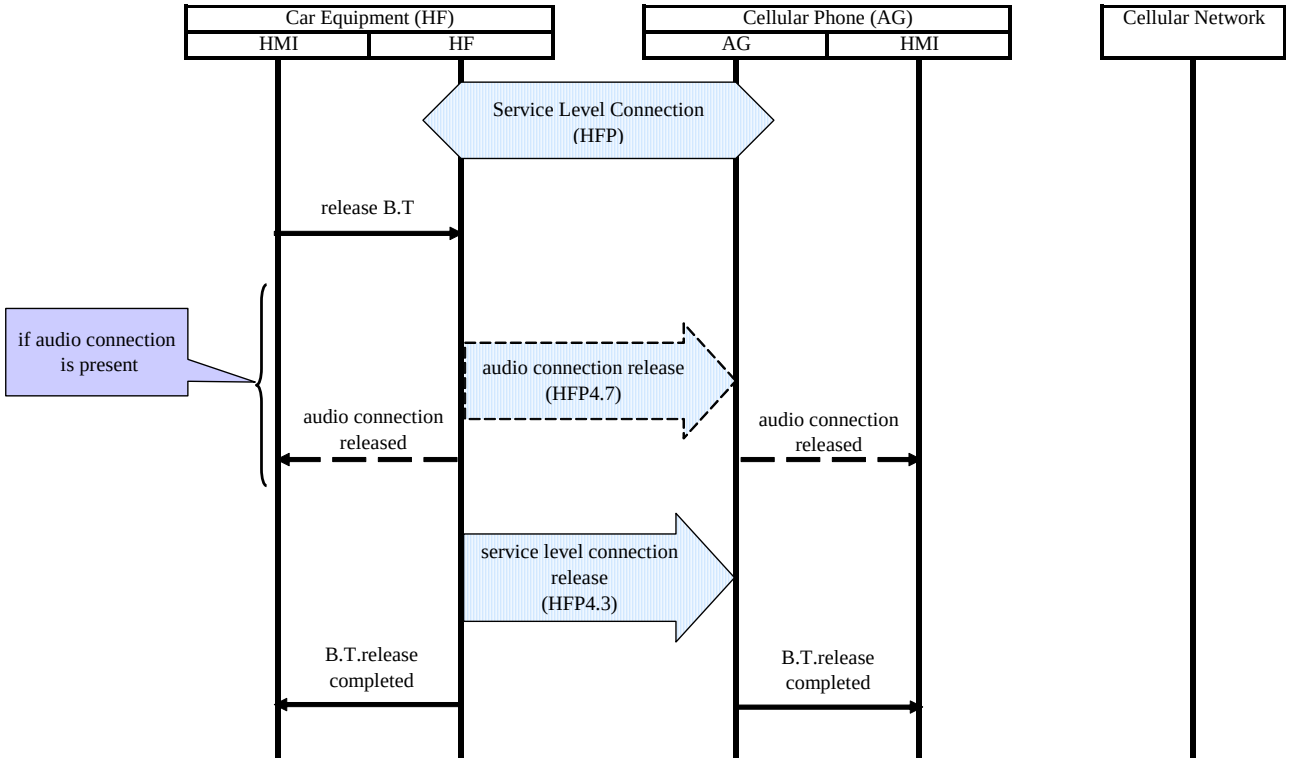


6.2.6.4. Terminate a call process from the cellular network(communication by Private Mode)

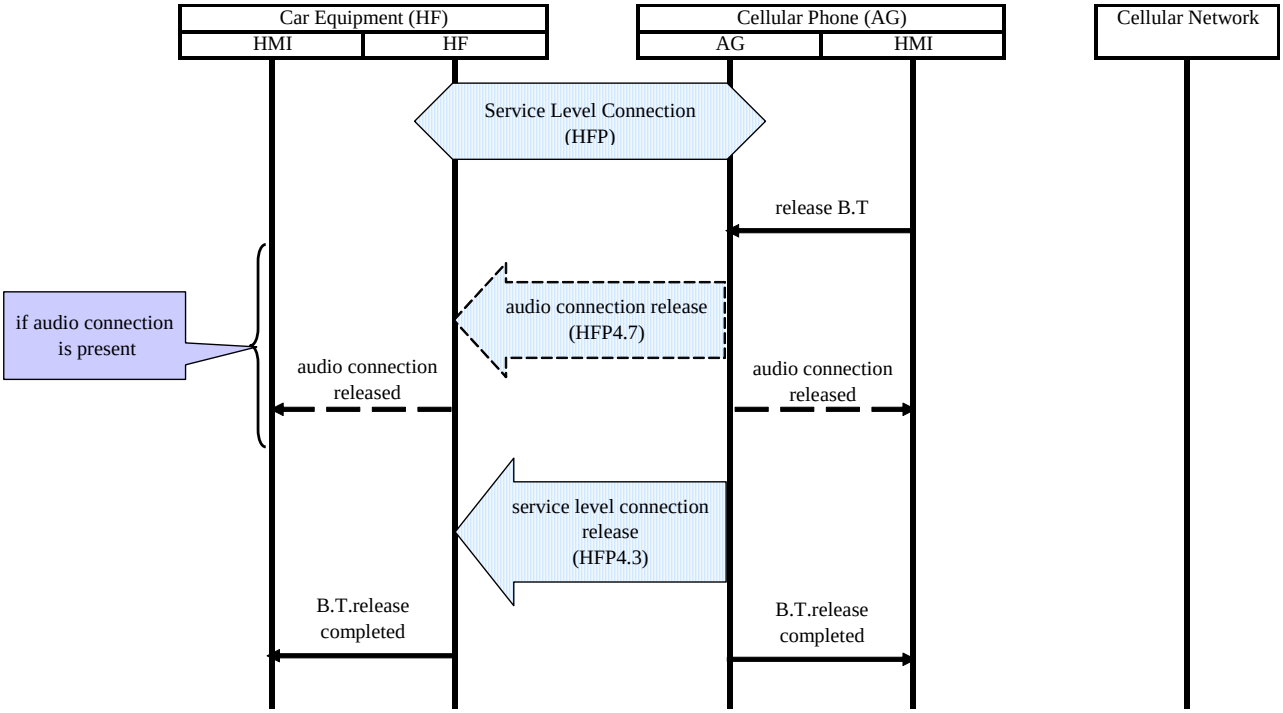


6.2.7. Connection release

6.2.7.1. Connection release from the HF

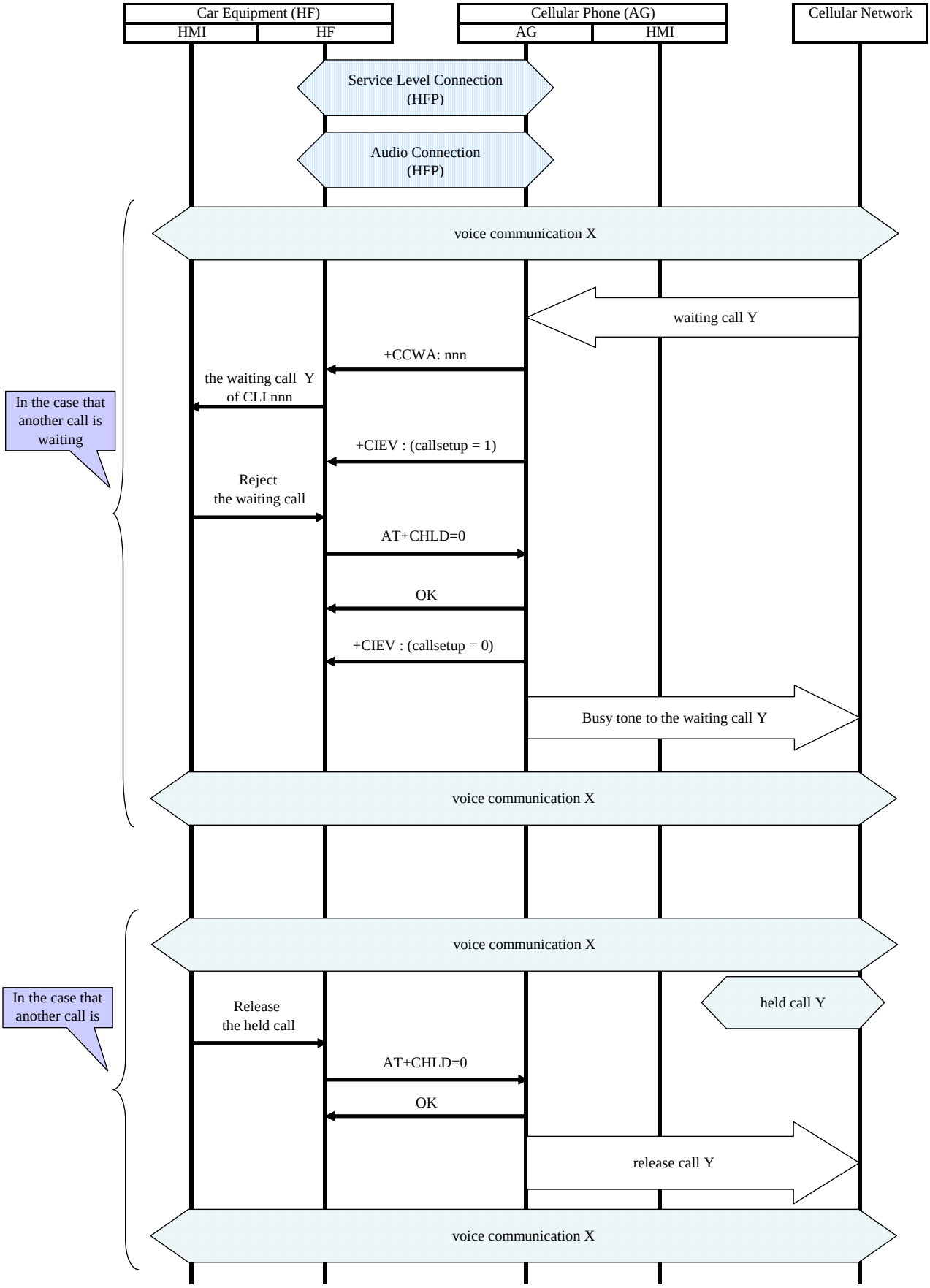


6.2.7.2. Connection release from the AG

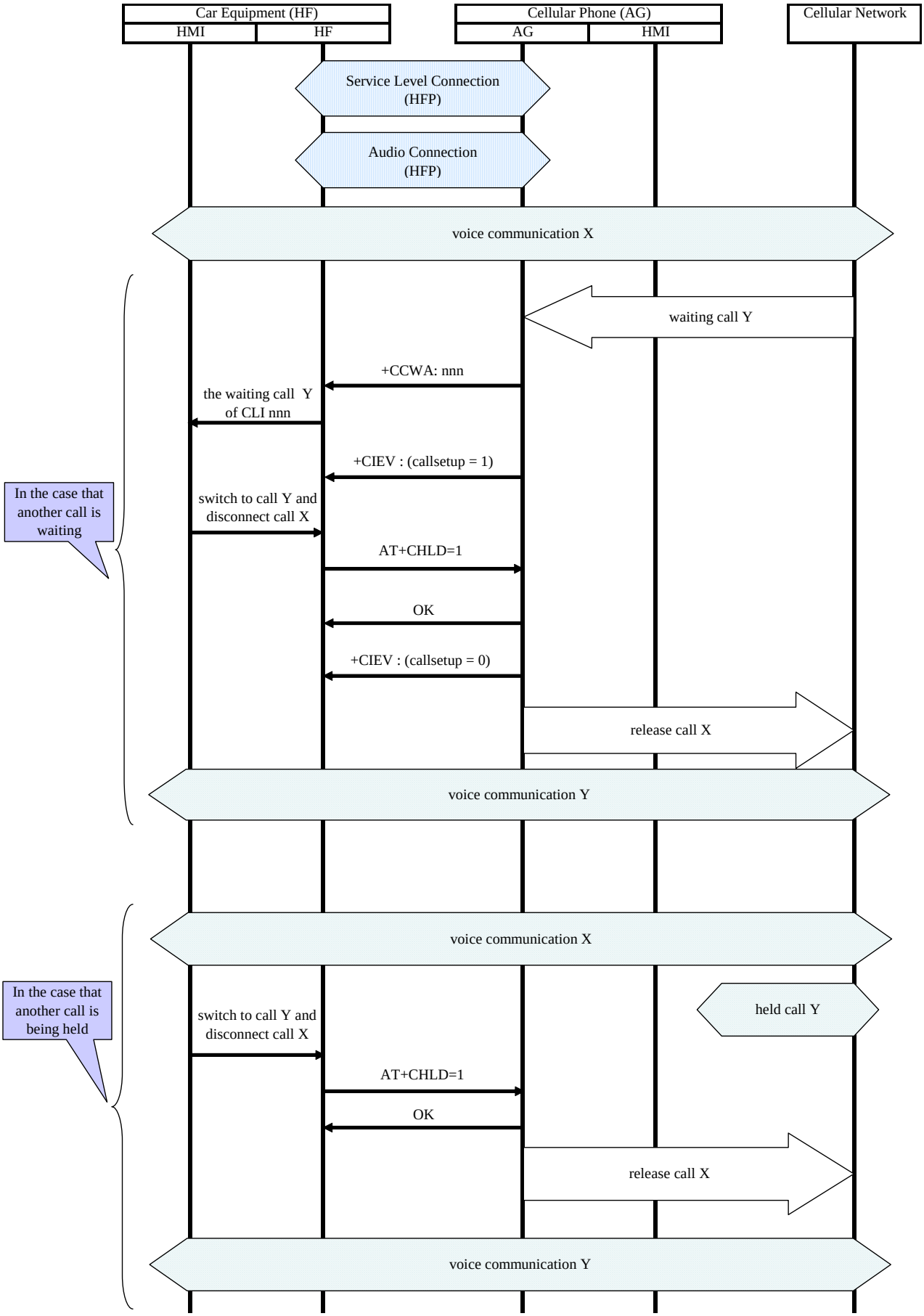


6.2.8. Three way calling

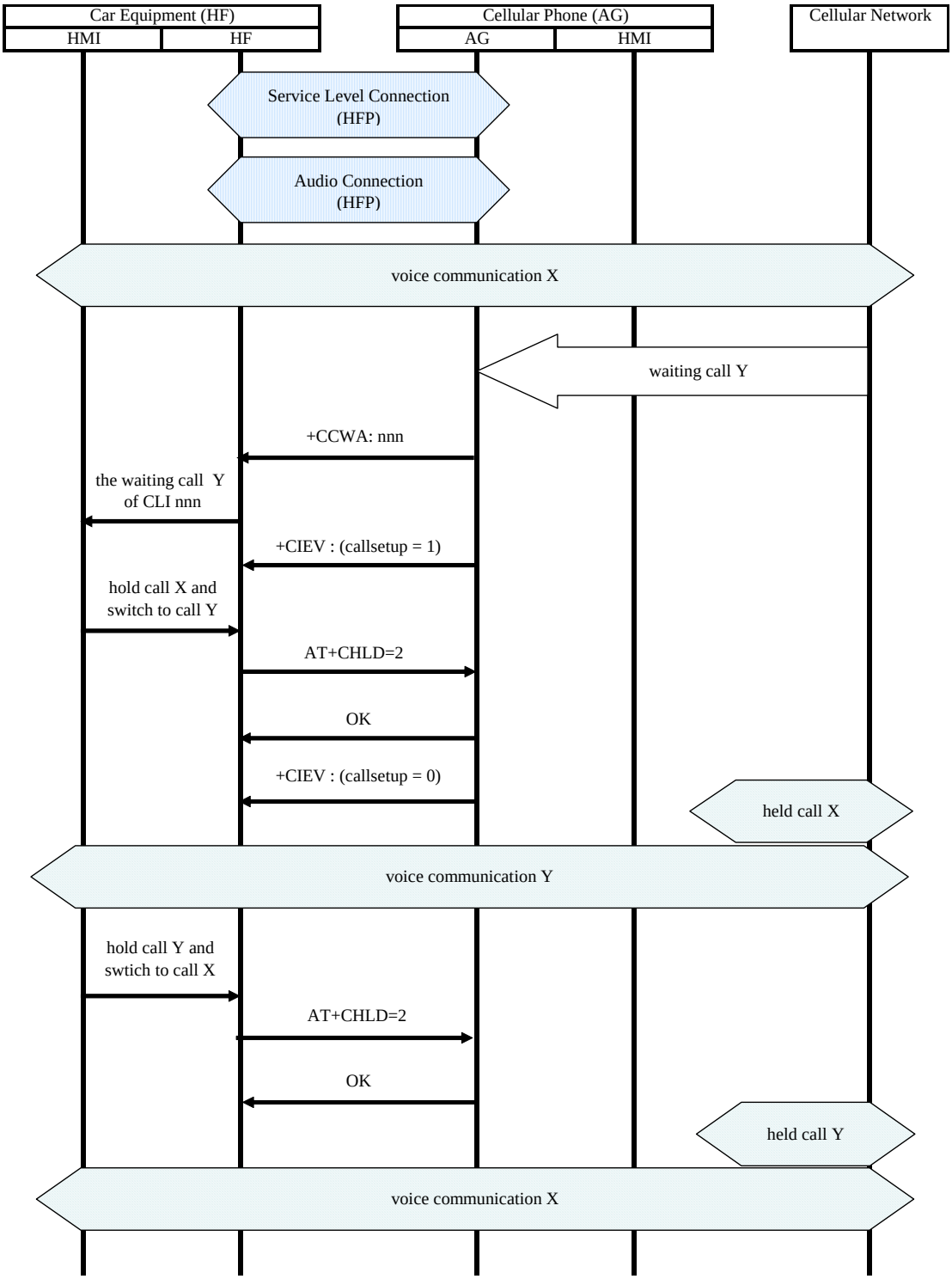
6.2.8.1. Three way calling (SEND 0)



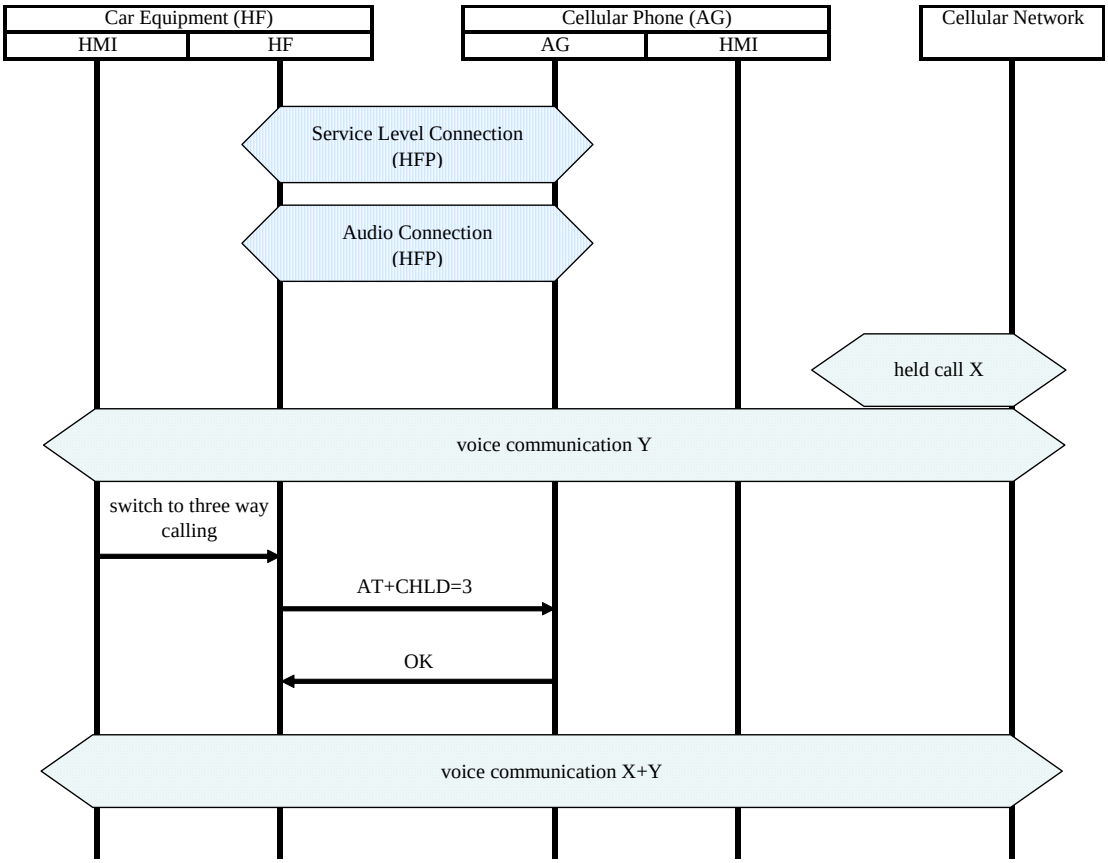
6.2.8.2. Three way calling (SEND 1)



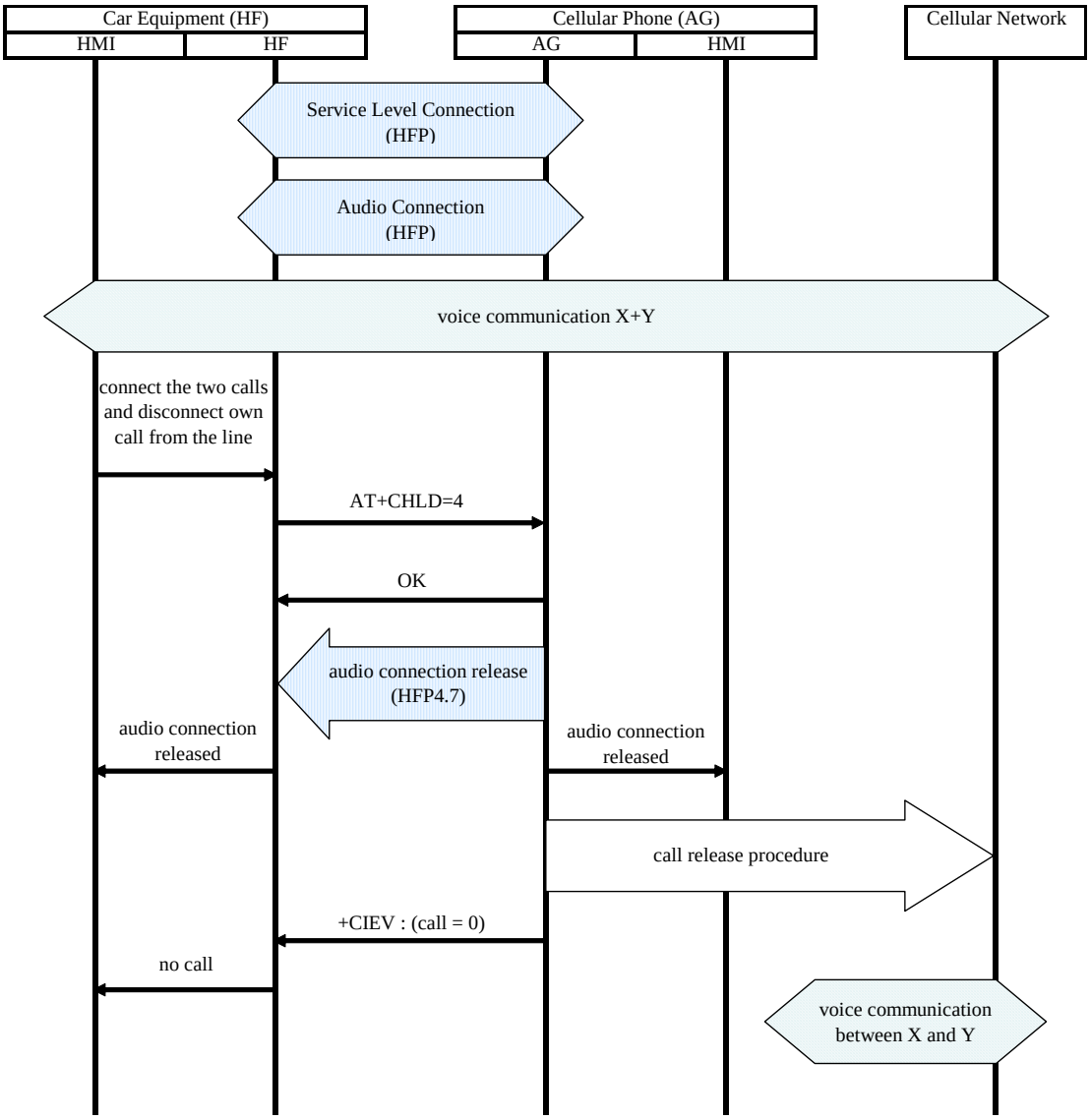
6.2.8.3. Three way calling (SEND 2)



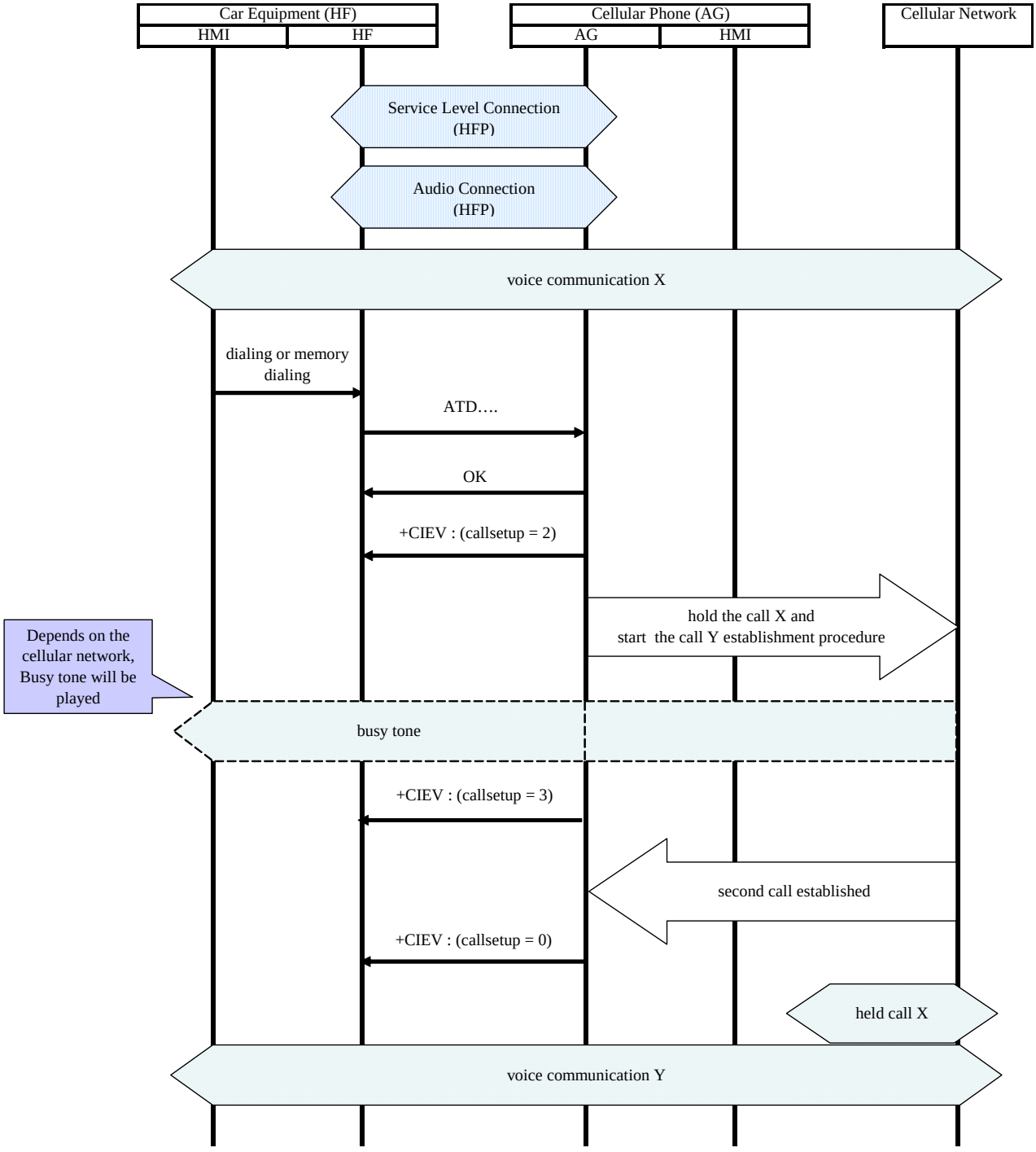
6.2.8.4. Three way calling (SEND 3)



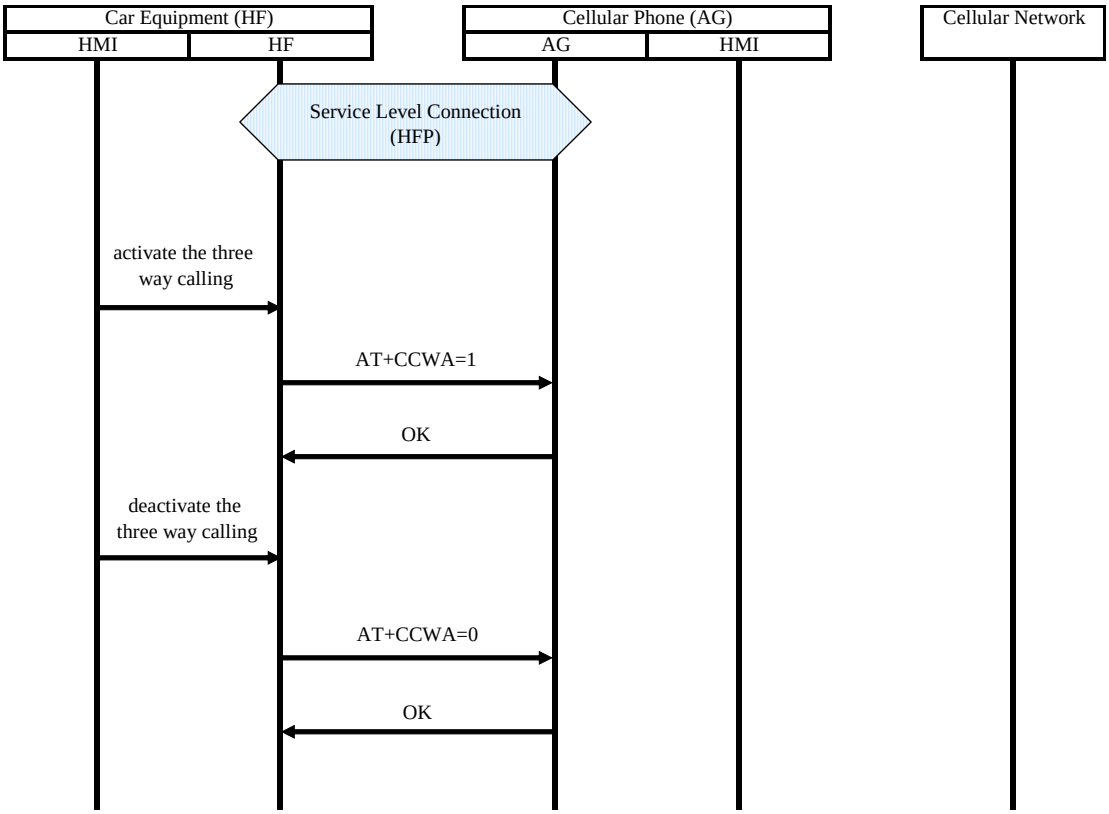
6.2.8.5. Three way calling (SEND 4)



6.2.8.6. Three way calls – Third party call placed from the HF

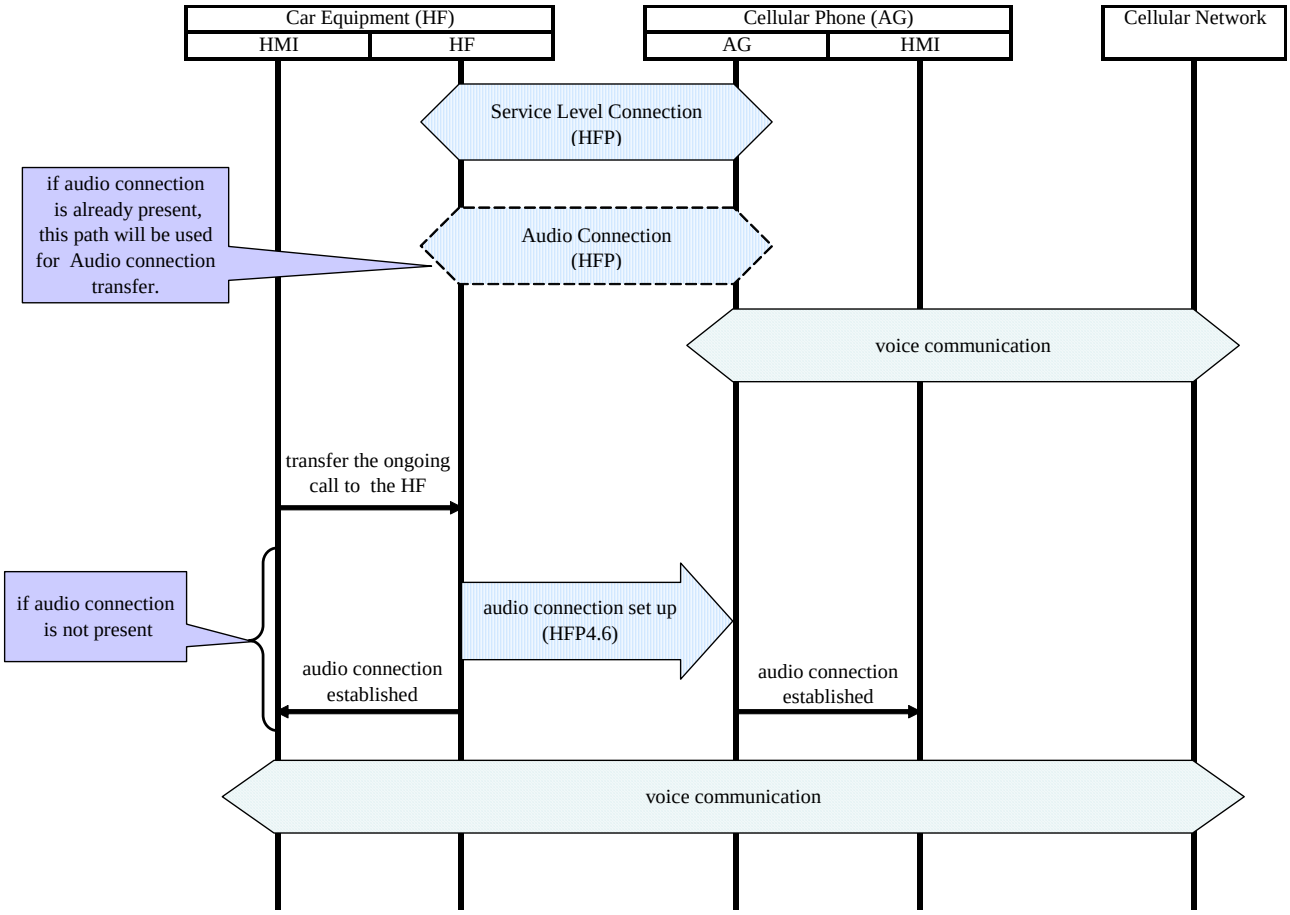


6.2.8.7. Setting the three way calling

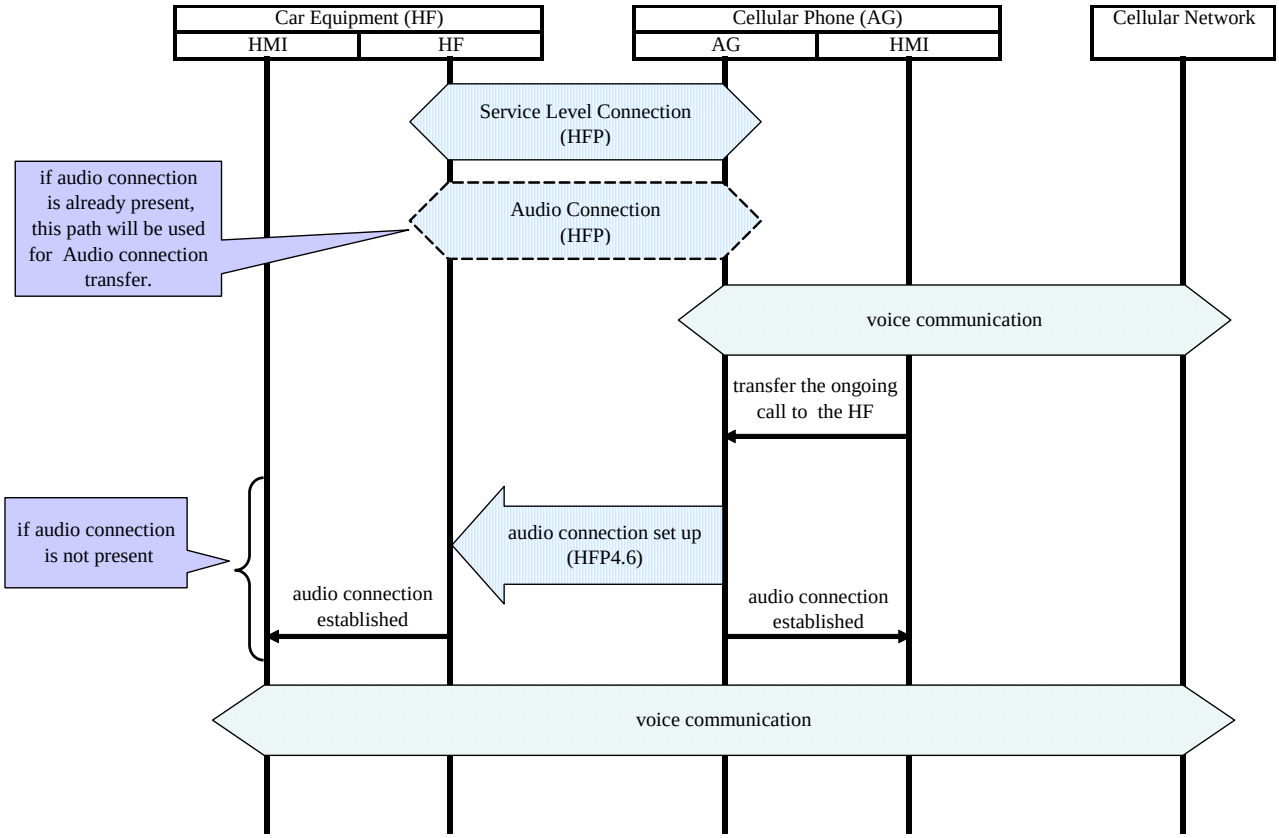


6.2.9. Audio connection transfer

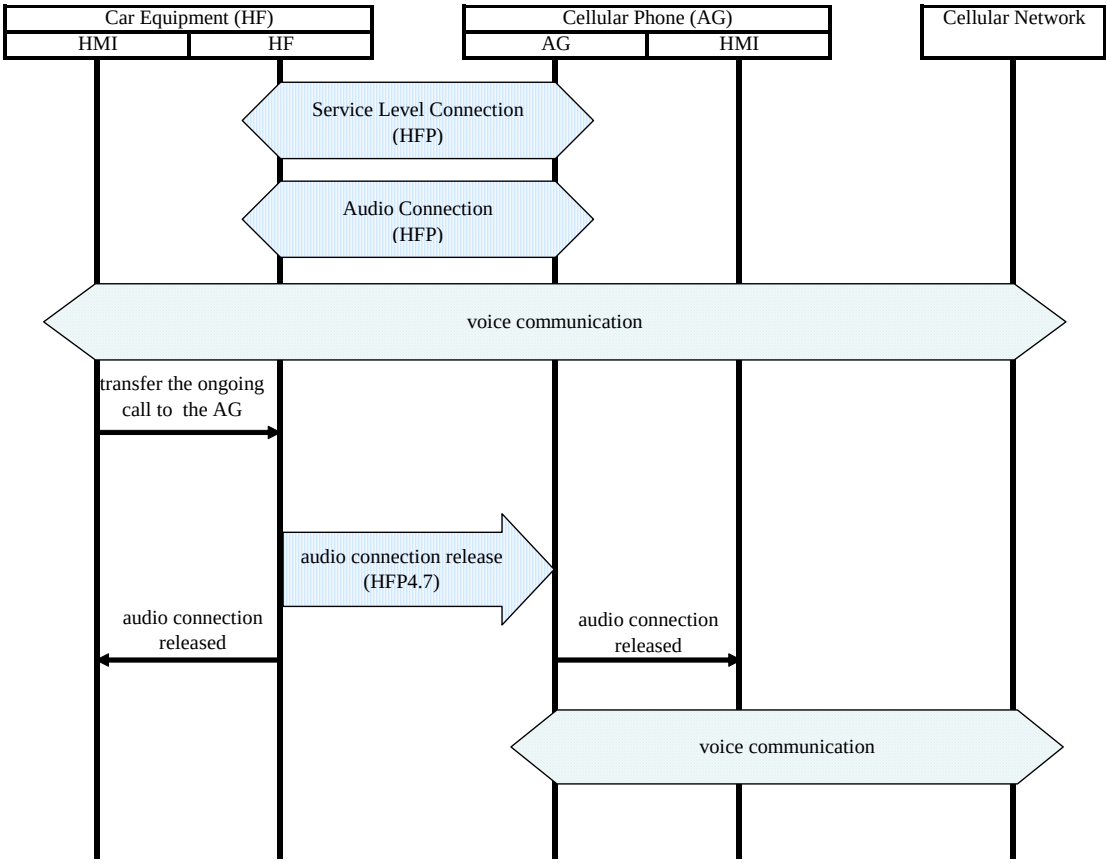
6.2.9.1. Audio connection transfer towards the HF(Operated by the HF)



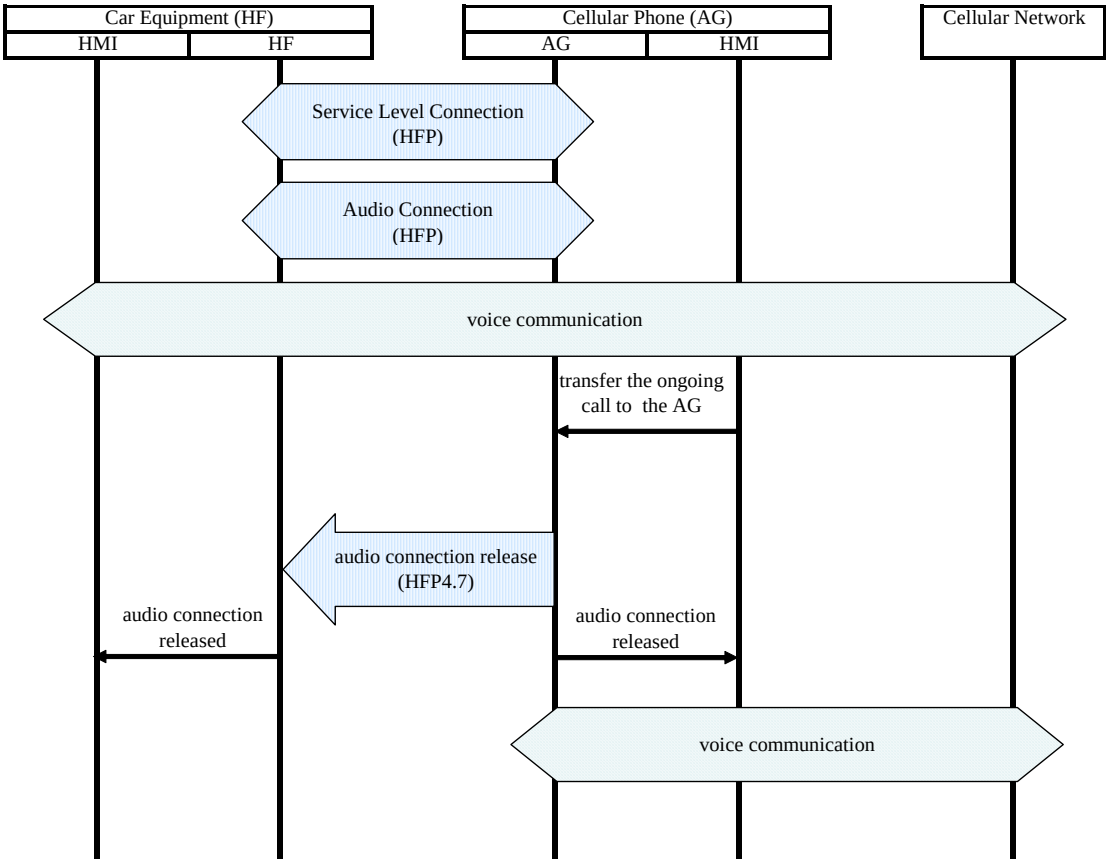
6.2.9.2. Audio connection transfer towards the HF(Operated by the AG)



6.2.9.3. Audio connection transfer towards the AG (Operated by the HF)

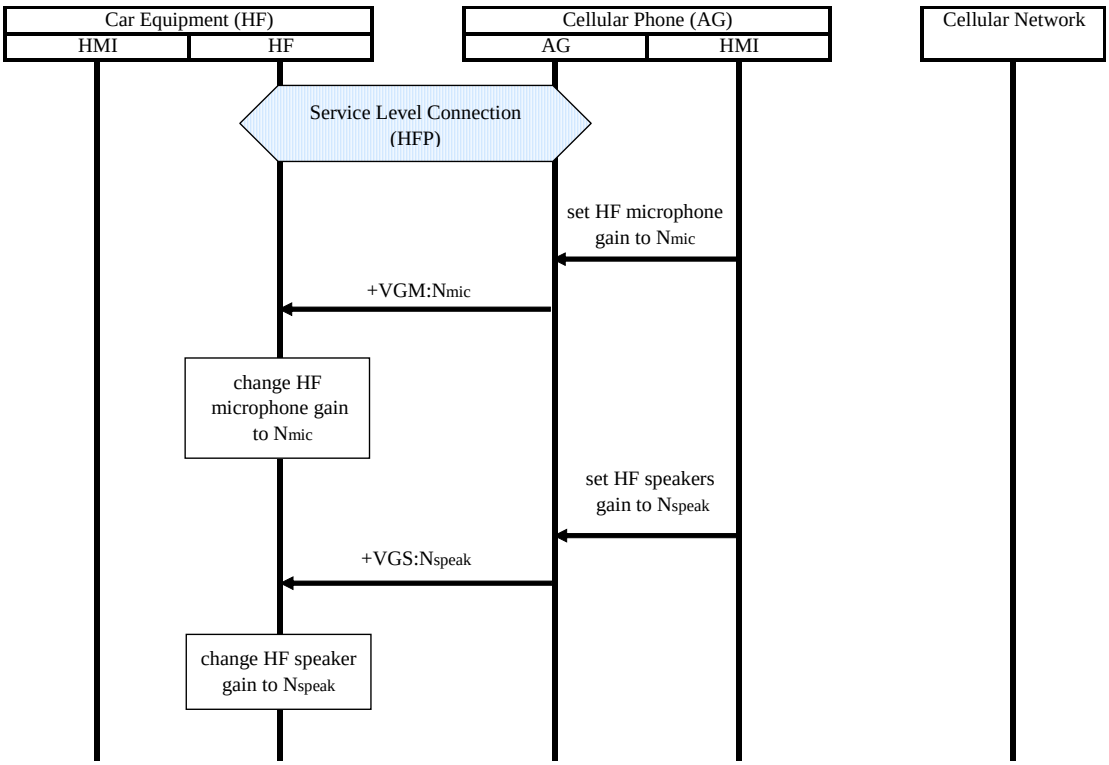


6.2.9.4. Audio connection transfer towards the AG (Operated by the AG)

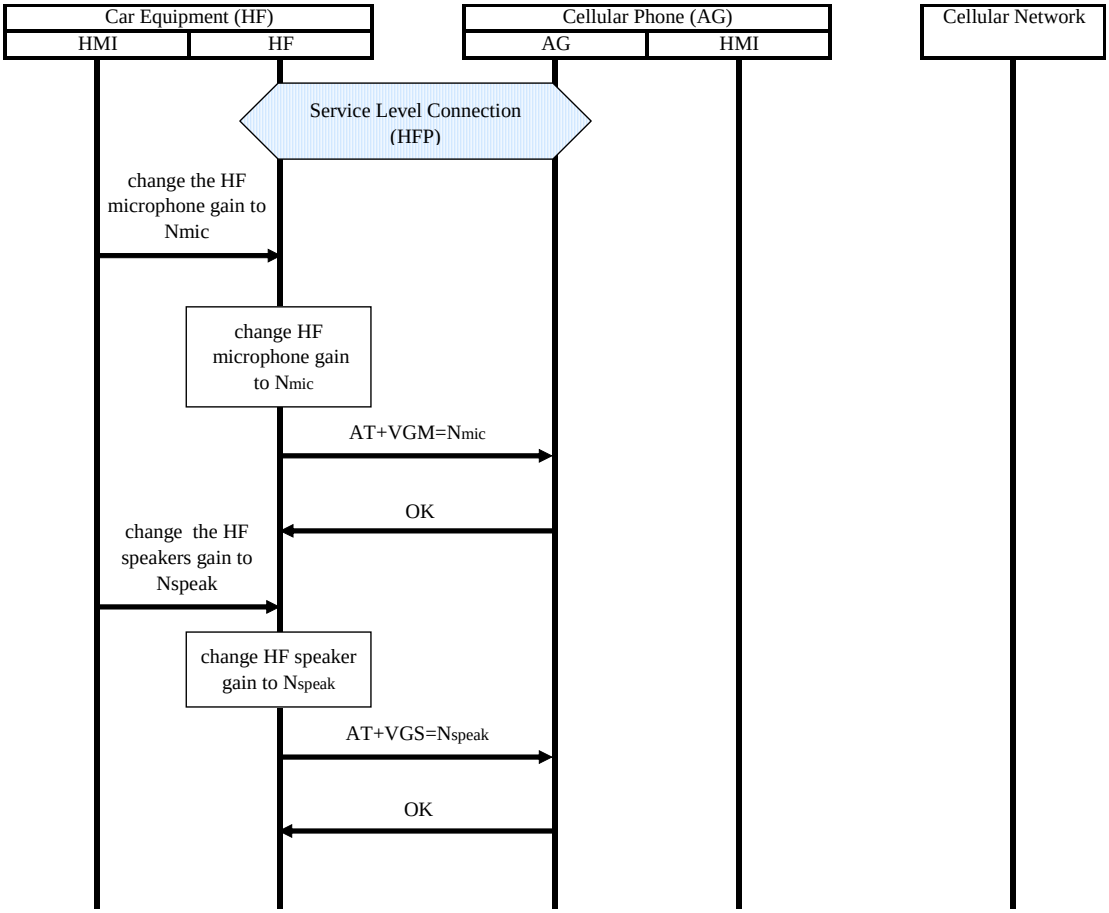


6.2.10. Remote audio volume control

6.2.10.1. Remote audio volume control

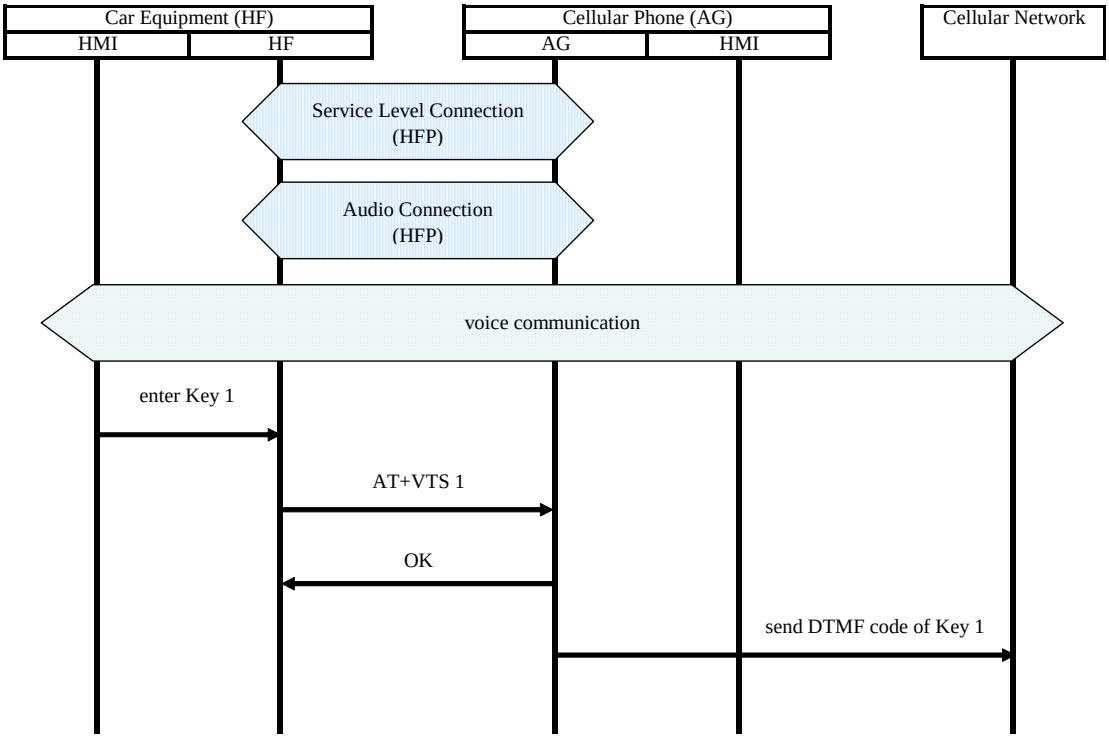


6.2.10.2. Volume level synchronization

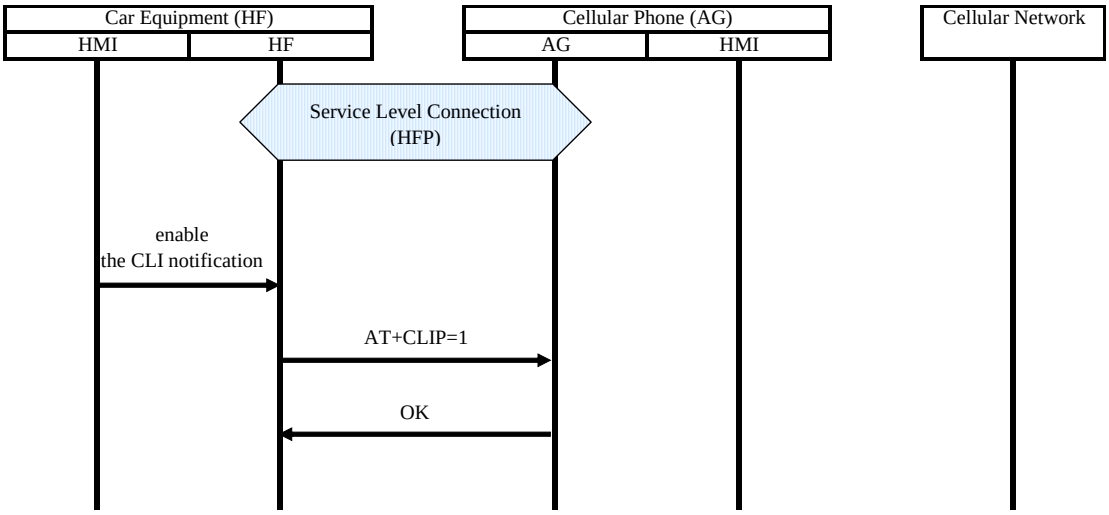


6.2.11. Others

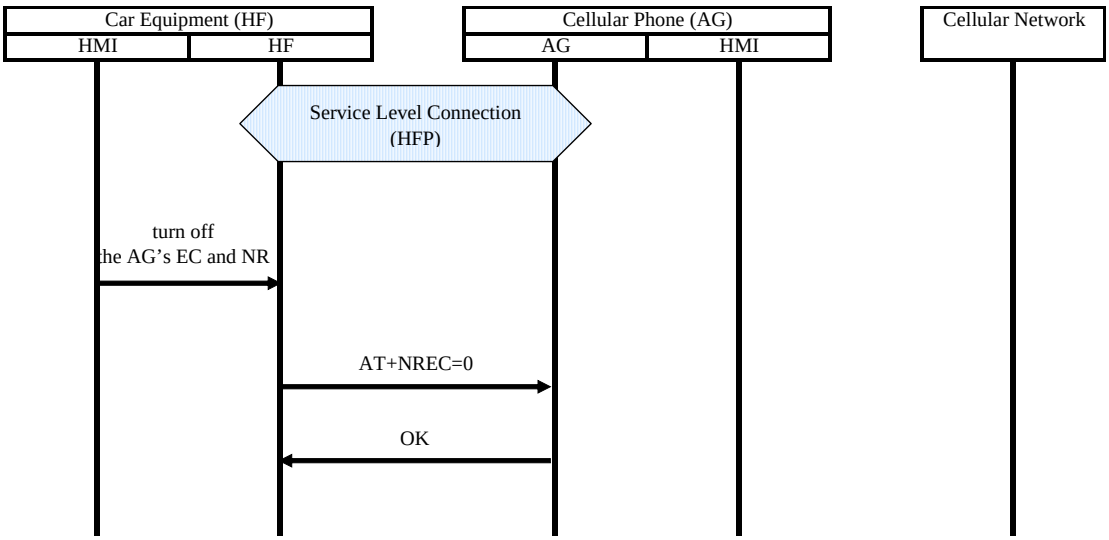
6.2.11.1. Transmitting DTMF codes



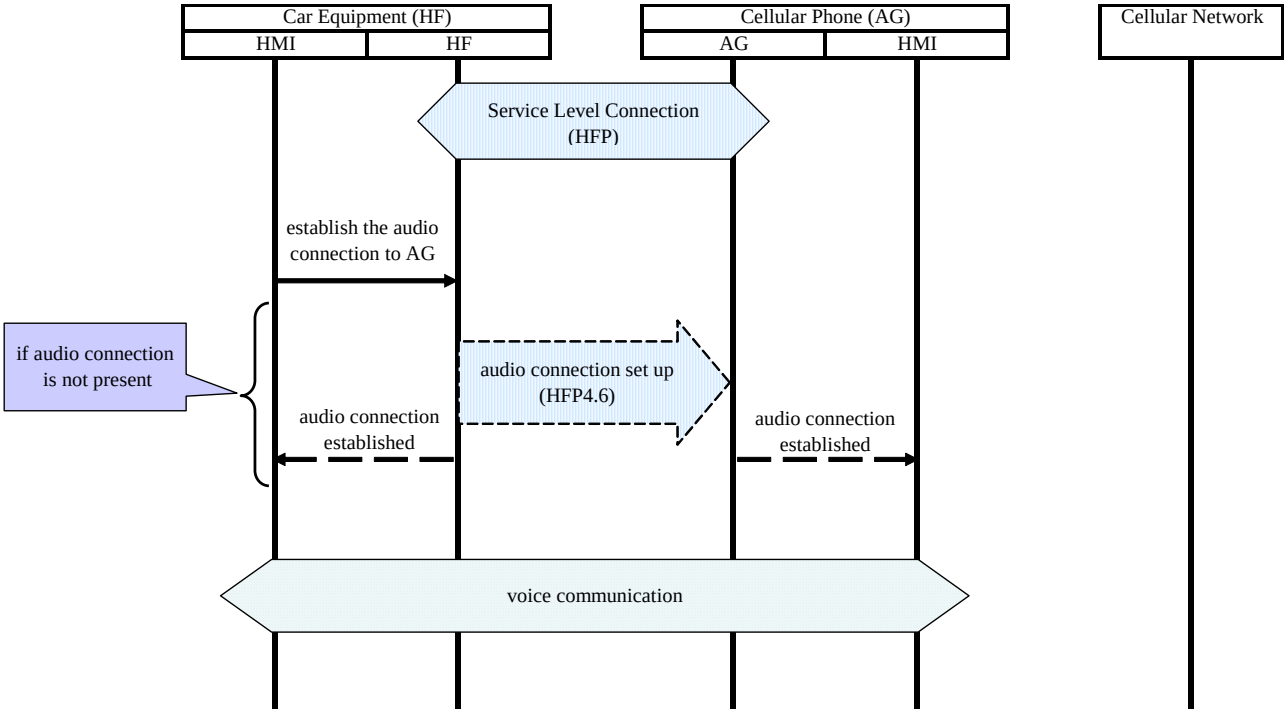
6.2.11.2. Calling line identification(CLI) notification



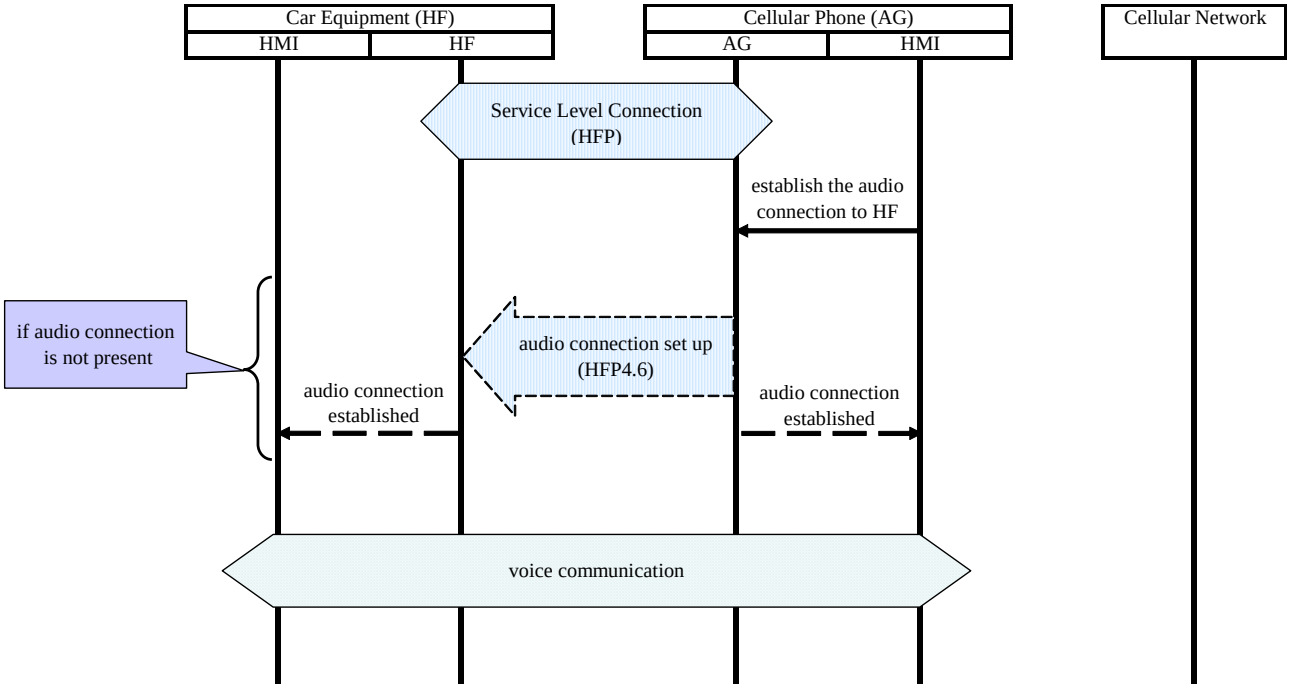
6.2.11.3. Turning off the AG's EC and NR



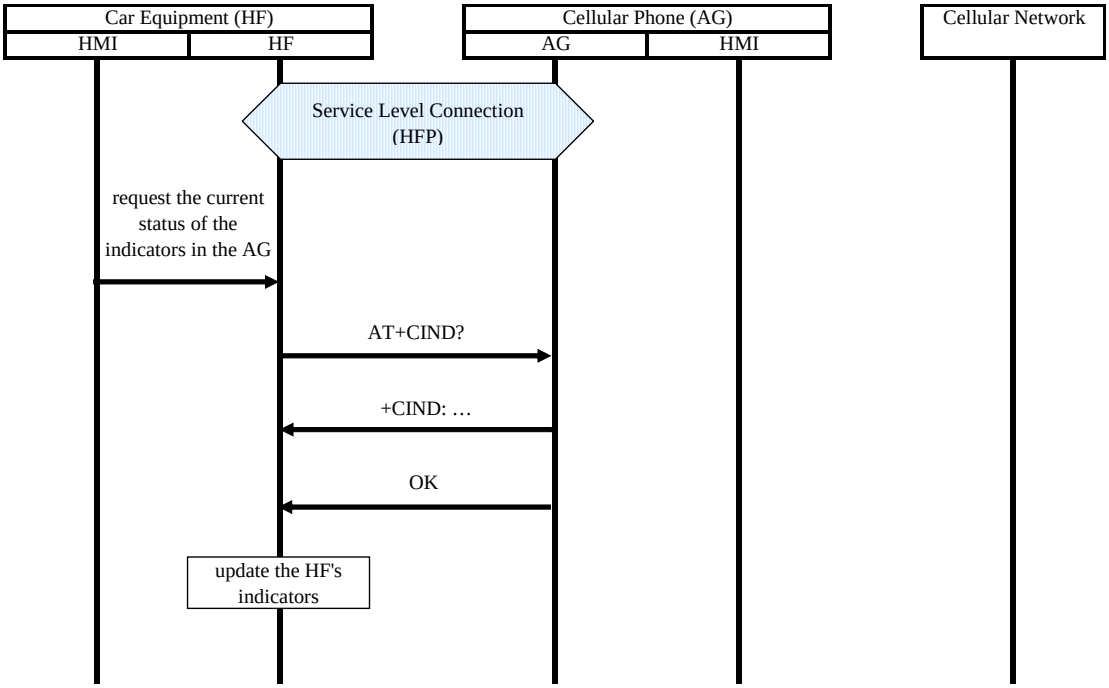
6.2.11.4. Audio connection set up from the HF



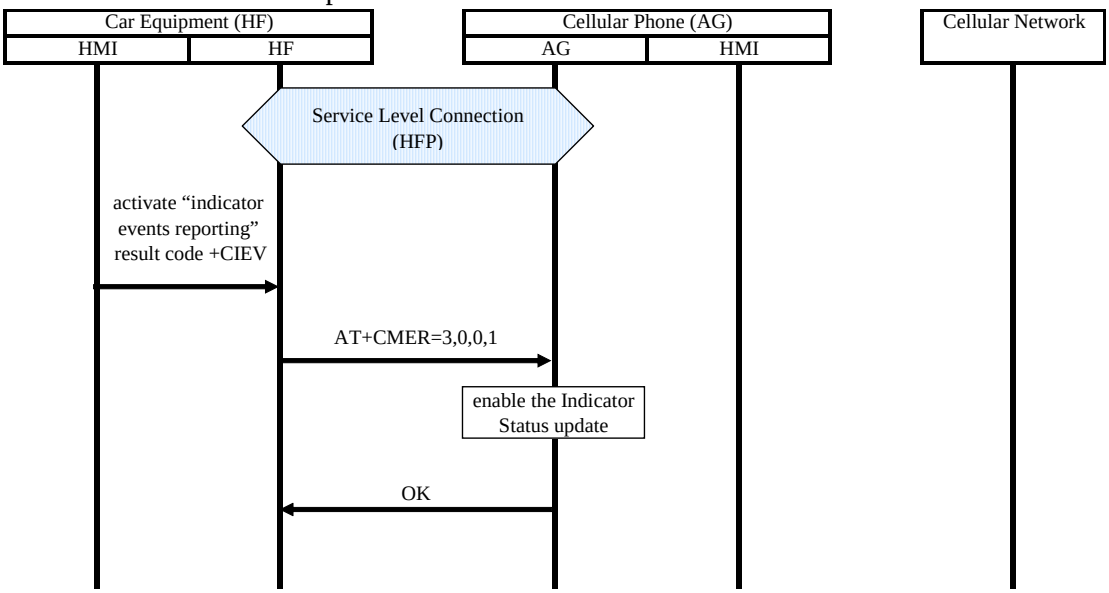
6.2.11.5. Audio connection set up from the AG



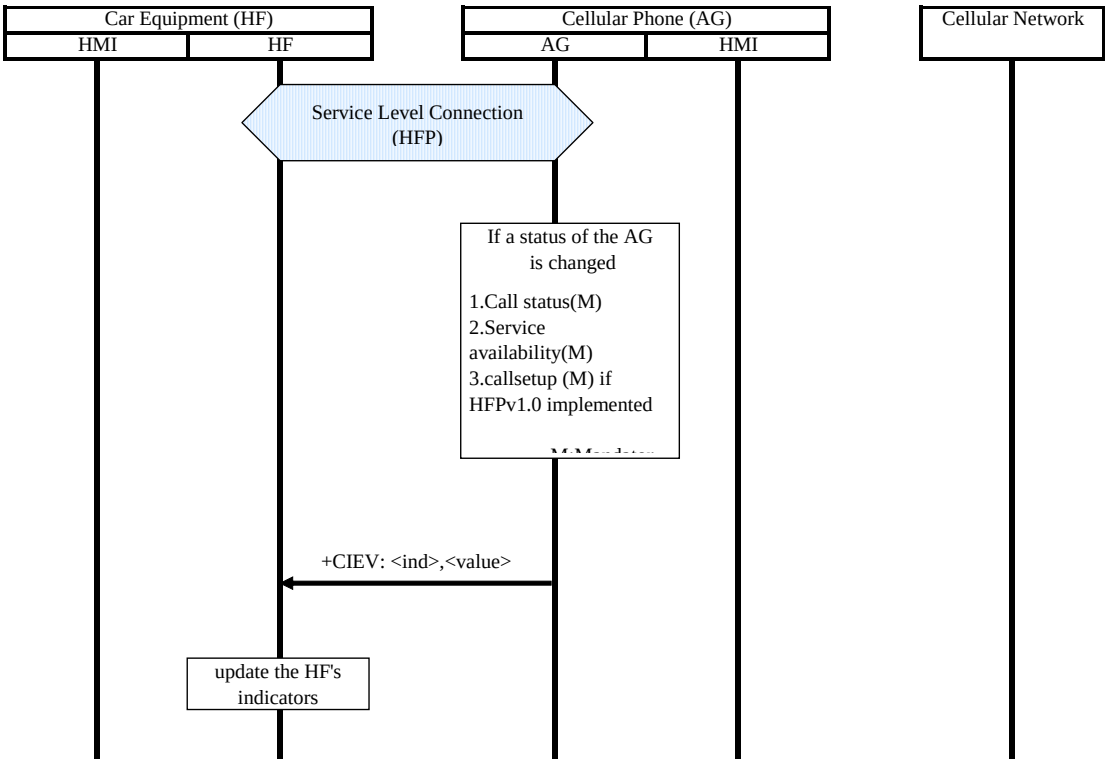
6.2.11.6. Transfer of status indicator(Initiated by the HF)



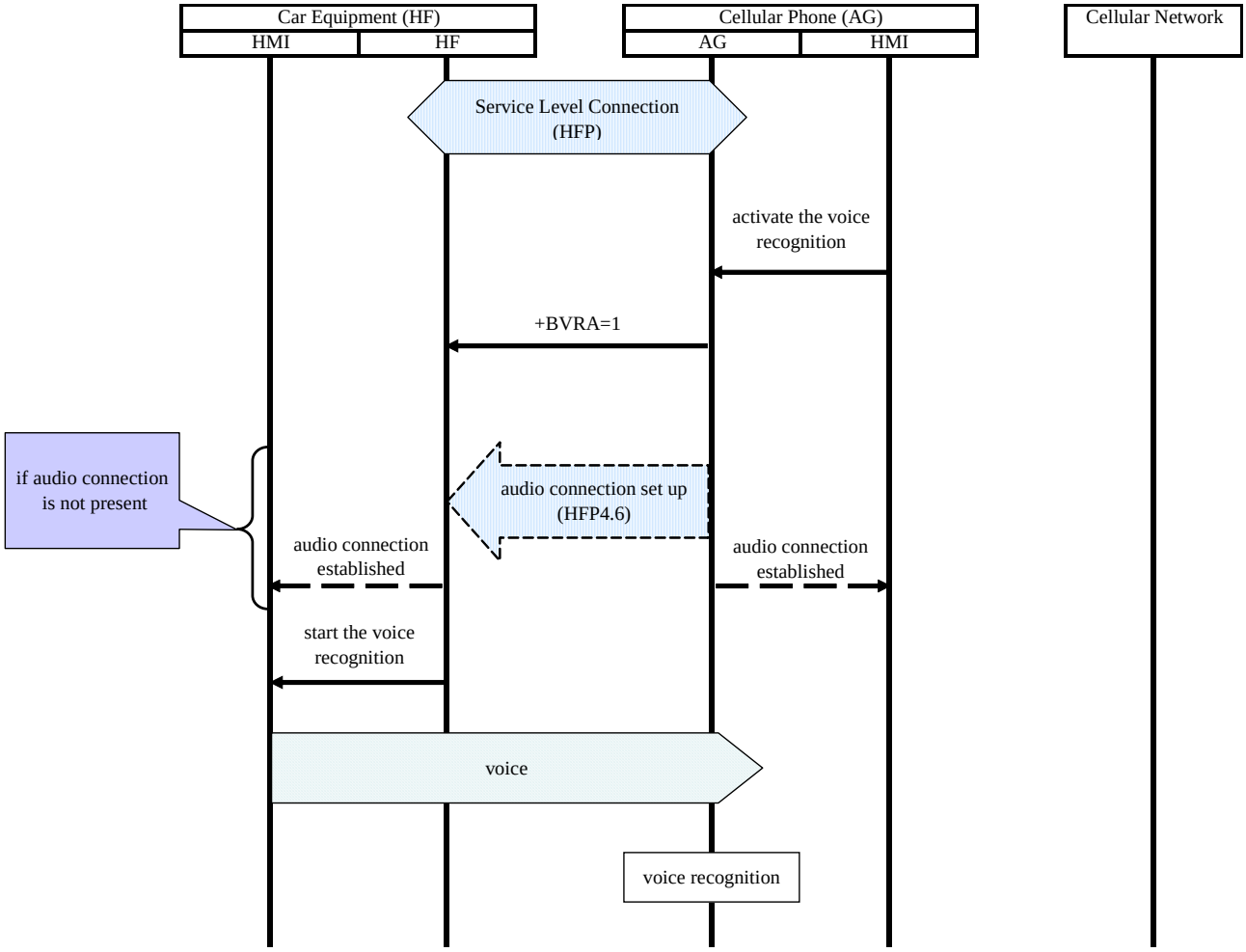
6.2.11.7. Enable the indicators status update function in the AG



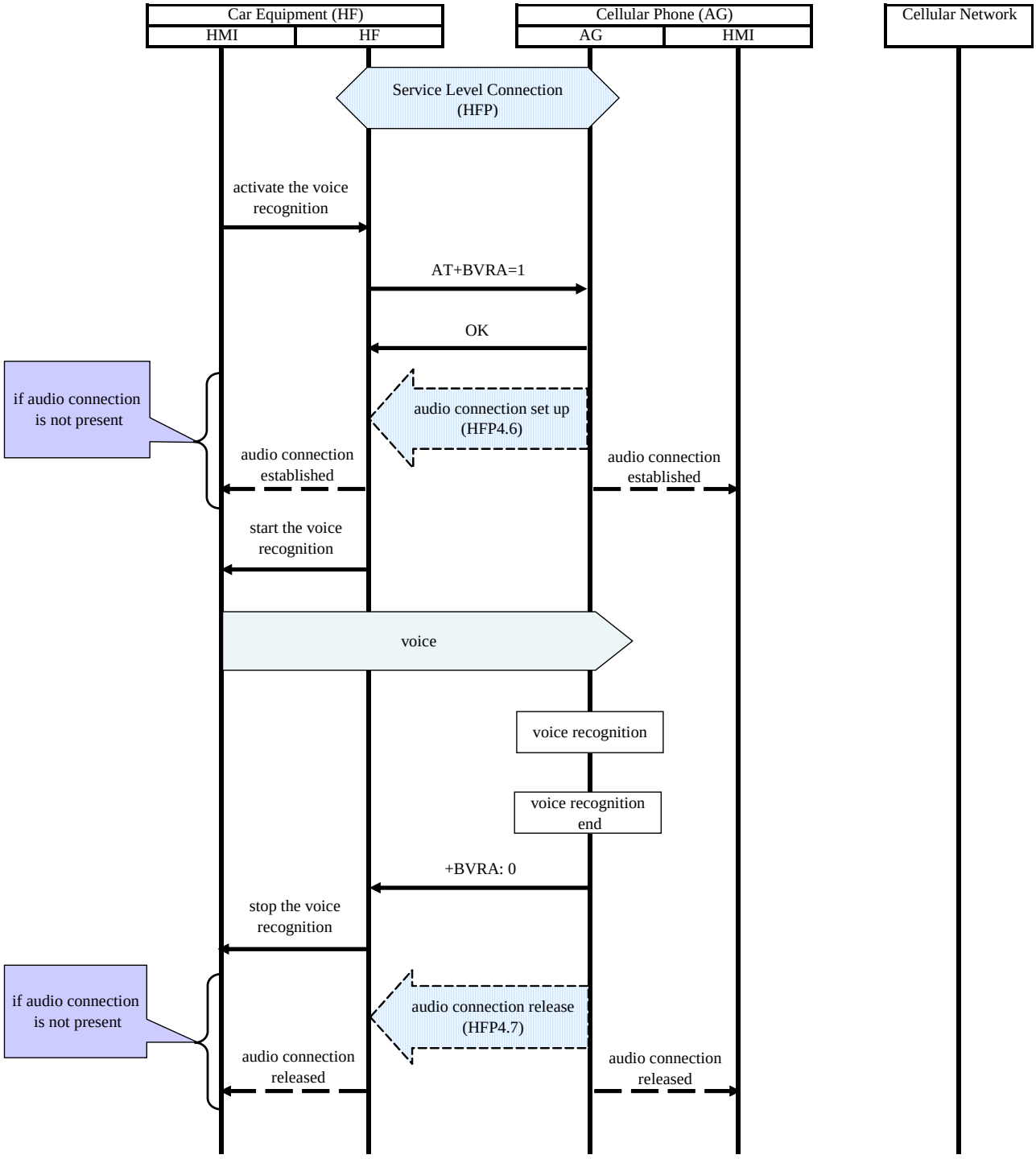
6.2.11.8. Transfer of status indication (Initiated by the AG)



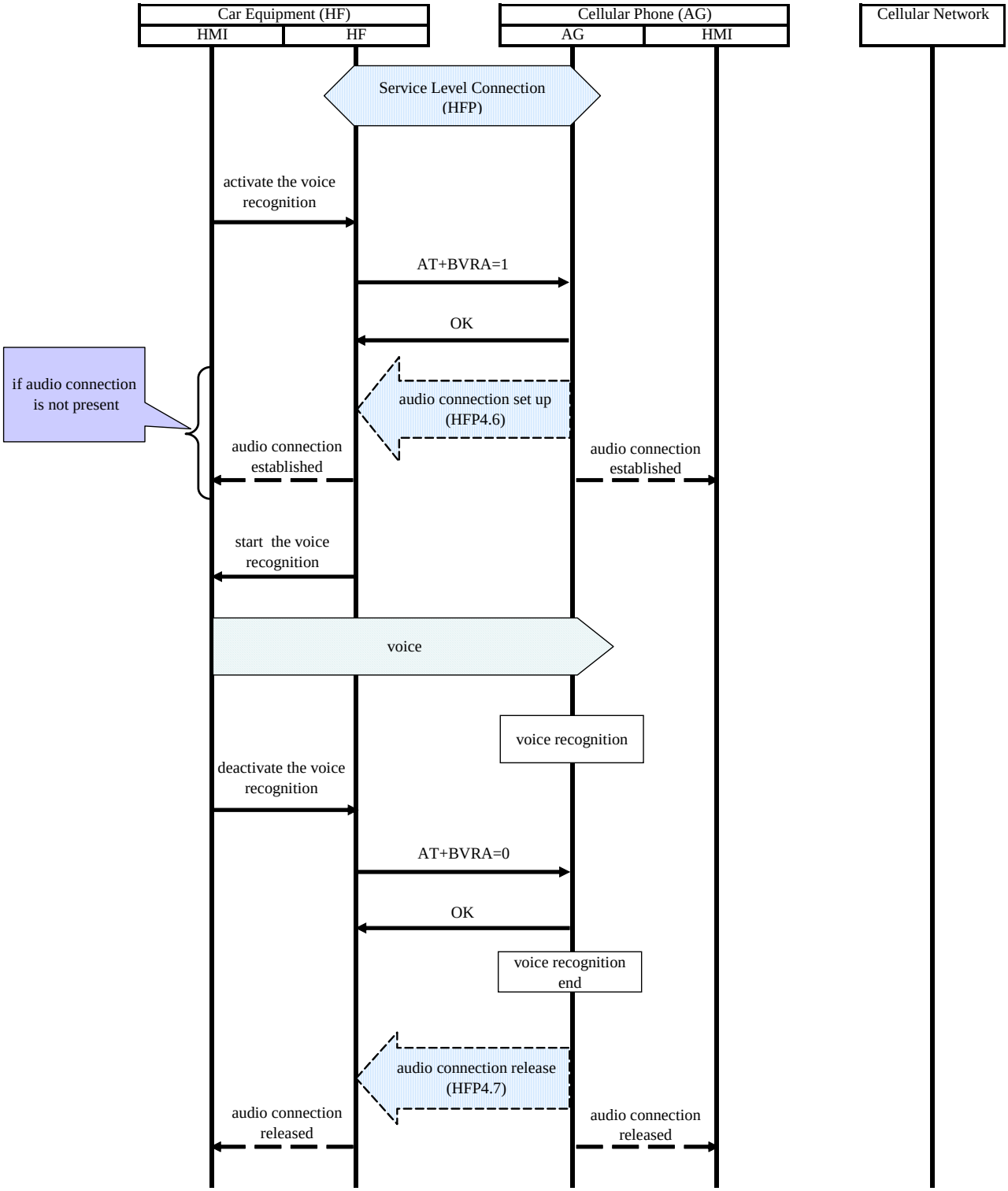
6.2.11.9. Voice recognition activation – AG initiated



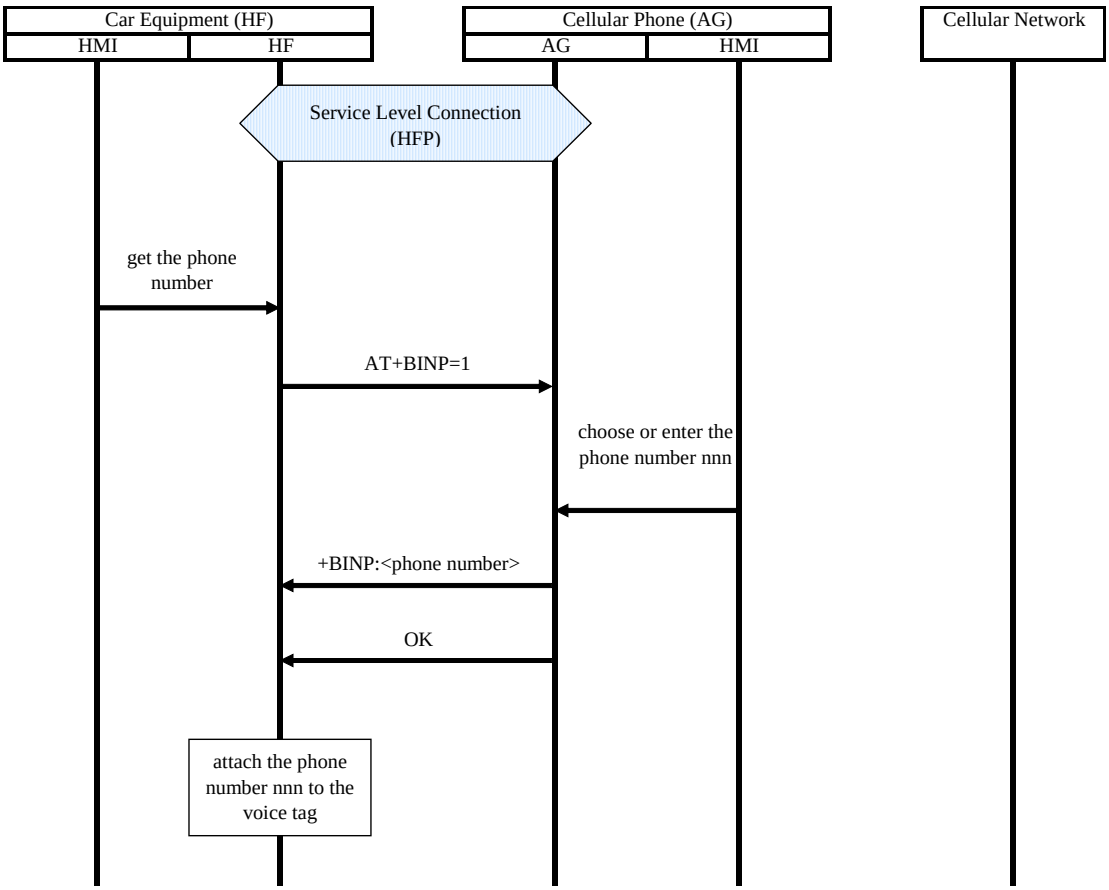
6.2.11.10. Voice recognition activation (Deactivated by the AG)



6.2.11.11. Voice recognition activation (Deactivated by the HF)

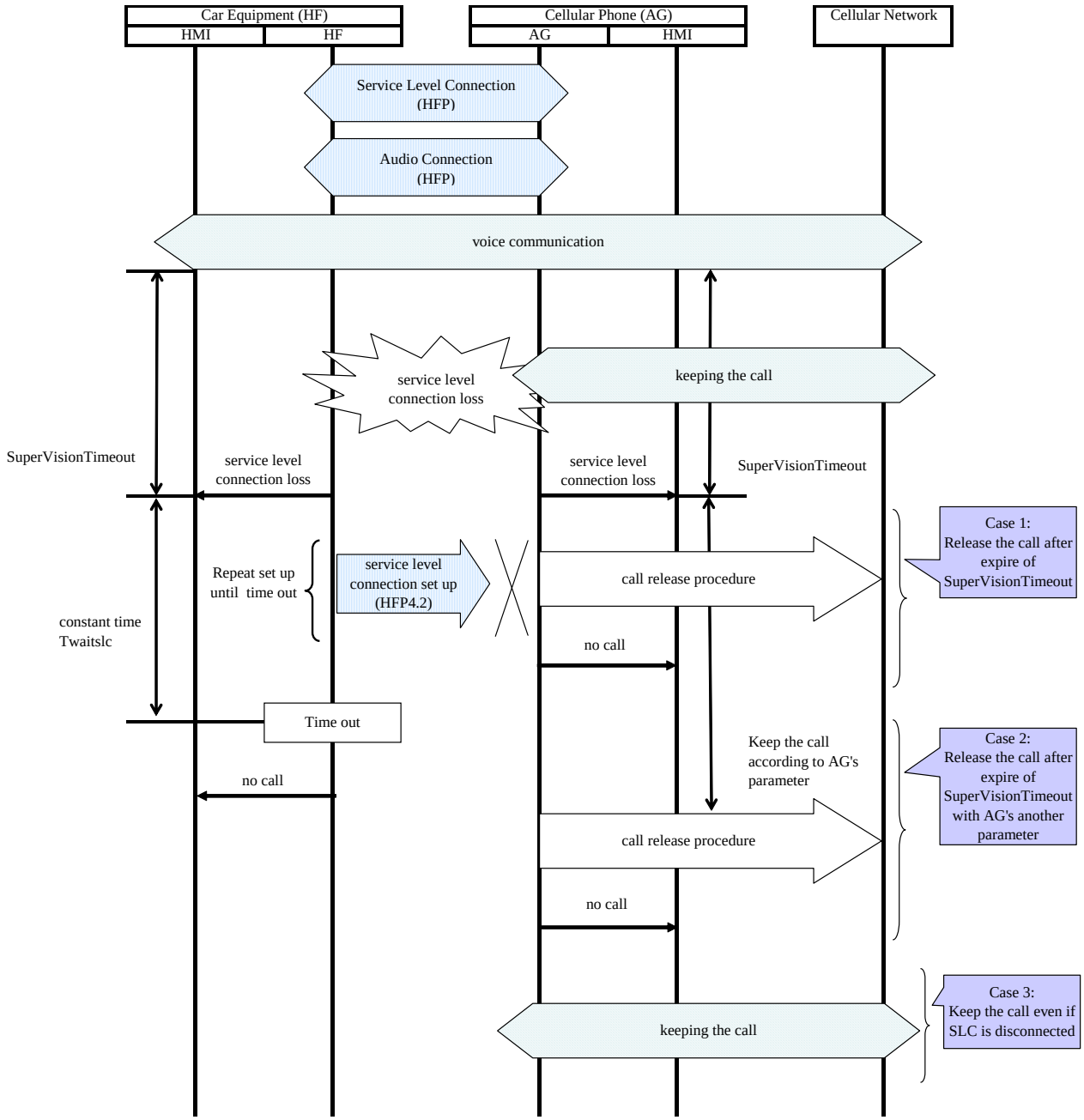


6.2.11.12. Attaching a phone number to a voice tag

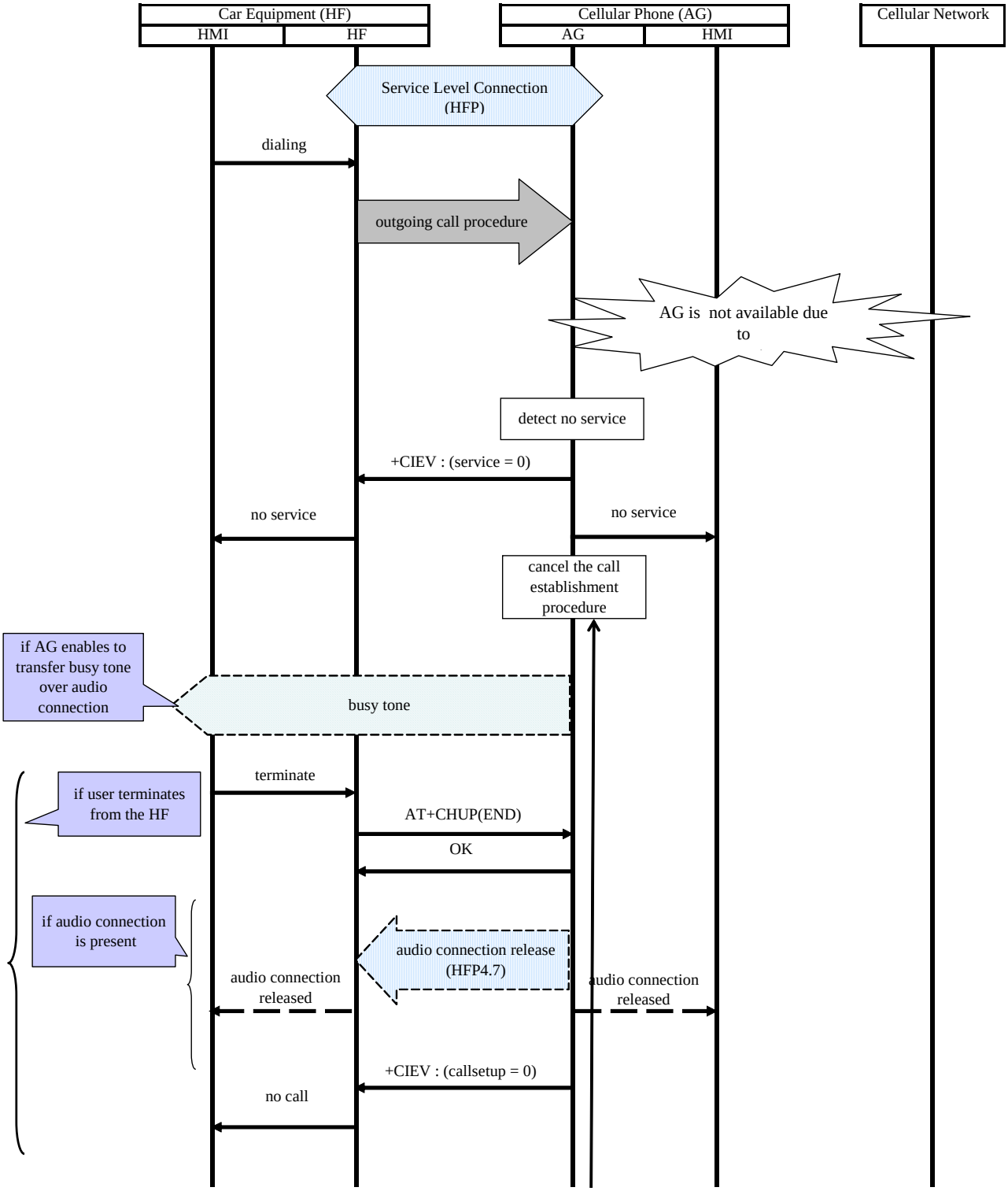


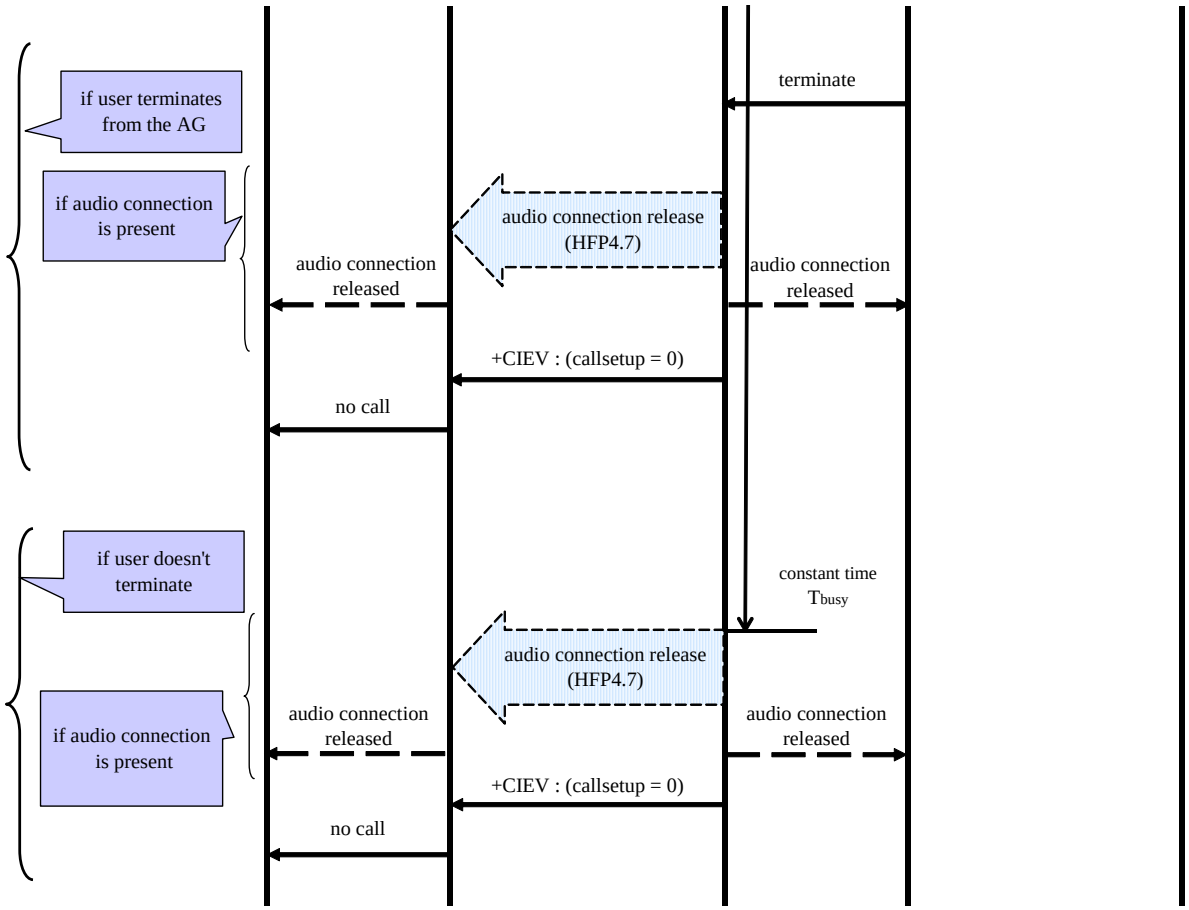
6.3. Abnormal Usage Scenarios

6.3.1. Service level connection loss during an ongoing call(the reconnection fails)

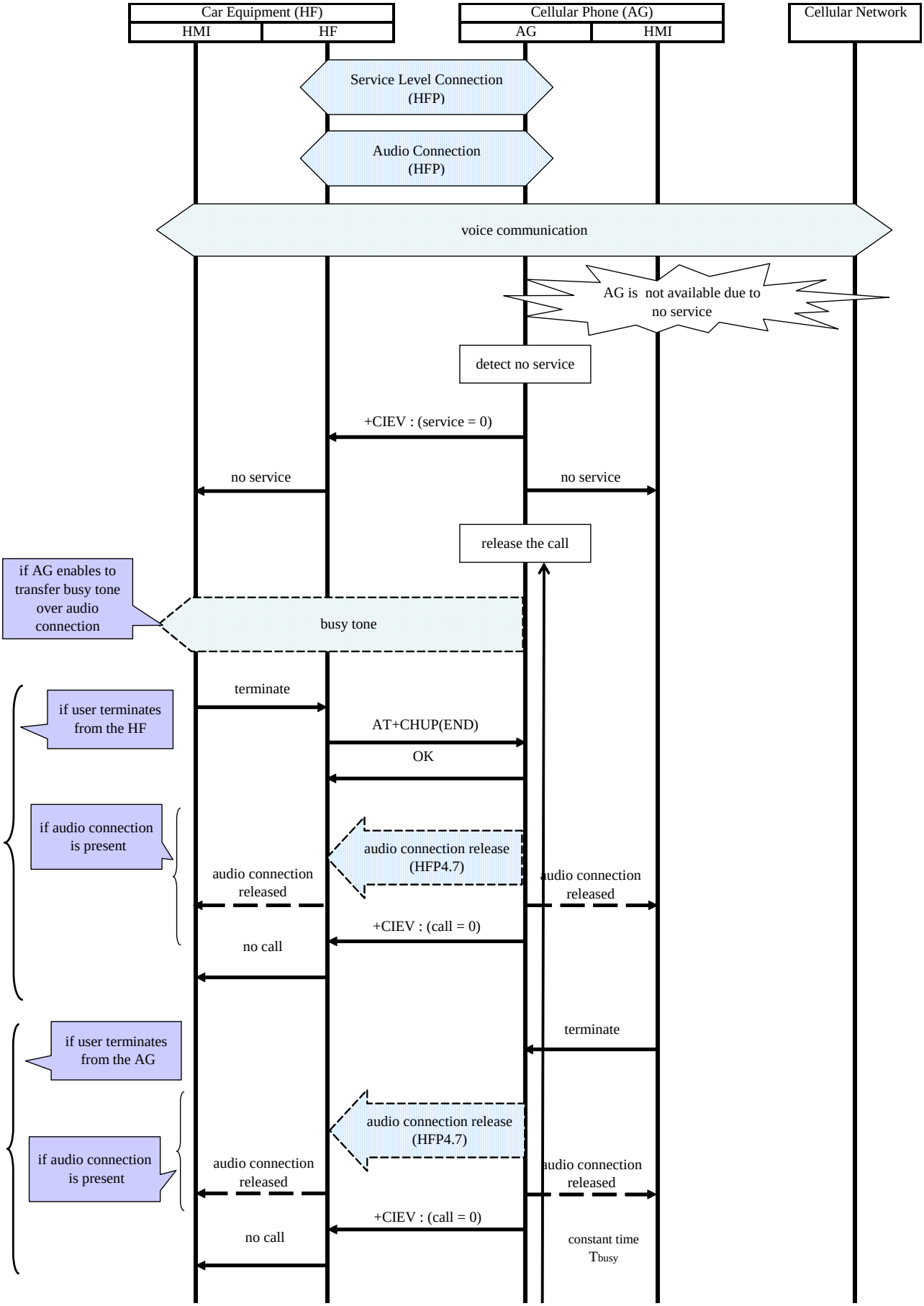


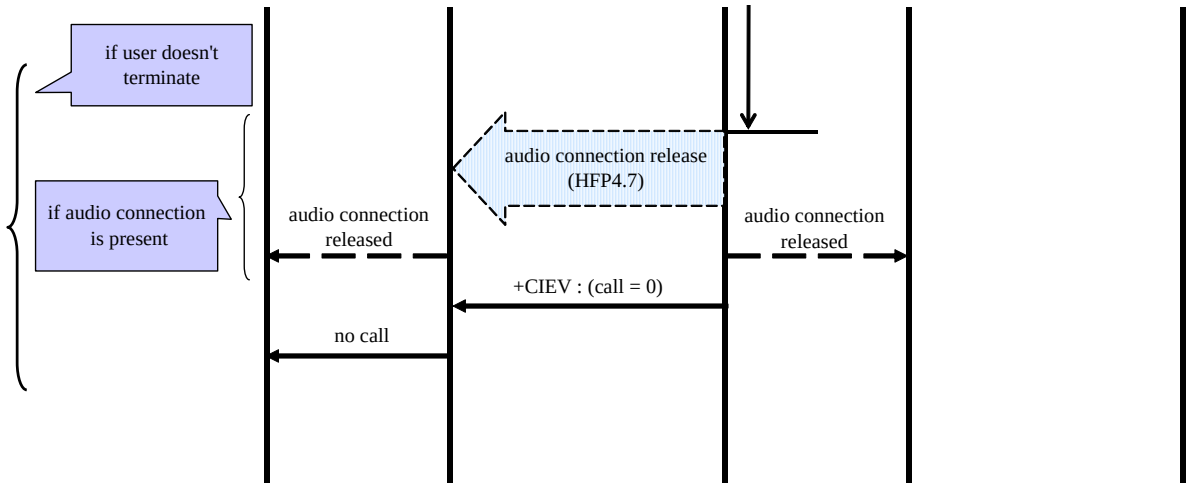
6.3.2. Outgoing call (Canceling the call process due to no service for AG)



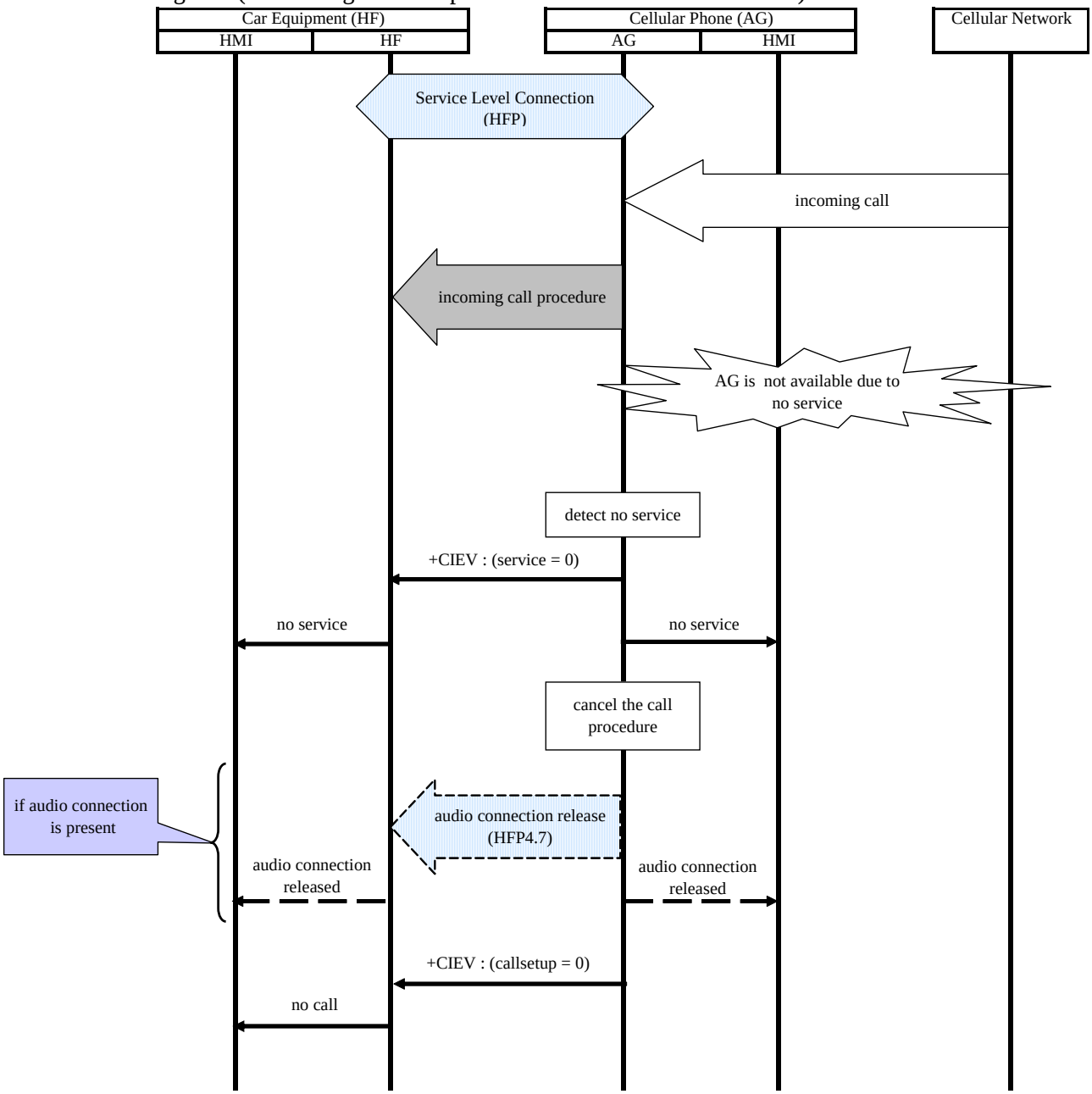

if user terminates from the AG
if audio connection is present
terminate
audio connection release (HFP4.7)
audio connection released
audio connection released
+CIEV : (callsetup = 0)
no call
if user doesn't terminate
constant time Tbusy
audio connection release (HFP4.7)
if audio connection is present
audio connection released
audio connection released
+CIEV : (callsetup = 0)
no call

6.3.3. Terminate a call process due to no service for AG

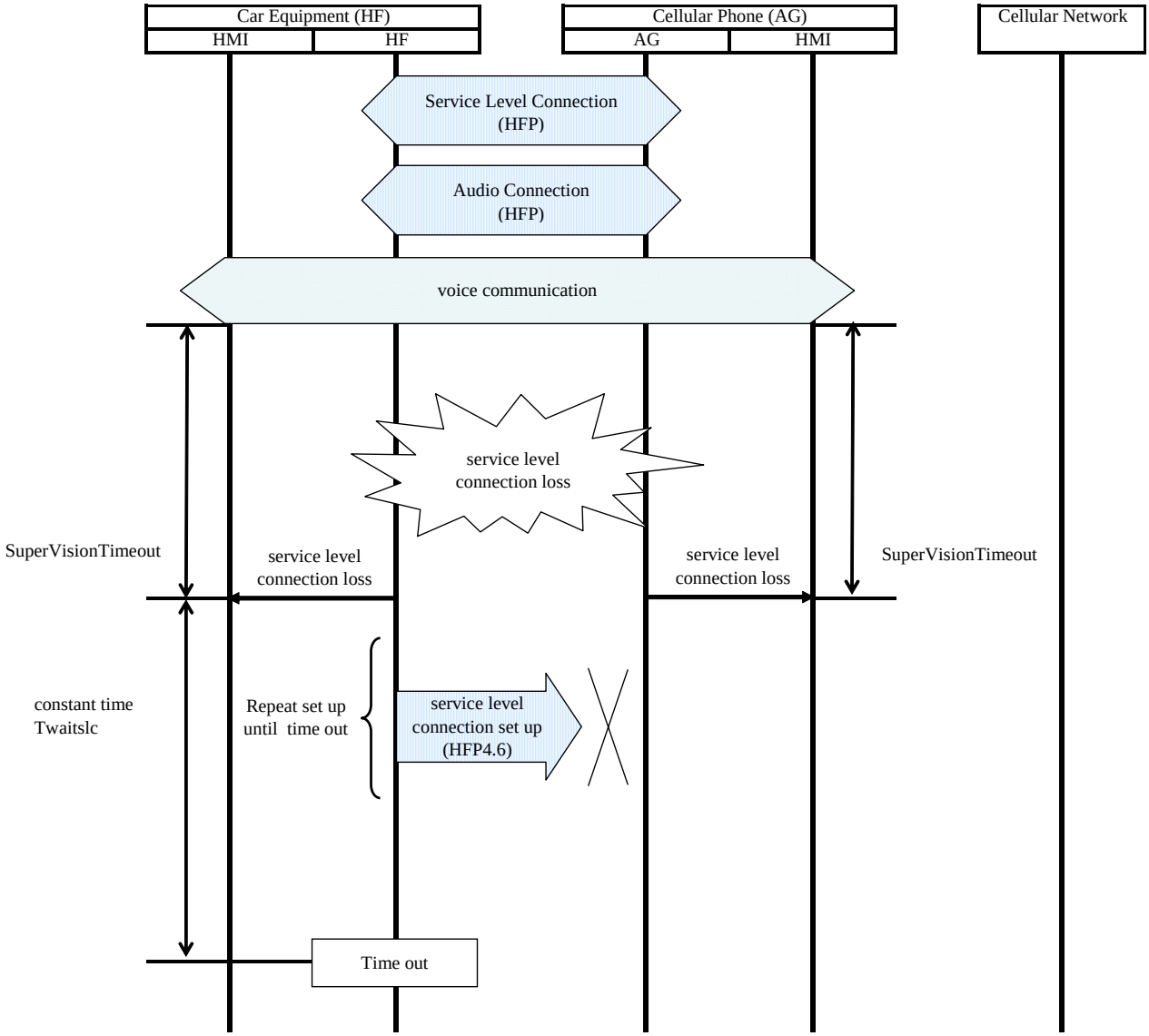



if user doesn't terminate
if audio connection is present
audio connection release (HFP4.7)
audio connection released
audio connection released
+CIEV : (call = 0)
no call

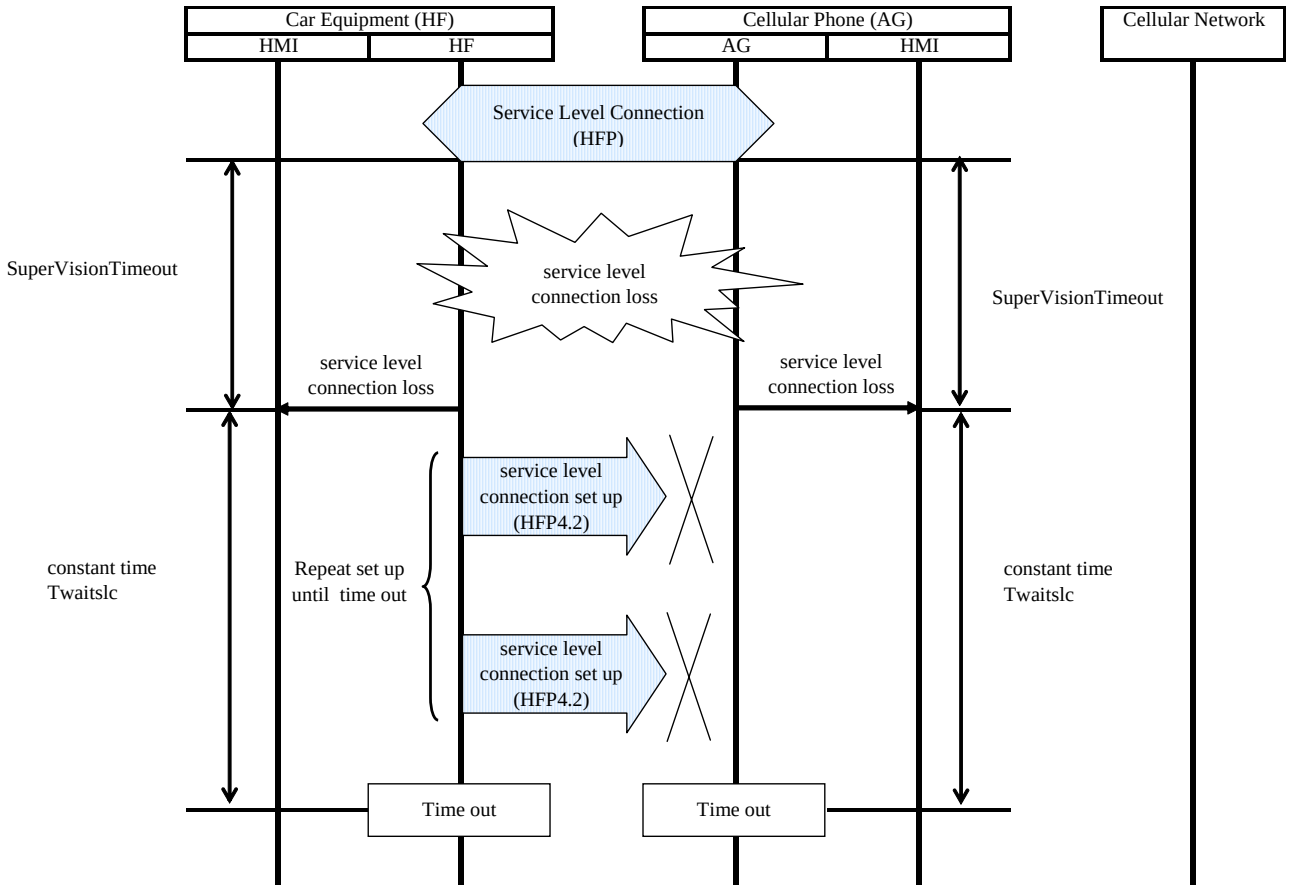
6.3.4. Incoming call (Canceling the call process due to no service for AG)



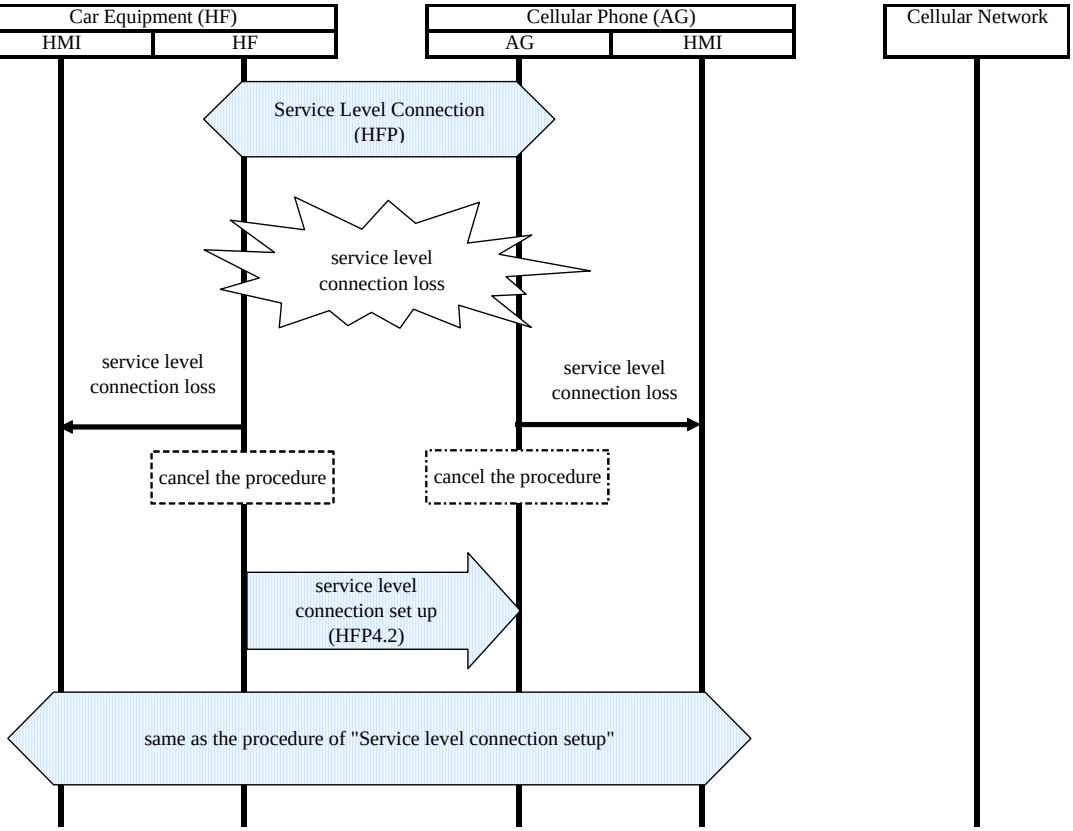
6.3.5. Service level connection loss during audio connection(the reconnection fails)



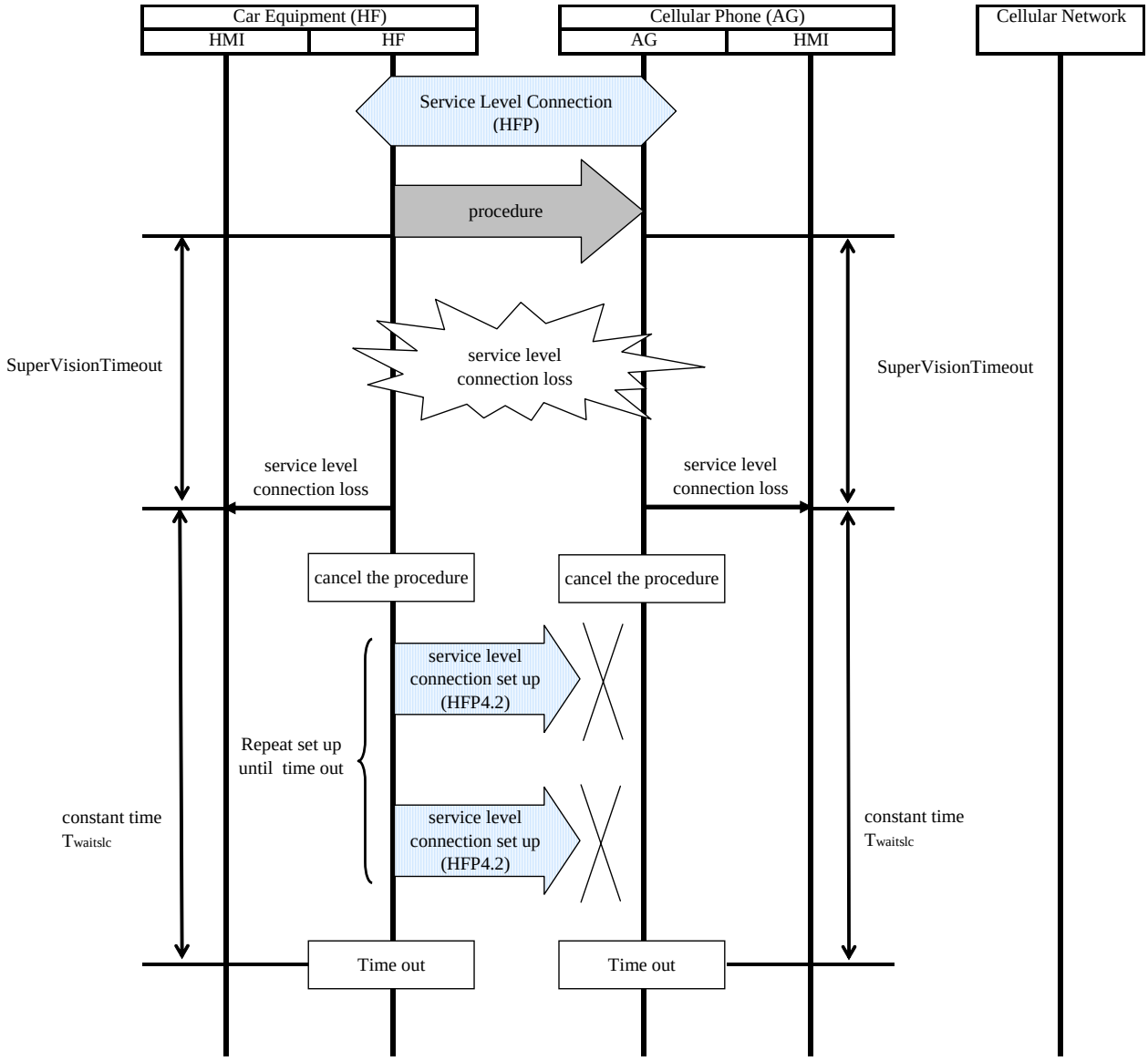
6.3.6. Service level connection loss during service level connection(the reconnection fails)



6.3.7. Service level connection loss and reconnection succeeded



6.3.8. Service level connection loss during the procedure(the reconnection fails)



7. For example (Use case)

Name: Mr. A
Address: S city (metropolitan)
Family: wife (recently-married)

-Travel version-

[Scene 1]
September 7 (Friday), 11:30 p.m.: Overdrinking a little at a party toasting the success of a three-month laborious project, I somehow made an appointment with my wife to have me picked up at the station. I was in a cheerful mode through my way home on the subway.

I passed through the wicket to find her on the way, apparently enjoying talking with someone on her cell phone that she bought recently. She just said, “Welcome back,” with a slight touch on her handset and got into the car. She continued that phone conversation even after getting into the car, with her phone switched to the HF mode (Audio connection transfer towards the HF, Operated by the AG). Yet, she was not bold enough to ignore me sitting in the seat next to her, and looked like lowered the speaker volume a little with the HF (Remote audio volume control / Volume level synchronization). Although I was a little disturbed with my trip plan starting tomorrow, all too soon I went to sleep into a dream.

[Scene 2]
Arriving at the airport, I rushed to a rent-a-car shop with which I had made a reservation via Net in advance. Rent-a-car shops nowadays have their procedural work streamlined to users’ comfort. The clerk asked me if I was familiar with using the optional HF function. A sense of confidence with it through my everyday use made me take it lightly, and I just hurried to the car without being able to control myself.

Getting in the driver’s seat, I at once attempted registration in the installed HF by operating my cell phone. Soon I found things not going well as usual! I rushed back to the shop to find that the HF had the previous user’s information still stored in it to prevent entry of my data (Registration from the AG <Already registered>). I had no choice but to ask the clerk to tell me how to, and managed to set it to work. Let’s drive!

[Scene 3]
While I was driving in high spirits, suddenly the HF started to ring. It was from my colleague Mr.G, appearing on the HF LCD (Calling line identification <CLI> notification). Recollecting a promise with my wife to refrain from talking about my job detail while we were on a trip together, I pushed down the button to reject with much regret. “Sorry, G” (Reject an incoming call from the HF).

[Scene 4]

After refueling on the way, I got back into the car and made a phone call to my hotel to check where the parking lot was located (Connection release from the HF and Connection set up from the HF). The HF on a car I rented previously did not have a function to reconnect automatically when the engine that was once turned off was turned on again. In that case, the Bluetooth connection remained disconnected. It was very inconvenient because I had to operate my cell phone to re-establish the connection (Connection release from the HF and Connection set up from the AG).

[Scene 5]

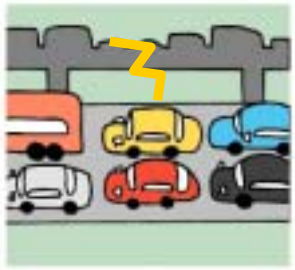
After driving around the grandeur for three days, time came to return the car. With some sorrow at parting with the HF which I had used a number of times in my precious communication during the trip, I cleared the registration and left the car behind (Connection release from the HF or Connection release from the AG).

-Golf Course version-

[Scene 1]

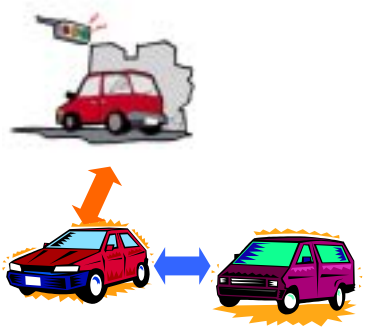
October 6 (Sunday), 6:00 a.m.: My wife served me a cup of coffee, and that gave me some relaxation early in that Sunday morning. I was then going out for golf after a long interval. Time came to leave home, and I got into my car that I had washed yesterday. The HF on my loved car provided service as soon as I turned on the key to run the engine even though my cell phone was in my pocket (Connection set up from the HF).

[Scene 2]



Traffic jams as usual on Sundays! I rang up my friend Mr. C to inform him that I would be late for the appointed time but would be hardly in time for the starting hole. Mr. C's phone number had been registered in advance, and I made the phone call with my voice without operating any buttons. The system is really convenient (Memory dialing from the HF and Voice recognition activation <Deactivated by the HF>).

[Scene 3]



While I was talking with Mr. C on that link, I had a call from another member Mr. D. I switched my conversation with Mr. C to the call-waiting mode, and started to talk with Mr. D. Soon I found it better to have Mr. C join our conversation, and switched the link to the three way calling mode (Three way calling). Anyway we all three would not be in time for the appointed time. So I decided to clear the call and continue driving (Terminate a call process from the HF).

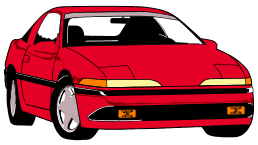
[Scene 4]

On the way I bought some drinks at a convenience store and drove to the course, relying only on my memory and roadside signs. What a hell! I couldn't remember the way on the last mile. I stopped driving and called Mr. C again with HF (Last number re-dial from the HF). With my older HF, if I walk away with my cell phone in my pocket somewhere out of the reach of Bluetooth, I had to manually connect it again (Terminate a call process from the AG and Connection set up from the AG). My new HF is really convenient. Such reconnection process is now automated (Terminate a call process from the AG and Connection set up from the HF).

I learned the correct way from Mr. C, and arrived at the course safely. I switched the engine off and rushed to the clubhouse where the members should be waiting for me (Connection release from the HF).

Mr. N who lives in City A:Male, age 37
Distance to work: 20 Km (Approx. 40 min.)
Time spent at work: 12 hrs.
Mr. N's Family:
His parents, wife and two daughters (six people altogether)
His wife is 35 and his two daughters are in grades 3 and 5

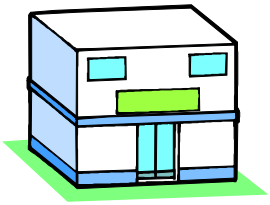
A Day in the Life of Mr. N (Weekday)



Today is Monday. Mr. N, who normally has difficulty waking up for work in the mornings, wakes up refreshed today. His new car arrived yesterday and he is unable to hide his excitement.

As it is time to get up, he wakes his wife, who is still sleeping soundly.

He has breakfast while reading the newspaper and prepares to leave for work. He heads out to the garage and gets into his new car. Every time he wanted to use (HF) in his old car he had to put his mobile phone on the console and run a cable to it. When he bought his new car, though, he had a Bluetooth compatible HF unit installed as an option, which saved him this trouble. He recalls his dealings with the Dealer yesterday.



While taking his new car that had just come in for a test drive yesterday, he had received a phone call. Despite the fact that ~~it~~ the HF unit came with Bluetooth, it didn't work! How strange!
He immediately went to the Dealer to complain. Mr. S, the person in charge there who was the same age as Mr. N, checked the users manual for the car.

Scene 1: Registering the phone
Mr. S performed the registration procedure for Mr. N's phone referring to the users manual. Both the HF unit and Mr. N's phone displayed they were successfully registered with each other. An indicator showing that the HF unit was ready for operation lit up on the HF display.

Scene 2: Receiving a call
"Mr. N, I'll call you to make sure that it works, alright?" said Mr. S.
Mr. N got into his car and waited for the phone to ring.
The sound of the phone ringing came from a car speaker.
Mr. N pressed the Hook button on the HF and heard Mr. S's voice from the car speaker.

Scene 3: Hanging up
Mr. N pressed the Hook button on the HF and hung up.

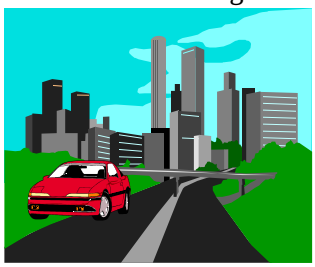
"If you leave Bluetooth of the phone on, you'll be able to use the HF anytime after you turn the ignition key!" said Mr. S.

Scene 4: Connection

After he turned the ignition off, he turned the ignition on again. The HF display showed the HF unit was ready for operation.
His problem was solved!

While remembering this, Mr. N turns the ignition on and starts the car. When he looks at the HF, he sees that the indicator that indicates the unit is ready for operation lights up on the display. He is amazed at just how convenient the world we live in has become.

Scene 5: Receiving a call



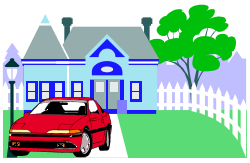
After about 15 minutes of riding in the car, the sound of the phone ringing comes from a car speaker. The ringing tone tells him that it is his wife. He presses the Hook button on the HF and starts a HF conversation.

The gist of the call is that his daughter wants him to pick up the latest edition of a magazine that has just come out.

Scene 6: Hanging up
Mr. N presses the Hook button on the HF and hangs up.

A Day in the Life of Mr. N (Weekend)

Today is Saturday, the beginning of a long awaited weekend. The children are going to swimming school. “Maybe I’ll just laze around the house all day.” he thinks. His wife is busy getting the kids ready for swimming school. “Bye,” they call out as they ~~left~~ leave. He heads into the kitchen to eat breakfast. His wife insists that they get some shopping done while the kids are at swimming school, ruining his plans of a lazy day around the house.



The shopping mall opens at 10:00 AM and it’s now 9:50 AM. His wife always keeps him waiting while she gets ready to go out. After waiting impatiently, he finally sees his wife coming out of the house.

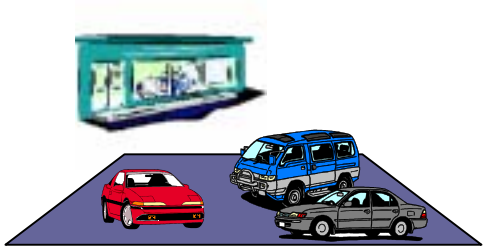
Scene 1: Connection
Mr. N gets in the car and turns the ignition on.
His wife takes her mobile phone out of her purse. “I wonder if I can use my phone with this HF unit, too.” she says.
The HF display indicates that the unit is ready for operation.
She makes a phone call on the HF. “The phone display isn’t changing.” she says.
His phone is in the calling state.
He presses the Hook button on the HF and hangs up.

Scene 2: Second AG registration

Mr. N turns the ignition off and then turns the power to his own phone off.
Then he turns the ignition back on. This time, the HF display does not indicate that the unit is ready for operation.
He takes his wife’s phone and performs the registration procedure. The HF unit now shows that it is ready for operation.

They take off in the car and head to the shopping mall about 20 minutes away. As they near the shopping mall, Mr. N’s wife suddenly asks him what he wants for lunch. “I’d like to have pizza, but I don’t think my parents would be up to it.

Scene 3: Making a call
Mr. N operates the HF unit and calls home.
A car speaker sounds the phone ringing several times before his mother answers it.



Scene 4: Out of Bluetooth range
Mr. N is still talking using the HF unit when he drives into the parking lot.
He parks the car and his wife immediately gets out.
His conversation with his mother is suddenly cut off after a while.

All he has been able to hear his mother say is that they would like to have sushi for lunch.
Then he remembers that his wife’s phone is connected to the HF unit.
He turns the car’s ignition off and heads to the entrance of the shopping mall to wait for his wife.

Mr. N's wife returns and he explains what happened.

Scene 4: Still out of Bluetooth range

Mr. N looks at the phone. The line is not busy. It is in the stand-by mode.
His wife says that she hasn't touched it. It must have just hung up automatically.

Mr. N picks up his phone and calls his mother back to say that they has been cut off and that he apologizes for the interruption.
They finish their shopping at the mall, get some take-out sushi and return to the car.

Scene 5:Changing the AG selection
Mr. N turns the ignition to his car on.
He refers to the manual and checks how to change the AG selection from his wife's phone to his own one. He enters the selection menu of the HF unit and selects his phone.
The display on his own phone indicates that it is connected to Bluetooth.

Scene 6: Talking using only AG
On the way home, Mr. N's wife decides to call home because the children should have just gotten home from swimming school. She takes Mr. N's phone, makes a phone call and talks on it, without the HF unit.

Scene 7: AG → HF audio connection
The kids say they want hamburgers for lunch. They go to a drive-through and switch to the HF mode. The kids' voices comes from a car speaker.

Scene 7: HF VOL operation
They turn up the receiving volume on the phone so that the children's voices could be heard loudly from the car speaker. The person working at the counter listens to what the children say they want and take their orders.

Scene 8: Hanging up with the AG
Mr. N's wife presses the OFF Hook button on the phone and hangs up.

Mr. N then drives the car around to the pick-up window. The person at the window looks surprised and asks where the little girls are. Mr. N tells her that the kids ordered over the phone. After they receive the hamburgers just as the kids have requested them, they drive home.

Bluetooth
Hands-Free Profile
Application Guideline
Appendix A

Ver1.0

June. 20, 2003

CCAP

(Car - Communication - Application - Promotion)

1. Introduction

This appendix is an additional and a supplemental specification of CCAP Application Guideline for Hands-Free Profile (HFP) issued by the Bluetooth Special Interest Group (SIG).

HFP does not specify the status of the battery and the electric field strength of the AG. However, it might be necessary for the HF to receive and display these information on the screen of the actual products. This appendix specifies how these undefined specifications should be processed. Also this specifies how “Response and “Hold” function specific to Japan should be realized.

1.1. Target System

Figure 1.1 shows the configuration of the target system.

“AG” covers both mobile phones embedded Bluetooth and installed a Bluetooth adapter.

“HF” enables the additional functions displaying the subscriber number, battery level and electric field strength on the screen. Also “Response and Hold” switch is added for the localized function (Japanese specification).

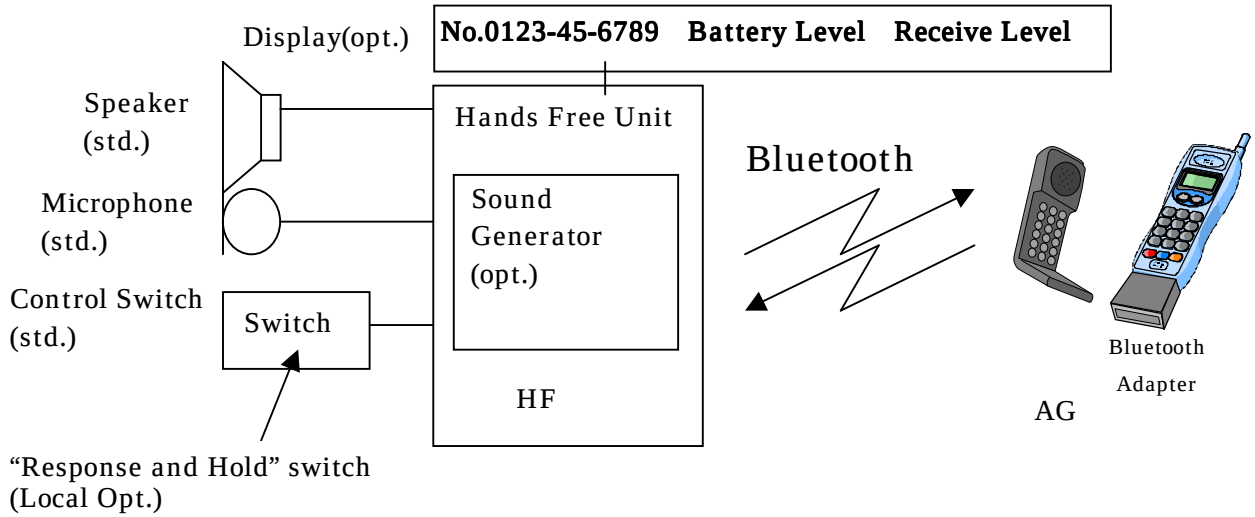


Chart 1.1 Target System

1.2. Recommendations for Bluetooth Adapter with AG function

It is recommended that a Bluetooth Adapter with AG function connected to the handsfree/data interface which a cellular phone of Japan has the following functions.

Basically, It is recommended that the Bluetooth Adapter is controllable from a cellular phone. It recommends that having a function for performing minimal setup operations (for example, path keystroke etc.) when using an AG application, and also the functions to start the registry operation for a simple cellular-phone/Bluetooth-Adapter' configuration if possible. Moreover, It is necessary to have either the cellular phone or the Bluetooth adapter with switch or mechanism to perform the registry operation, and also have some indicator for check the connection state of Bluetooth link.

It is recommended that the volume level which Bluetooth Adapter outputs is adjusted to the optimal level. Or it recommends having a function for adjusting the volume of Bluetooth adapter outputs.

2. Usage scenario

The objective and description method of this section are same as those of core guideline.

Usage Scenarios

Scenario Category	Scenario Name	Initial Status			Support in HF	Support in AG	Scenario Description	HFP Section
		SLC**	AC***	Call				
Others	Indicate the Subscriber Number Information	E	?	?	O	O	The HF gets the subscriber number information from the AG.	
Respond and Hold	Put an Incoming call on Hold from the HF (No in-band ringing)	E	?	X	O	O	The HF puts an incoming call on hold (No in-band ringing).	-
	Put an Incoming call on Hold from the HF (In-band ringing)	E	?	X	O	O	The HF puts an incoming call on hold (In-band ringing).	-
	Put an Incoming call on Hold from the AG (No in-band ringing)	E	?	X	O	O	The AG puts an incoming call on hold (No in-band ringing).	
	Put an Incoming call on Hold from the AG (In-band ringing)	E	?	X	O	O	The AG puts an incoming call on hold (In-band ringing).	
	Accept a held incoming call from the HF (No SCO link)	E	?	O	O	O	The HF accepts a held incoming call (No SCO link).	
	Accept a held incoming call from the HF (SCO link present)	E	?	O	O	O	The HF accepts a held incoming call (SCO link present).	
	Accept a held incoming call from the AG (No SCO link)	E	?	O	O	O	The AG accepts a held incoming call (No SCO link).	
	Accept a held incoming call from the AG (SCO link present)	E	?	O	O	O	The AG accepts a held incoming call (SCO link present).	
	Reject a held incoming call from the HF (No SCO link)	E	?	O	O	O	The HF rejects a held incoming call (No SCO link).	-
	Reject a held incoming call from the HF (SCO link present)	E	?	O	O	O	The HF rejects a held incoming call (SCO link present).	-
	Reject a held incoming call from the AG (No SCO link)	E	?	O	O	O	The AG rejects a held incoming call (No SCO link).	-
	Reject a held incoming call from the AG (SCO link present)	E	?	O	O	O	The AG rejects a held incoming call (SCO link present).	-
	Held incoming call terminated by Caller (No SCO link)	E	?	O	O	O	The held incoming call is terminated by caller (No SCO link).	-
	Held incoming call terminated by Caller (SCO link present)	E	?	O	O	O	The held incoming call is terminated by caller (SCO link present).	-

Note: Usage Scenarios colored yellow are not defined in HFP.

E : Exist M: Mandatory
X : Not Exist O: Option
?: Both case are assumed ** SLC: Service Level Connection *** AC: Audio Connection

3. Basic philosophy

The objective and description method of this section are same as those of core guideline.

3.1 Recommendations for Hands-Free Profile

Item	HFP	Recommendation	Reason
Support of rejecting an incoming call	-	For Japanese cellular network, it is recommended that the function to reject an incoming call be supported by the AG.	It is mandatory for the HF to support the function to reject an incoming call. Therefore if the AG doesn't support this function, users feel very inconvenient.
Timing to transmit +CIEV (call=1)	-	For Japanese cellular phones, it is recommended that the timing to transmit +CIEV (call=1), which notifies the starting of the call in the incoming call and the outgoing call, be the timing that the charge starts in the cellular network.	To show the charging time for the user in the AG
Timing of audio connection release in a terminating call and rejecting an incoming call with in-band ringing	-	When terminating a call is initiated by the cellular network or the AG's internal events (the AG's no service and so on), it is recommended that the AG keep the audio connection for the defined time after the AG terminated a call to cellular network.	Users can confirm the busy tone from the cellular network
battery charge level and signal quality	-	In the HFP, three indicators, "service", "call" and "call_setup" are covered as parameters for AT+CIND command. In addition to these indicators, it is desirable "battchg" (for battery charge level) and "signal" (for signal quality) indicators should be supported by the AG. The value of them which are transferred from the AG to the HF as a parameter of +CIEV unsolicited result code range form 0 to 5 (See also the "Parameter" section).	For users' convenience.

3.2 Additional functions

It is recommended that the following functions be supported in Japanese cellular phones.

A. Subscriber number information
B. Respond and hold function

These functions are initiated by AT commands from the HF. These AT commands are not defined in the HFP. In the HFP 4.24.4, there is a description that the AG shall respond with the proper error indication to any unknown command received from the HF. So, in case the HF transmits these AT commands and receives error indication, the HF can know that these functions are not supported in the AG. Therefore, this extension doesn't disturb the proper action of the AG.

Recommendations for respond and hold (1/2)

Item	HFP	Recommendation	Reason
Holding tone	-	Ifthe SDP record of the AG or +BSIR result code shows that the in-band ring tone capability is off, it is recommended the HF generate the holding tone.	If the AG cannot transmit its generating tone over the audio connection, the HF generates the holding tone.
Holding tone switching timing (no in-band ringing)		When there is an incoming call with no in-band ring and the HF put an incoming call on hold, the HF switches the generating tone from the ring tone to holding tone. It is recommended the HF switches the generating tone from the ring tone to holding tone, when a proper result code is transmitted from the AG to the HF.	To define the timing to switch audio path in the HF.
HF timing of audio switching in accepting a held call (no in-band ringing, audio present)	-	When there is a HF held call with no in-band ringing and there is an audio connection, the HF outputs the local holding tone. And about accepting the held call from the HF, it is recommended that the HF switch the audio path from the local holding tone to the audio on the audio connection when a proper result code is transmitted from the AG to the HF.	To define the timing to switch audio path in the HF.
HF timing of audio switching in incoming call (no in-band ringing, audio absent)	-	When there is an incoming call with no in-band ringing and there is no audio connection, the HF outputs the local holding tone. And about accepting the held call from the HF, it is recommended that the HF switch the audio path from the local holding tone to the audio on the audio connection when the audio connection is set up.	To define the timing to switch audio path in the HF.

Recommendations for respond and hold (2/2)

Item	HFP	Recommendation	Reason
HF timing of audio switching in rejecting or terminating a held call(no in-band ringing, audio present)	-	When there is a HF held call with no in-band ringing and there is an audio connection, the HF outputs the local holding tone. And about rejecting the held call from the HF or terminating the held call from the caller, it is recommended that the HF switch the audio path from the local holding tone to the audio on the audio connection when a proper result code is transmitted from the AG to the HF.	To define the timing to switch audio path in the HF.
HF timing to stop local holding tone (no in-band ringing, audio absent)	-	When there is a HF held call with no in-band ringing and there is no audio connection, the HF outputs local holding tone. And about rejecting the held call from the HF or terminating the held call from the caller, it is recommended that the HF stop the local holding tone when a proper result code is transmitted from the AG to the HF.	To define the timing to switch audio path in the HF.

4. Parameters

The objective and description method of this section are same as those of core guideline.

Additional functions

Item	Parameter	Value, range	Reason	Spec
+CIND	Indicator <ind>	It is desirable that indicators, "battchg" and "signal", are supported by the AG in addition to "service", "call" and "call_setup"	To indicate battery charge level and signal quality on the HF.	ETS 300 916
+CIEV	current status of the indicator <value>	0-5 *	According to ETS 300 916.	

* For AGs or HFs that handle battery charge level and/or signal quality internally with value of 0-3, it is recommended that the internal value and the +CIEV parameter be converted as follows:

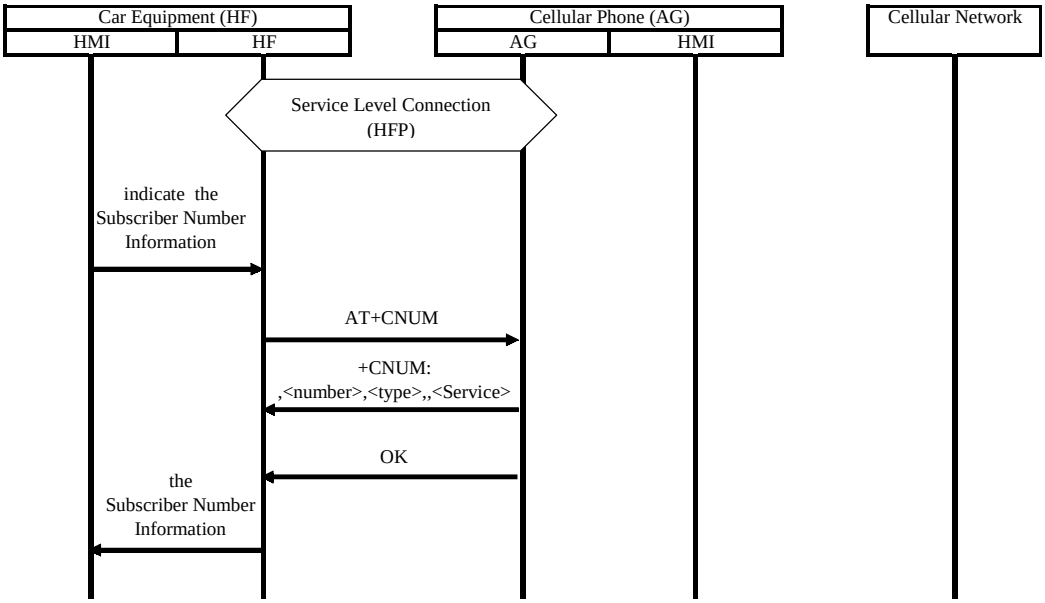
AG internal value	0	1		2		3
+CIEV parameter	0	1	2	3	4	5
HF internal value	0	1	1	2	2	3

For example, if the battery charge level is handled internally with value 0-3 in an AG and its current charge level is 2, the parameter of +CIEV result code should be 3.

If the signal quality is handled internally with value 0-3 in an HF and it received +CIEV with parameter "4", it should be translated to 2 as an internal value of the HF.

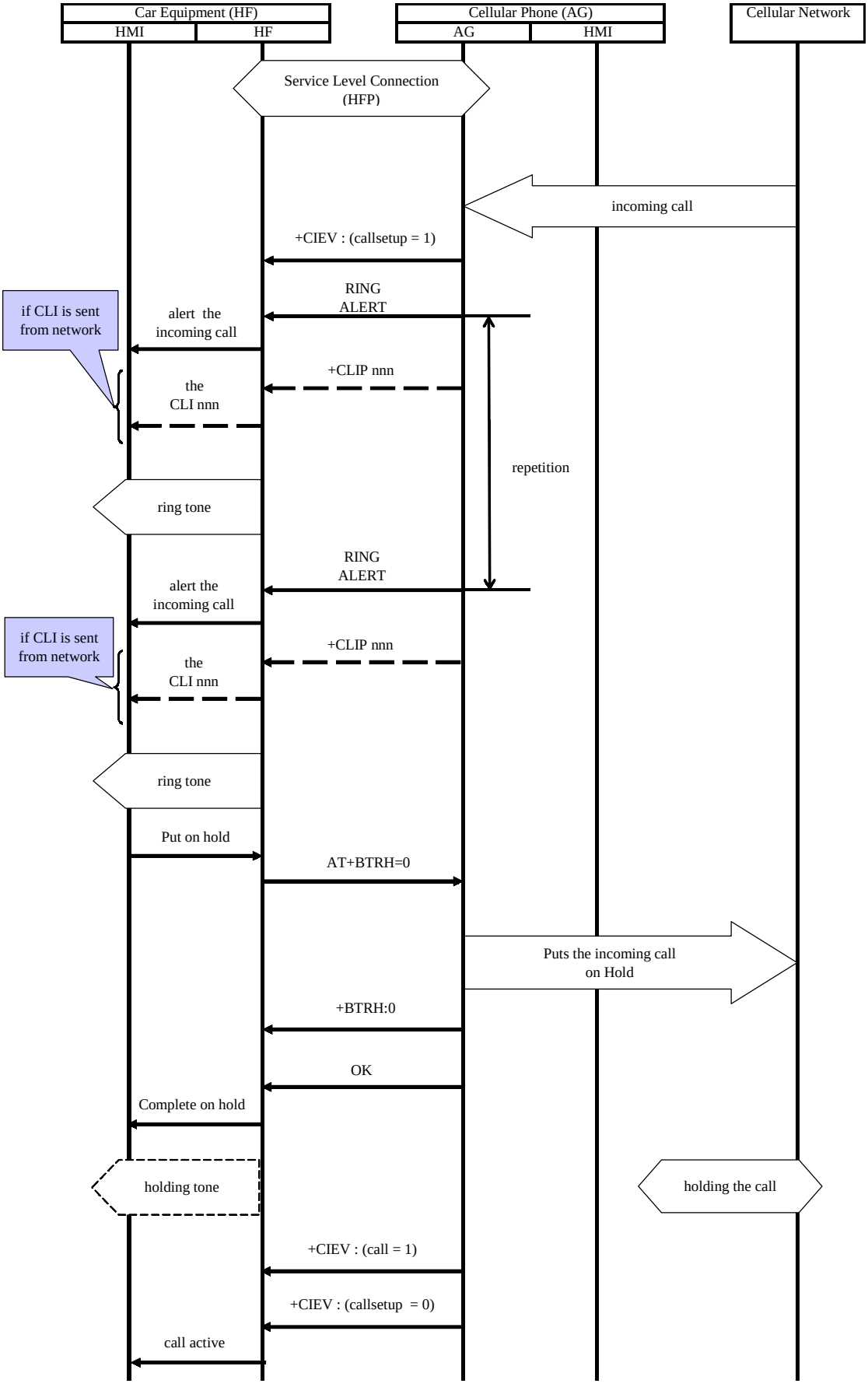
5. Sequence chart

1.3. Indicate the Subscriber Number Information

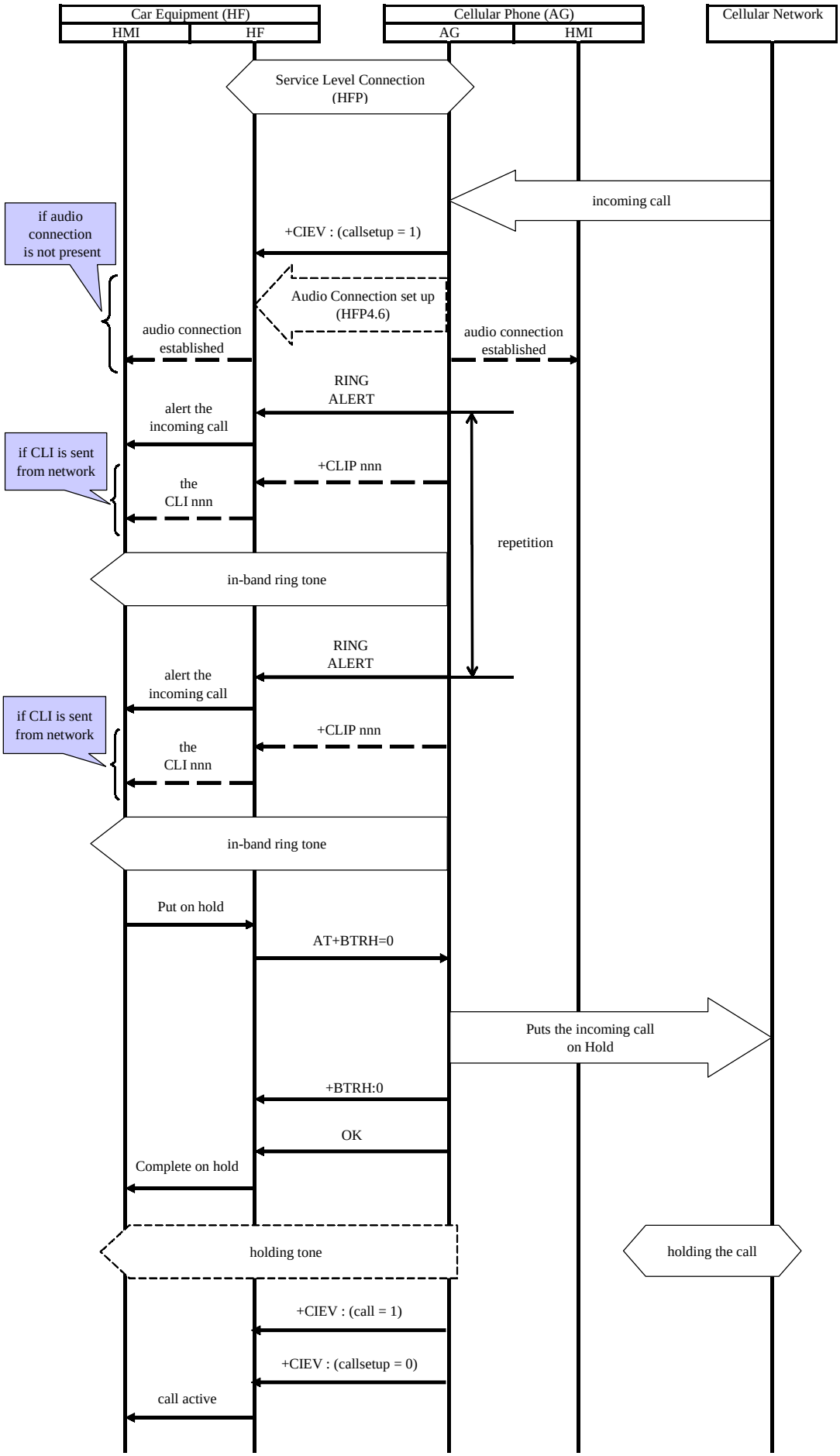


5.2 Response and Hold

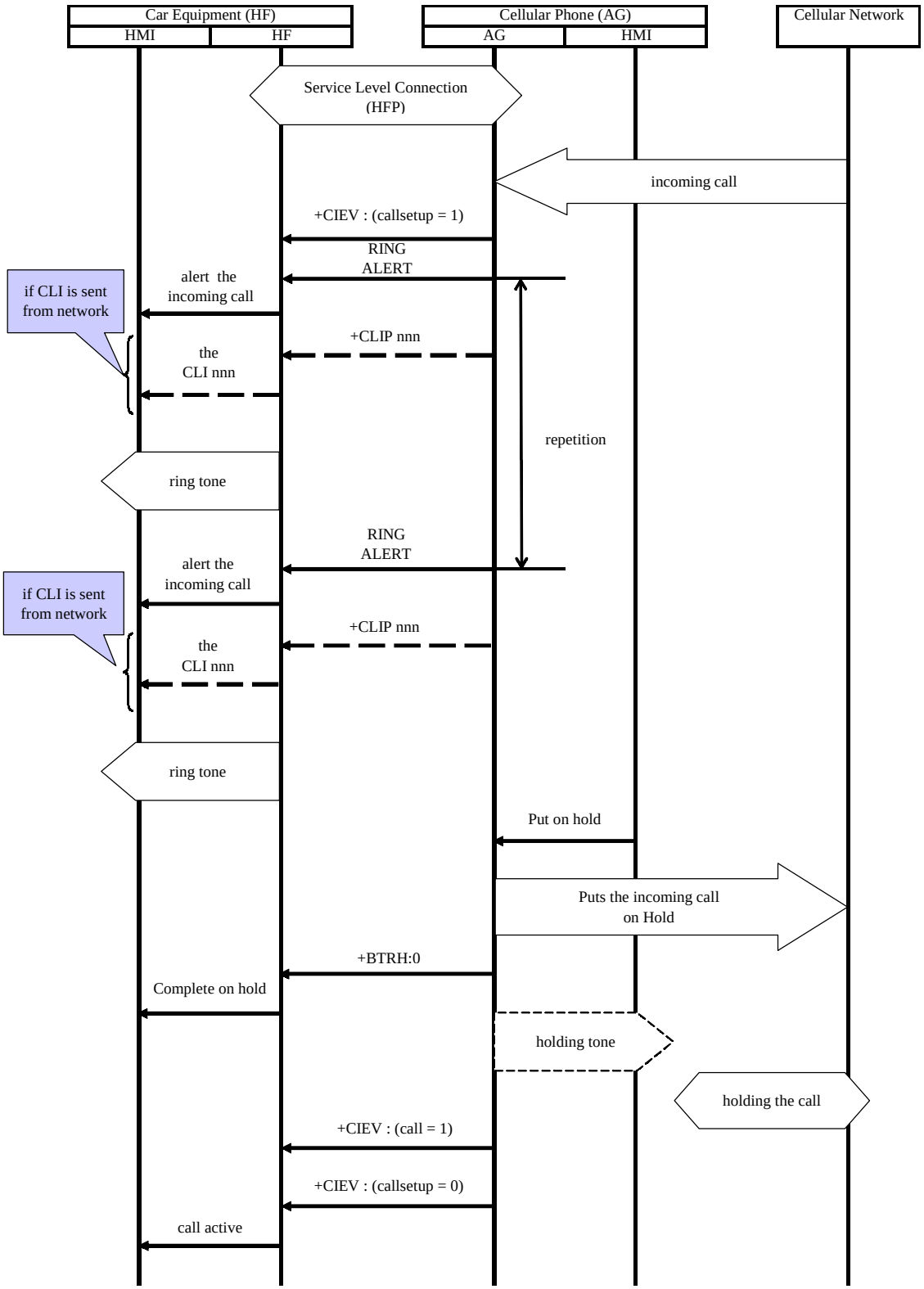
5.2.2 Put an Incoming call on Hold from the HF (No in-band ringing)



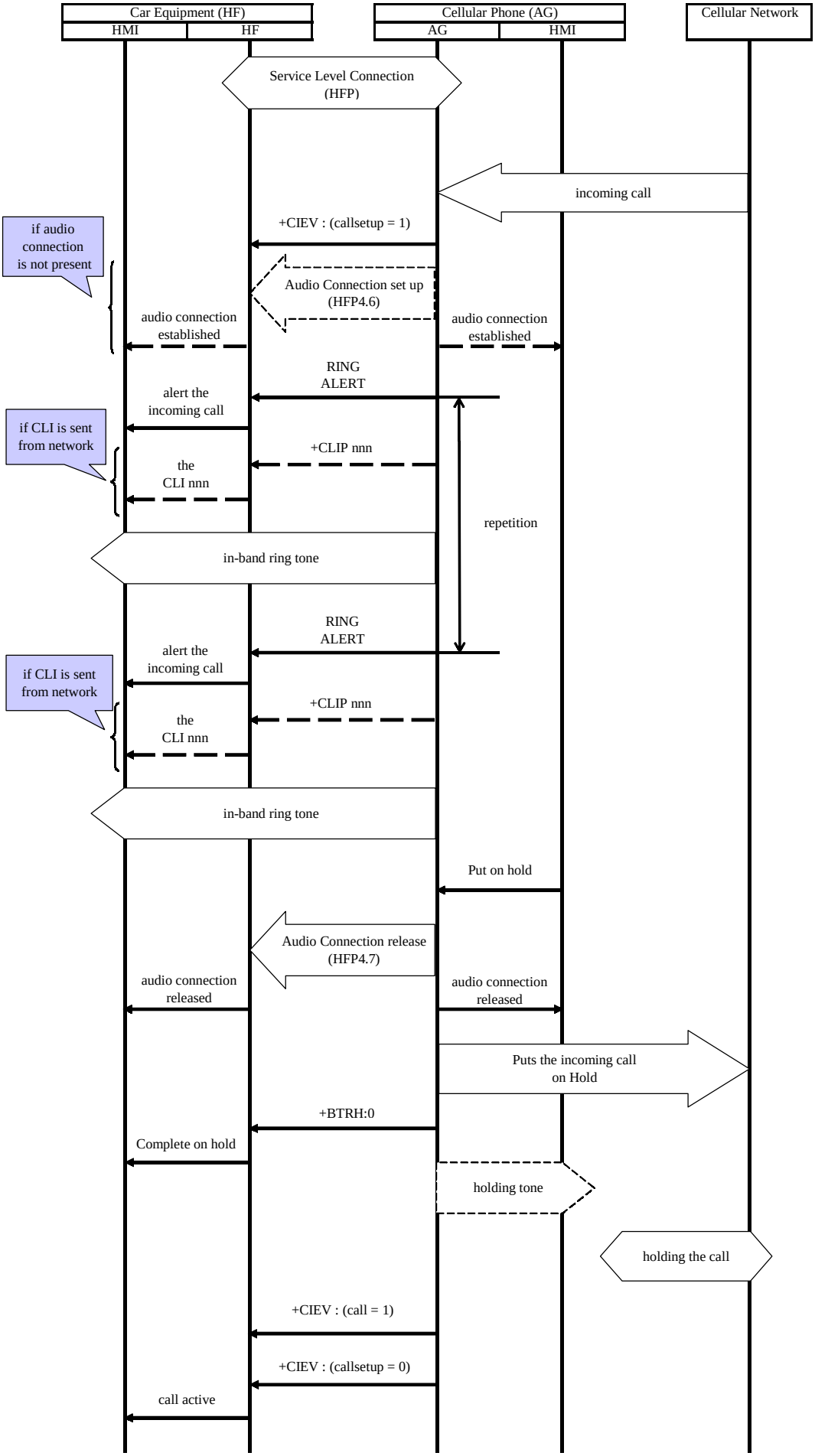
5.2.3 Put an Incoming call on Hold from the HF (In-band ringing)



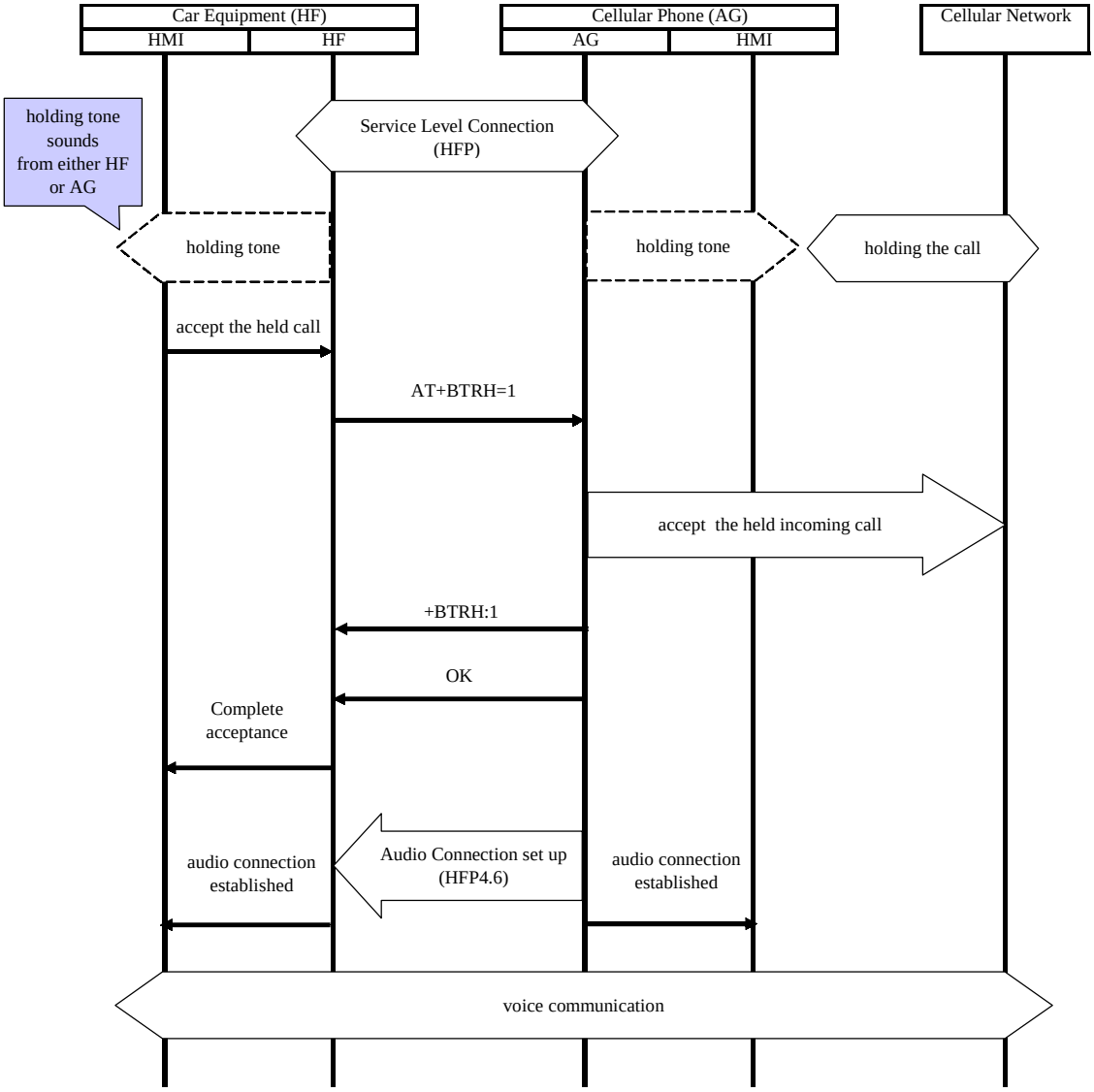
5.2.4 Put an Incoming call on Hold from the AG (No in-band ringing)



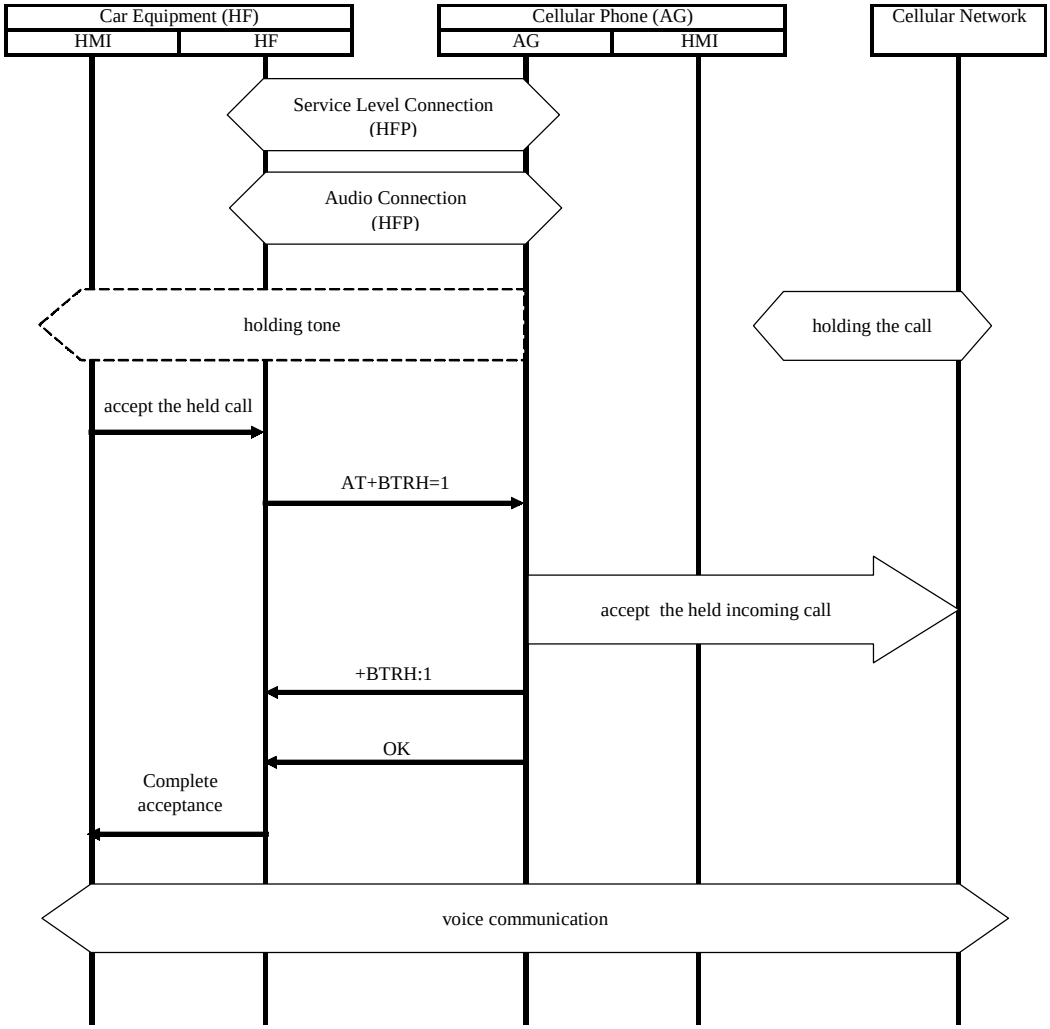
5.2.5 Put an Incoming call on Hold from the AG (In-band ringing)



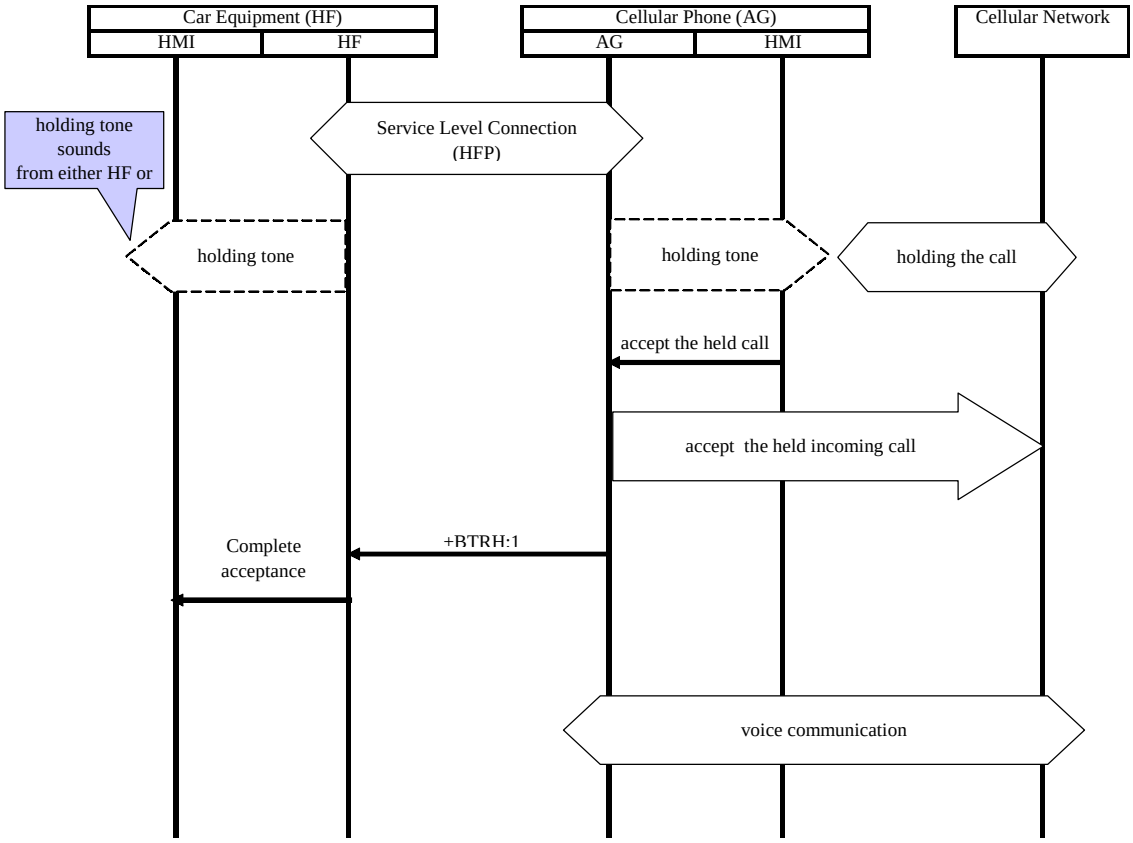
5.2.6 Accept a held incoming call from the HF (No SCO link)



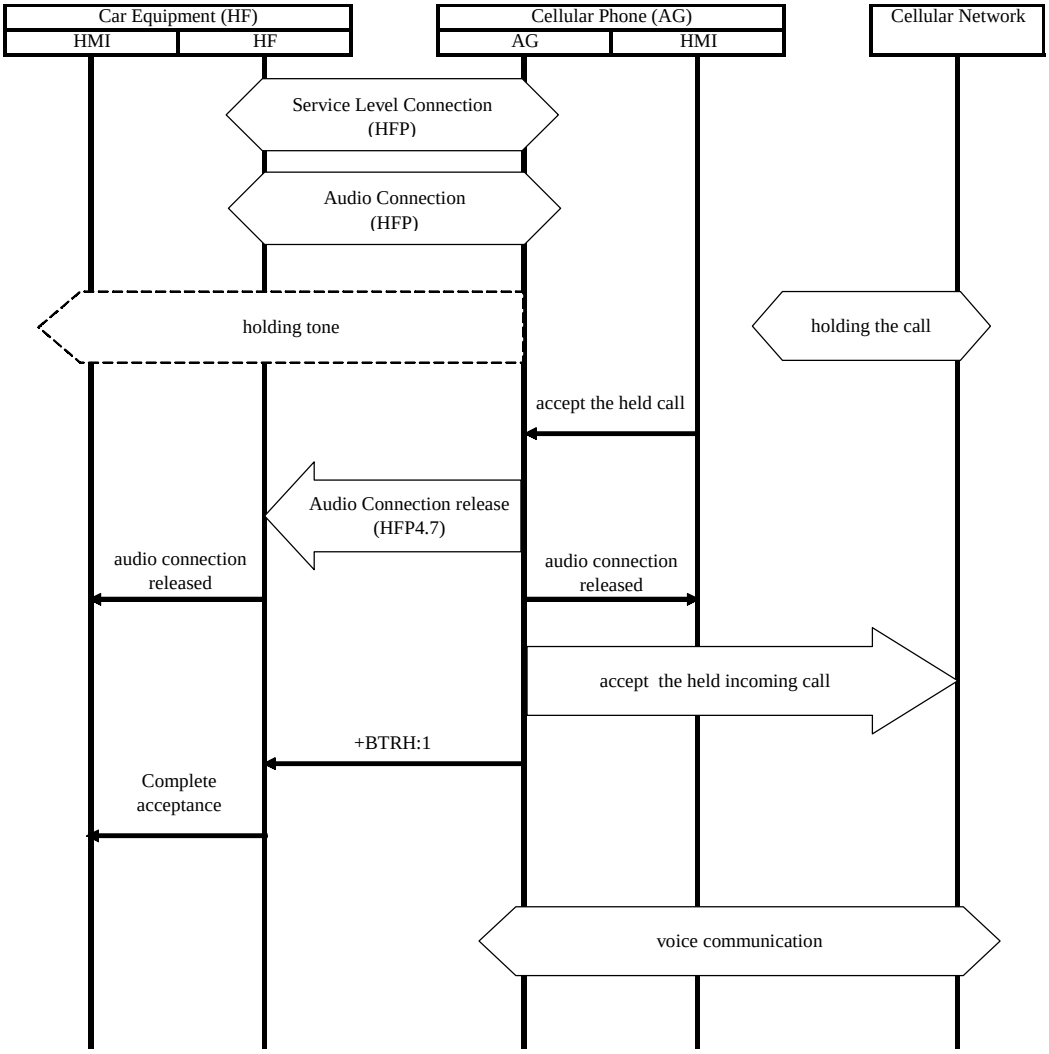
5.2.7 Accept a held incoming call from the HF (SCO link present)



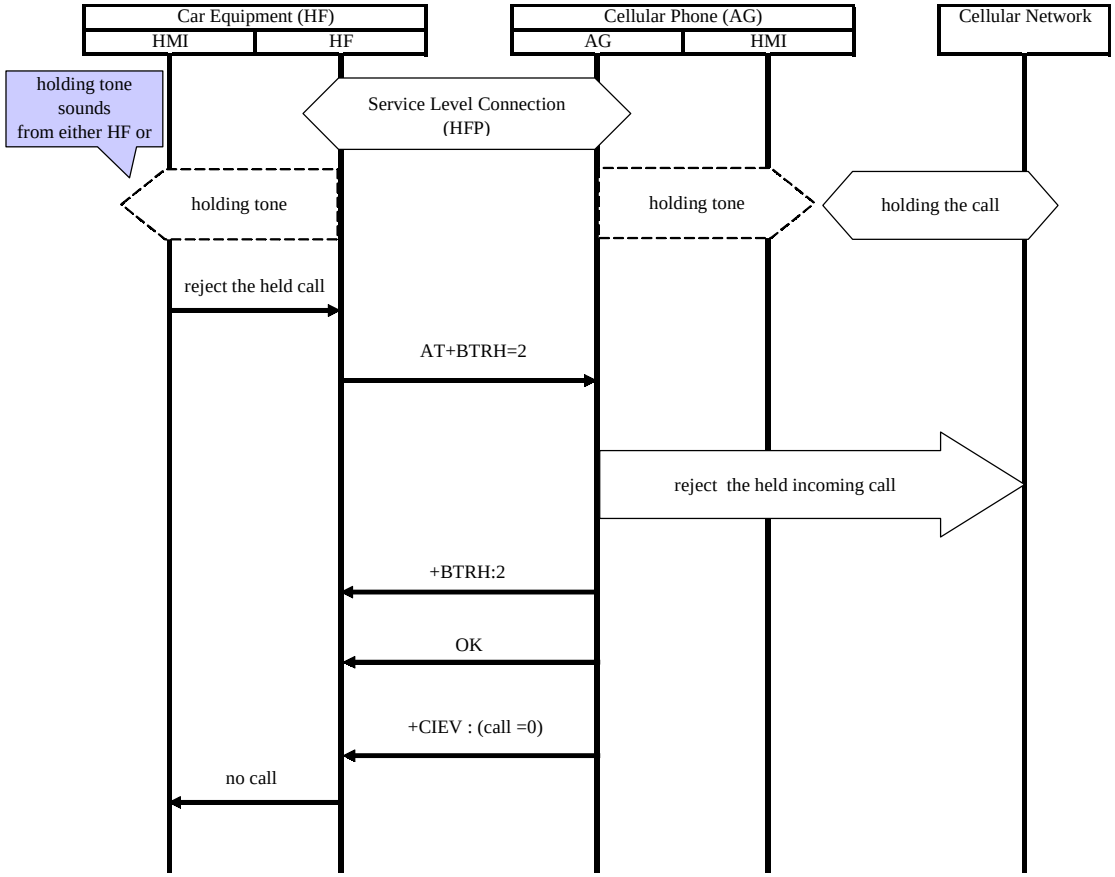
5.2.8 Accept a held incoming call from the AG (No SCO link)



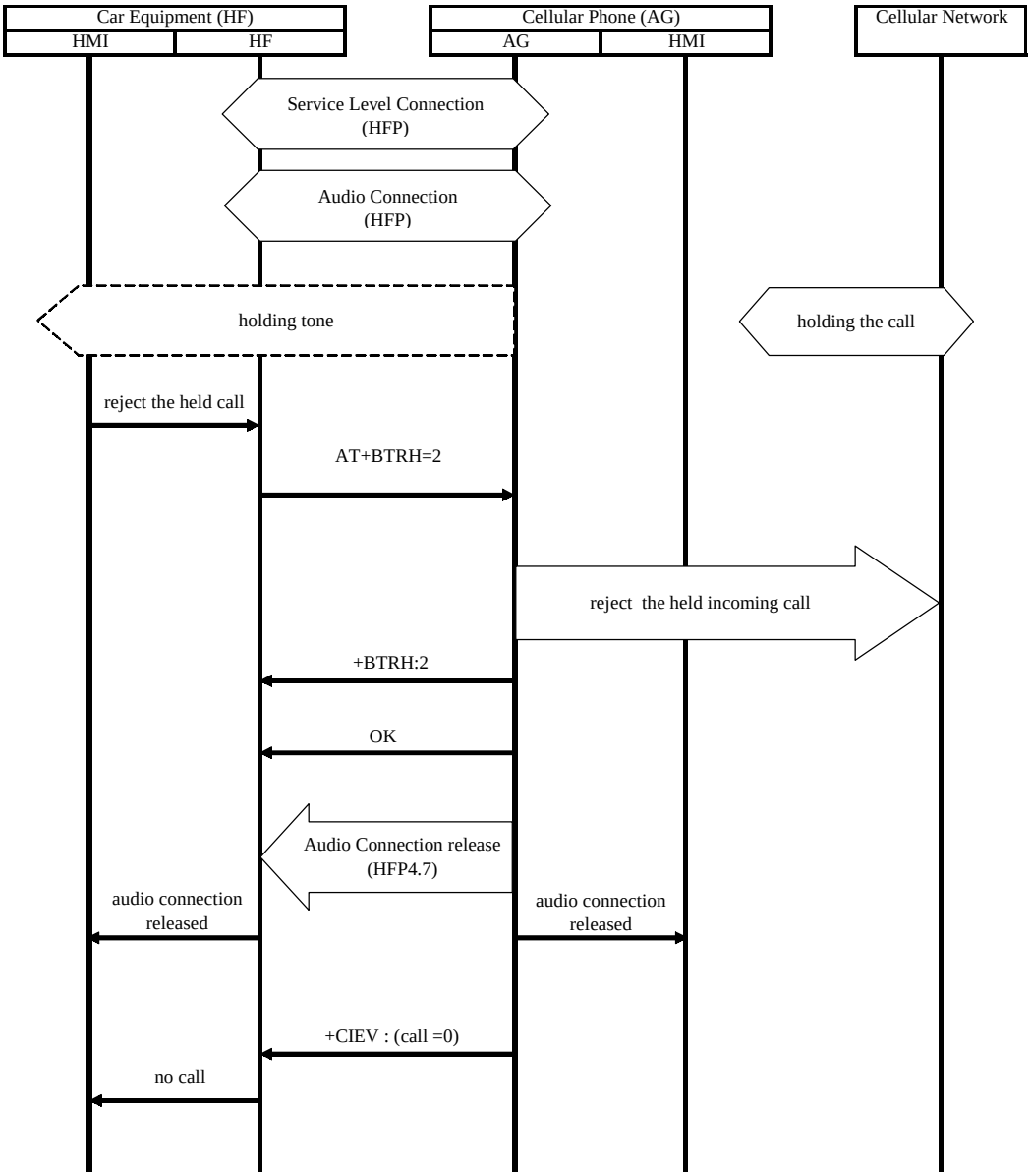
5.2.9 Accept a held incoming call from the AG (SCO link present)



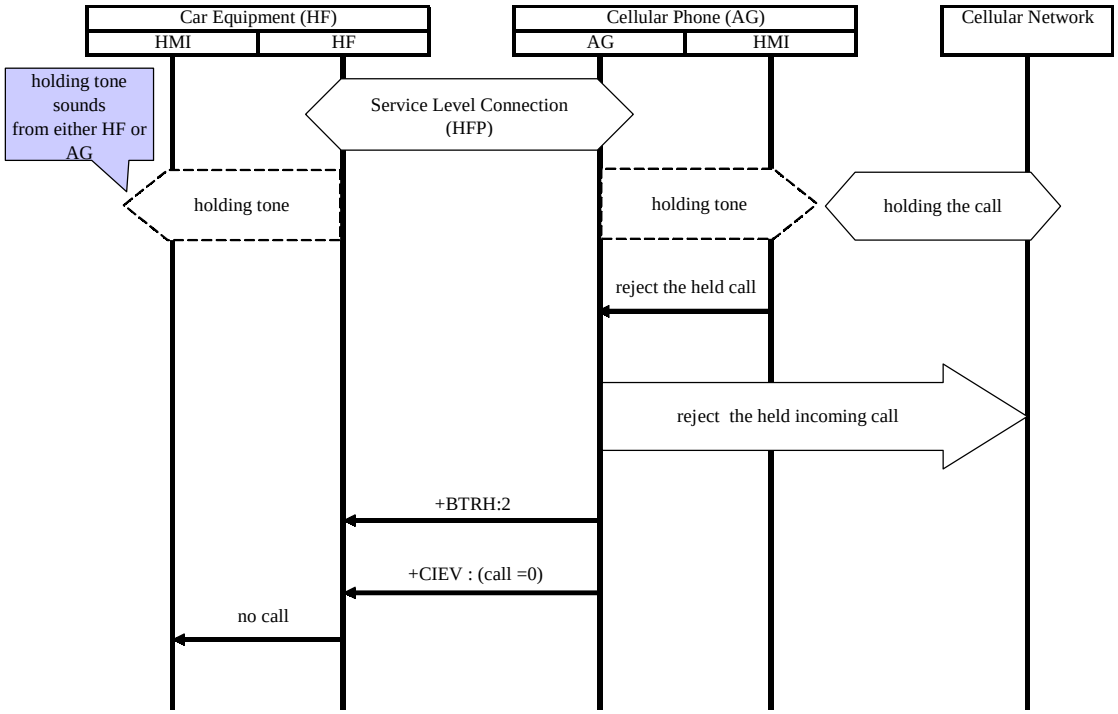
5.2.10 Reject a held incoming call from the HF (No SCO link)



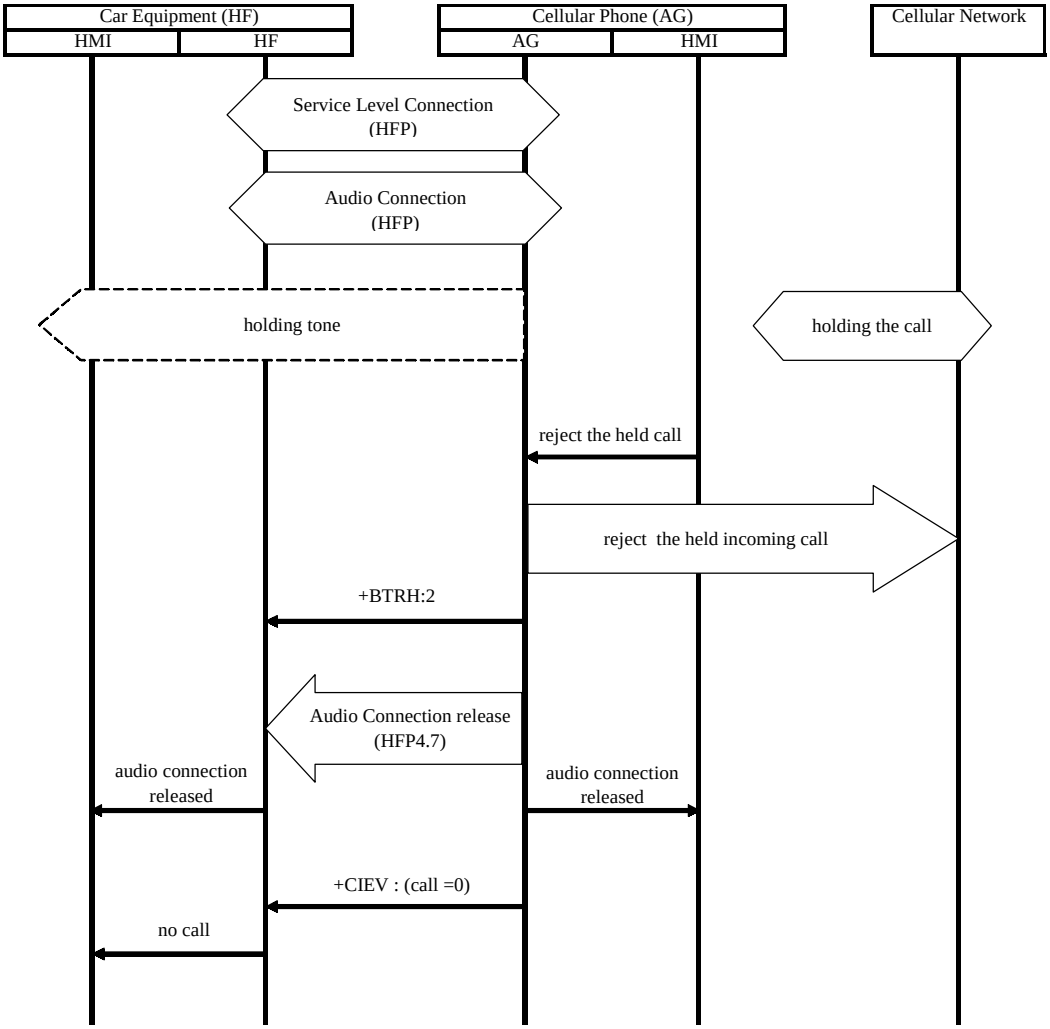
5.2.11 Reject a held incoming call from the HF (SCO link present)



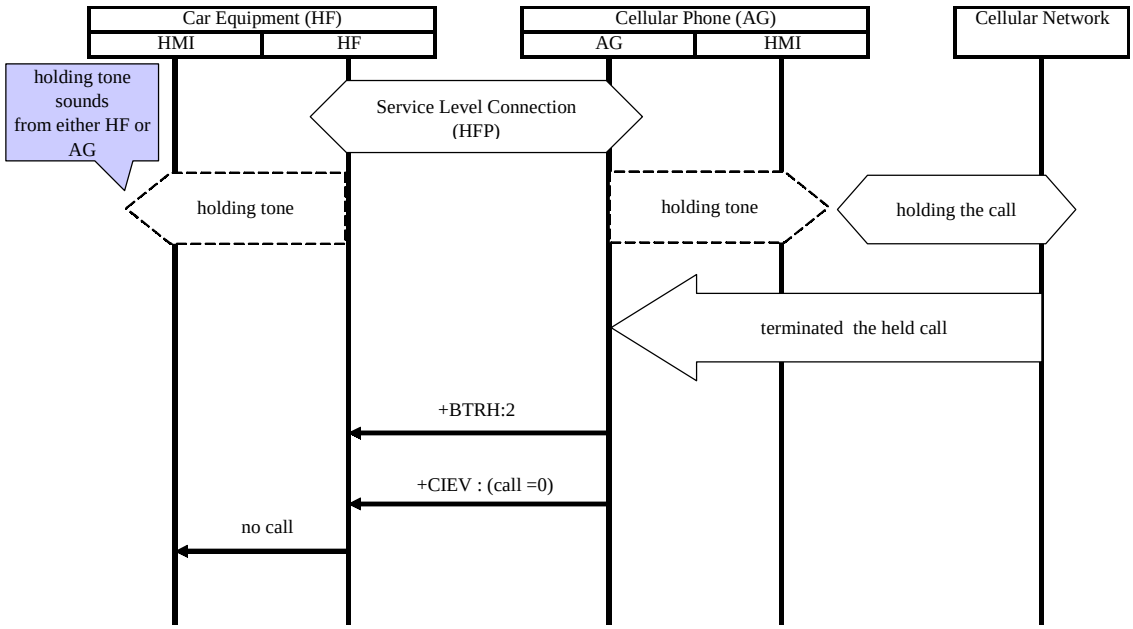
5.2.12 Reject a held incoming call from the AG (No SCO link)



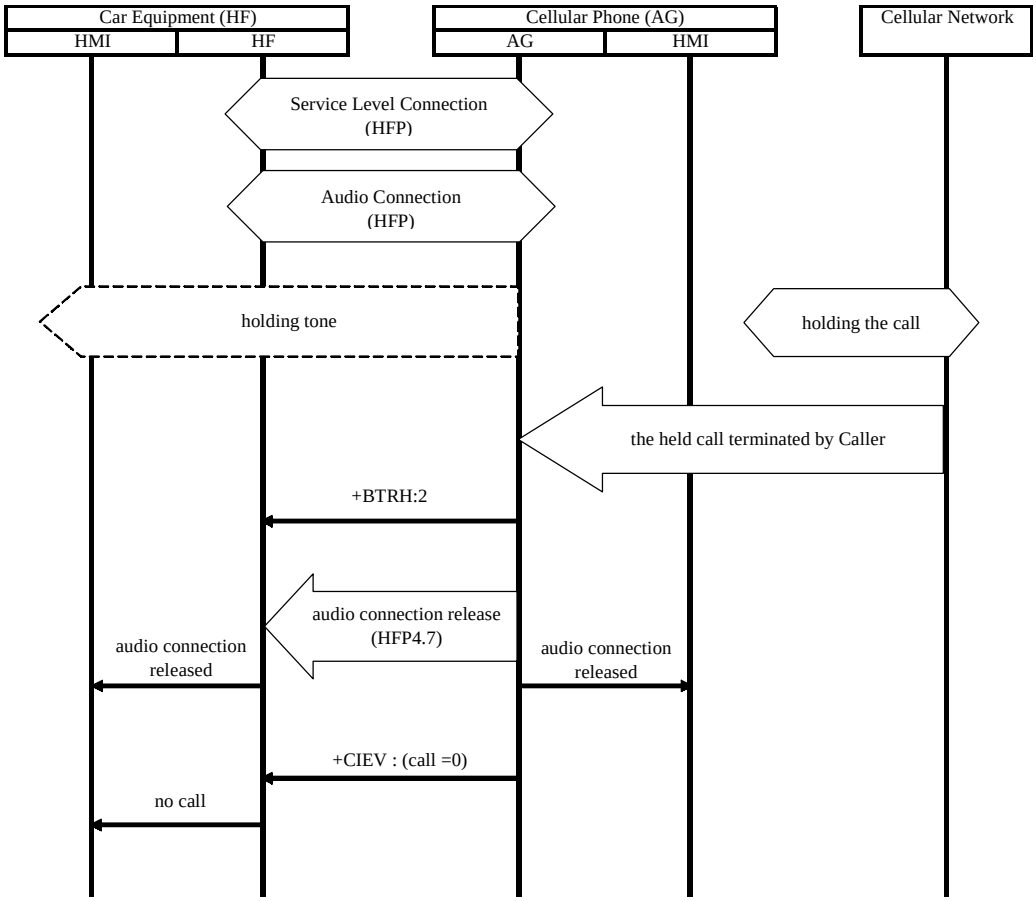
5.2.13 Reject a held incoming call from the AG (SCO link present)



5.2.14 Held incoming call terminated by Caller (No SCO link)



5.2.15 Held incoming call terminated by Caller (SCO link present)



6. For example (Use case)

Mr. T living in the city of Y, Male, 42 years old, Married, one child
Distance to his office: 35 Km (It takes about 90 minutes)

A Day in the Life of Mr. T (Weekday)

I was woken by the alarm clock earlier than usual. A meeting is scheduled this morning at 7: 30. I usually have breakfast with my family, but today I finished it alone and left the house.

[Scene 1]

I got into the car and started the engine. An alarm tone from the HandsFree and my cell phone number was displayed. The car I bought three months ago is now equipped with a Hands-Free utilizing Bluetooth for connection. Seems the connection is made with a terminal in the bag. The remaining amount of battery displayed on the HandsFree indicated the second level. I didn't charge the battery last night but it will last all day today.

[Scene 2]

Since I left home earlier than usual the traffic was smooth. I approached a toll road. When receiving a ticket at the tollbooth a ringer tone rang. Since I couldn't answer for a while I used the HandsFree to hold the cell temporarily. After I left the booth and joined the traffic, I canceled the hold and took the phone. It was my wife. She wanted to confirm the place where we were supposed to meet for that tonight's classical music concert. I promised to visit her office at six in the evening and finished the call.

[Scene 3]

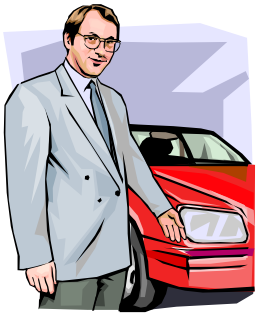
Today I left the office earlier than usual. I drove the car to the office of my wife. As I was worried the traffic was rather heavy and it looked like I would be a little late, I tried to make a call to her but the car came to a standstill because there was so much traffic. I checked the field signal strength by the indicator of the HandsFree. Since the strength seemed merely adequate I called my wife. Sounded like she had just come to a pause at work. I told her that I would be about ten minutes late and hung up. The traffic continued. It was likely caused by road construction at a crossroad a little ahead.

I arrived at the office five minutes late. My wife was waving to me. We will probably be in time for the concert.

Mr. H living in the city of I,
Male, 36 years old, Married, DINK.

- The day of a holiday -
Saturday morning. I woke up earlier than usual. This is the day of the delivery of a new car waited for a long time. Some time is left before a delivery. I prepared breakfast and woke my wife up.

[Scene 1]



Mr. Y, the person in charge of my family dealer, arrived. I went to the garage and a new car was waiting there. He explained about the equipment and how to use it. He says this new car is equipped with a HandsFree function using the Bluetooth, which requires a cell phone corresponding to the Bluetooth. But my cell phone doesn't have such a function. "To my regret I can't use the function," I told Mr. Y, and he replied that I could buy an adapter for the Bluetooth. My product does not function unless it is provided with a HandsFree function. At this good occasion I would like to buy one and asked Mr. Y about the manufacturer's name and model number.

[Scene 2]
Driving the new car I went to buy an adapter for Bluetooth, and tried it with wife in my garage. I waited some time after inserting the adapter into my cell phone but it didn't work. The indicator showing connection status indicated that there was no connection. When I was at a loss for what to do, wife, who was reading the manual, told me that it might be necessary to register the cell phone number to the HandsFree. That reminded me that I had gone through a similar procedure when connecting my PC and PDA using Bluetooth.

[Scene 3]
Unlike the PDA I am using, the cell phone does not seem to have a menu for Bluetooth. It looks OK if settings are made and memory is set to the cell phone according to the manual.
Once the registration to the HandsFree was made, a message indicating the completion of the connection appeared on the display. Checking the cell phone I found the indicator showing connection status indicated that the connection was made.

[Scene 4]

Now we were ready to use the telephone, I believe. I asked my wife to make a call from outside. After a while a ringer tone showing the incoming call from wife was heard from the audio speaker. Looking into the HandsFree I found my wife's cell phone number displayed. I pressed the button, and there was my wife's voice. It seems the system is working now. As a trial the adapter was inserted into my wife's cell phone and the connection failed. According to the manual, the adapter is compatible with my unit. My wife complains that it is not fair that only I can use the function. It may be a good idea to take her to a nice lunch to get on her good side.

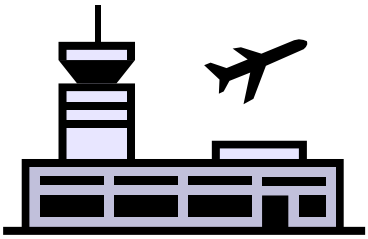
- The day of a travel -

The long awaited consecutive holidays start today. My wife wants to visit a resort about 1500 km away and we are supposed fly there and then rent a car for a three day trip.

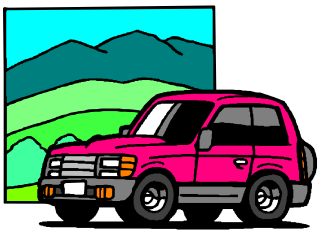
To be honest, I wished drive my new car. But on second thought, I was thinking while going to the airport that it would be good to take a faster way to our destination.

[Scene 1]

Arriving at the airport of the destination, we first got into a microbus to get the rental car. At the rental car office they explained the functions of the reserved car. I had requested a car equipped with a HandsFree cell phone. They said that the system accommodates a Bluetooth. Since it took some time to go through registration with my own car, I asked them to help me with the registration. As I was worried because the operation of registration seemed different from the one for my car. I had already checked how to register the adapter to a new HandsFree. When I continued to press the button of the adapter, the connection status indicator showed that registration could be made. A while after setting the HandsFree to the wait-for-registration state, then the device seemed to notice my cell phone. The registration was made in that state. Indicators of the adapter and HandsFree displayed that connection was completed.



[Scene 2]



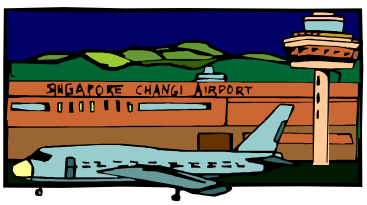
The three-day holiday ends today and we are heading for the airport. If we came here in own car, it wouldn't have been possible to do everything in three days. It would be nice to rent a car while traveling.

I returned the car to the rental car office at the airport. Just to make sure, I deleted my cell phone number from the HandsFree. It seems possible to cancel the registration to the adapter too but I decided to leave it as it was, because the steps to do so are hassles. A bus took us near the departure gate and we left Kyushu.

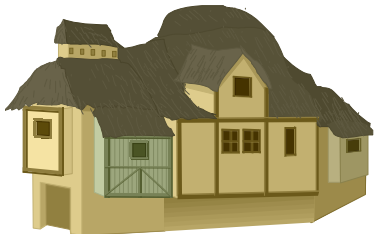
[Scene 3]

Arriving at airport we headed for our car in the parking lot. I turned the key ON worrying that the registration might have been canceled because the number was registered to the rental car.

After some time there appeared a display to indicate the connection to the HandsFree was OK. There seemed to be no problem. If the system works this way, several phones can be registered to a car and that would eliminate inconvenience. Now shall we go home after having been away for such a long time.



[Scene 4]
The next day we visited Mr. and Mrs. A to bring them a gift we bought on the trip. They are both friends of ours. I have a great deal to talk about with Mr. A because I haven't seen him for some time. My wife and Mrs. A were talking about fashion. I told him that the car I bought recently was equipped with a HandsFree and the connection was made through a Bluetooth adapter, and he told me that his navigation system he got lately was also geared with a Bluetooth HandsFree rig, and was using an adapter to make the connection. He and I exchanged cell phones with each other and tried. While touching here and there I found that his cell phone displayed the settings of the adapter. From the menu it seemed possible to show the list of registered devices or to register a new device. According to him, recently introduced cell phones can display a menu to control various adapters. It should be very useful.



Since Mr. A and I drank until late in the evening, my wife drove us home. On the way I asked her if she would use my cell phone if because I would buy a new one with Bluetooth. She said nothing but pointed at a new cell phone in the console box. It looks like she and Mrs. A went shopping and bought the phone while I had been talking with Mr. A. She seemed to have been regretting that her cell phone didn't correspond with Bluetooth, so she bought a new one with a built-in Bluetooth. Looking at my cell phone I found that the indicator showing the connection status displayed that connection couldn't be made. Looks like she had already registered her cell phone before I realized. What a smart one she is !
It's a little bit inconvenient only when making registration. But I will accept it because the function is used not often used.
I then went to sleep thinking that while I was aware that I would have to go to the office the next morning.

Bluetooth Hands-Free Profile Application Guideline Appendix B

Ver1.0

May. 24th,2003

CCAP

(Car-Communication-Application-Promotion)

Appendix B Contents

(Phonebook Transfer Guideline)

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1. Abstract

This document describes the guideline how to transfer the phonebook from the cellular phone or PDA to Hands Free Car Kit using Bluetooth wireless technology.
Generally, we already have some of the solutions to support phonebook transfer as follows.

(1) vCard with OBEX
(2) AT command
(3) Custom application for exchanging phonebook data

In this document, we select and show the guideline of (1). Because vCard and OBEX is already standardized as OPP (Object Push Profile) in Bluetooth SIG, it can be utilized for the multipurpose. This technology can resolve the problem of sorting or selecting Japanese character data (ex. furi-gana which means sound).

2. OBEX (OPP : Object Push Profile)

OPP is already defined in the profile specification by Bluetooth SIG, which was released on 22 February 2001. Most of current Bluetooth embedded cellular phones have OPP available, CCAP would like to utilize this as the phonebook transfer.
The phonebook format is defined to adopt vCard ver2.1 when using the telephony application in this specification.
OPP defines the roles, the server and the client. CCAP strongly requests that AG should be the client and HF should be the server at the point of the phone functionality.

3. vCard

As defined in OPP, the format of the phonebook should be followed ver.2.1 of vCard. However, especially considering in Japanese situation, HF Car Kit has to handle some of the ver3.0 of vCard because the property of “Sort_String” is used for the information of “furi-gana” in vCard 3.0. The following requirement or attentions should be considered for your implementation.

(1) Mandate Properties

data	*property*
Name	N
Furi-gana	SOUND or Sort_Strng
Phone number	TEL

vCard can assign the plural phone numbers into one entry. However, here its number of the phone number data shouldn’t be defined or restricted.

(2) Size of the vCard

However the limitation of vCard size is not defined, it should be taken into account for the receive buffer size of Car Kit. Especially the recent cellular phone can handle the photo, it's recommended the transmit data can be selected by the user's operation.

(3) other

For Japanese use, MCPC document <1> should be referred.

<1> MCPC GL-003 OBEX Implementation Guideline

4. Transfer

CCAP recommends to support following the object transfer.

(1) One object transfer

The OPP client can select just one object to be transferred. The way to select the object is the implementation dependant. The selection by the user's operation would be preferable. The client may close the OBEX session after the transfer.

(2) Plural objects transfer

The OPP client can select plural objects to be transferred. The way to select the objects is the implementation dependant. The selection by the user's operation would be preferable. In this function, the user's explicit operation to close the OBEX session might be required on the OPP client.

(3) Entire objects transfer

The OPP client can select whole phonebook in the client.

In the specification of IrMC, OBEX authentication shall be executed when entire data push. However, it's defined in OPP that this is not executed. In this guideline, CCAP recommends that OBEX authentication is not executed because Bluetooth authentication is already done and we think much of the convenience for the user.

5. Others

(1) Additional properties for Japanese market

The following properties would be considered because the conventional cellular phones already implement them.

Memory number, Group number, Group name and Secret code. They are defined in MCPC GL-003.

6. Sequence chart (example)