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**Bluetooth Multi-Connection
Technical Reference**

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Mobile Computing Promotion Consortium

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Terms and Abbreviations

A2DP	Advanced Audio Distribution Profile
AG	Audio Gateway (as in HFP)
AG_MP	Audio Gateway and Media Player
AG_MP_GW	Audio Gateway with Media Player and Gateway
AVDTP	Audio/Video Distribution Protocol
AVRCP	Audio Video Remote Control Profile
CSDM	Circuit Switched Data Mode (Data communication over Circuit switched bearer service)
CT	Controller (as in AVRCP)
DT	Data Terminal (as in DUN)
DUN	Dial-Up Networking Profile
GAVDP	Generic Audio/Video Distribution Profile
GW	Gateway (as in DUN)
HF	HandsFree (as in HFP)
HFP	HandsFree Profile
HF_RD	HandsFree and Rendering Device
HF_RD_DT	HandsFree with Rendering Device and Data Terminal
HQ ringing tone	Any audio using A2DP for ringing
MP	Media Player
NA	Not Applicable
PSDM	Packet-Switched data mode (Data communication over Packet switched bearer service)
RC	Remote Controller
RD	Rendering Device
SNK	Sink (as in A2DP/VDP)
SRC	Source (as in A2DP/VDP)
TG	Target (as in AVRCP)
UI	User Interface (Some possibility for the user to interact with the system. Can be just some buttons or a more complex UI may be e.g. a display with keyboard or touch screen.)
VDP	Video Distribution Profile

1. Document Terminology

The MCPC has adopted Section 13.1 of the IEEE Standards Style Manual, which dictates use of the words “shall”, “should”, “may” and “can” in the development of documentation, as follows.

The word shall is used to indicate mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (shall equals is required to).

The use of the word must is deprecated and shall not be used when stating mandatory requirements; must is used only to describe unavoidable situations.

The use of the word will is deprecated and shall not be used when stating mandatory requirements; will is only used in statements of fact.

The word should is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain course of action is deprecated but not prohibited (should equals is recommended that).

The word may is used to indicate a course of action permissible within the limits of the standard (may equals is permitted).

The word can is used for statements of possibility and capability, whether material, physical or causal (can equals is able to).

2. Introduction

2.1 Scope

This document is published based on Simultaneous Use of HFP, A2DP and AVRCP_WP [9] by Bluetooth SIG and describes how A2DP and AVRCP should be used together and how A2DP, AVRCP in conjunction with other profiles, especially HFP and DUN, should be used together to achieve high interoperability in all functions defined in the profiles. The scenarios and the sequences of the procedures defined in this document are not mandatory but recommended.

This document describes how multiple profiles operate simultaneously in typical use cases. These use cases are described in Appendix A. Multiple operations including profiles not mentioned in this document are implementation dependent.

For instance AVRCP is not involved in scenario 4.2.1 but it assumes that AVRCP should be connected in case that AVRCP is supported in both sides. The connection procedures should be referred to Simultaneous Use of HFP, A2DP and AVRCP_WP [9].

[Note]

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2.2 System

The following Figure 2.1 and Figure 2.2 shows example of system configuration defined by this technical reference. In this document, Third Device Scenario is defined as the connection type drawn in Figure 2.1. Also same device scenario is defined in Figure 2.2.

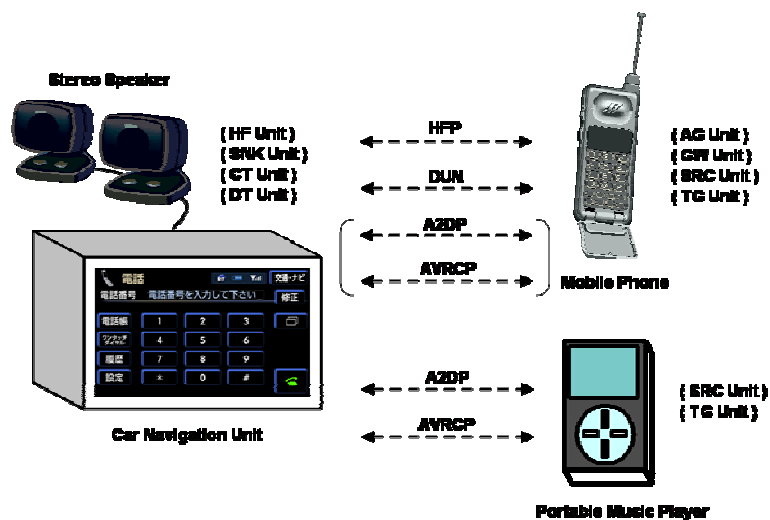


Figure 2.1 example system configuration Case 1 (Third Device Scenario)

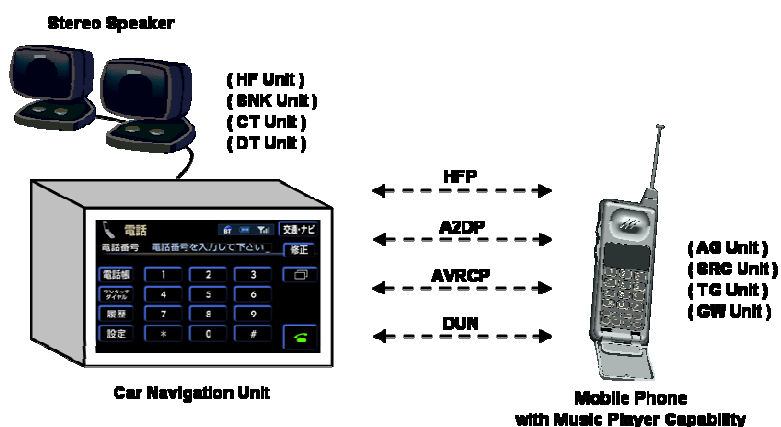


Figure 2.2 example system configuration Case 2 (Same Device Scenario)

2.3 Role Switch

To avoid the frequent role switches and utilize the band width efficiently on the multiple link connection, the role of device should not be fixed to neither Master nor Slave under the current condition, and a request of role switches should be accepted if there is no issue to be either Master or Slave role.

3. Basic Condition

3.1 Configuration and Roles

3.1.1 Audio Gateway with Gateway (AG_GW)

This kind of device has the capabilities defined in the HFP specification for AG and the capabilities defined in the DUN specification for GW. This is the device that provides access to the public network. Typical devices are cellular phones.

3.1.1.1 Recommendation

This kind of devices should support the following roles.

- HFP AG
- DUN GW

3.1.1.2 Motivation

This kind of device should support HFP AG and DUN GW role to enable Voice and Data communication between public network and HF/ DT device.

3.1.2 HandsFree with Data Terminal (HF_DT)

This kind of device has the capabilities defined in the HFP specification for HF and the capabilities defined in the DUN specification for DT. Typical devices are In-car devices.

3.1.2.1 Recommendation

This kind of devices should support the following roles.

- HFP HF
- DUN DT

3.1.2.2 Motivation

This kind of device should support HFP HF and DUN DT role to enable Voice and Data communication to a AG_GW device. It should also enable both of capabilities at the same time.

3.1.3 Media Player (MP)

The Media Player can among other devices be a portable media player (MP3 player, video player or mobile phone) or a fixed media player (home audio/video system or in-car audio/video system).

3.1.3.1 Recommendation

The Media Player should support the following roles

- A2DP and/or VDP SRC
- AVRCP 1.3 TG, category 1 and at least supporting PlayStatus and the Play , Pause and Stop commands
- AVRCP 1.3 CT, category 2 and at least supporting the Volume Up and Down commands if A2DP SRC is supported.
- AVRCP TG, category 2 and at least supporting the Volume Up and Down commands if A2DP SRC is supported.

3.1.3.2 Motivation

The Media Player should support A2DP/VDP SRC role to enable streaming of audio/video to a SNK device, it should also support the AVRCP TG role to be able to receive incoming Play, Stop and other commands from the Rendering Device or the Remote Controller. Finally it should also support the AVRCP CT role to be able to send volume up/down commands to the Rendering Device. The last recommendation is important since not all Rendering Devices will have a local volume control or the Rendering Device, e.g. loudspeakers, are not in the vicinity of the user.

3.1.4 Rendering Device (RD)

The Rendering Device can among other devices be headphones, loudspeakers, in-car audio systems or a video display with optional audio capabilities.

3.1.4.1 Recommendation

The Rendering Device should support the following roles

- A2DP and/or VDP SNK
- AVRCP 1.3 TG, category 2, supporting at least the Volume Up and Down commands in case A2DP SNK is supported.
- AVRCP 1.3 CT, category 1, supporting at least the Play, Pause, Stop and GetPlayStatus commands and EVENT_PLAYBACK_STATUS_CHANGED notification

3.1.4.2 Motivation

The Rendering Device should support A2DP SNK role to be able to receive audio from a Media Player. It should also support the AVRCP CT role to be able to send AVRCP Play, Pause, Stop commands, among others, to the Media Player. Finally it should also support the AVRCP TG role to allow the Media Player to change the volume on the Rendering Device by sending AVRCP volume up/down commands to it.

Rendering Devices without possibility for user input, (e.g. home audio system loudspeakers) should not support the AVRCP CT Role.

3.1.5 Remote Controller (RC)

The Remote Controller can among other devices be a device that only has the functionality of a Remote Controller; it can also be a multi functional device that supports other functionality as well.

3.1.5.1 Recommendation

The Remote Controller should support the following role

- AVRCP 1.3 CT, category 1 supporting at least the Play, Pause, Stop and GetPlayStatus commands and the EVENT_PLAYBACK_STATUS_CHANGED notification.
- AVRCP 1.3 CT, category 2 supporting Volume Up and Down.

3.1.5.2 Motivation

The Remote Controller should support the AVRCP CT role to be able to send volume up/down, play, stop, pause, and other commands to the Media Player.

The remote controller should support the AVRCP CT Role to be able to send play, stop, pause, and other commands to the media player. The EVENT_PLAYBACK_STATUS_CHANGED notification will ensure that the RC knows the play back state of the media player.

3.1.6 Audio Gateway with Media Player and Gateway (AG_MP_GW)

This kind of device has the capabilities defined in the HFP specification for AG, the capabilities for a Media Player (see 3.1.3) and the capabilities defined in the DUN specification for GW. Typical devices are cellular phones.

3.1.6.1 Recommendation

The recommendation is the same as written in 3.1.1.1 and 3.1.3.1.

3.1.6.2 Motivation

The motivation is the same as written in 3.1.1.2 and 3.1.3.2

3.1.7 Handsfree with Rendering Device and Data Terminal (HF_RD_DT)

This kind of device has the capabilities defined in the HFP specification for HF, the capabilities for a Rendering Device (see 3.1.4) and the capabilities defined in the DUN specification for DT. Typical devices are In-car devices.

3.1.7.1 Recommendation

The recommendation is the same as written in 3.1.2.1 and 3.1.4.1.

3.1.7.2 Motivation

The motivation is the same as written in 3.1.2.2 and 3.1.4.2 .

3.2 Profile Architecture

The specified profiles and protocols by the Bluetooth SIG for Audio/Video are following.

•Profile/Protocol for Streaming

Profile		Protocol
A2DP (Advanced Audio Distribution Profile)	GAVDP (Generic Audio/Video Distribution Profile)	AVDTP (Audio/Video Distribution Transport Protocol)
VDP (Video Distribution Profile)		

•Profile/Protocol for Control

Profile	Protocol
AVRCP (Audio/Video Remote Control Profile)	AVCTP (Audio/Video Control Transport Protocol)

Each profile is defined in a separate document; remote control issues are defined in the AVRCP profile whereas streaming aspects are handled by the A2DP profile. However, there is no detailed explanation on how to use streaming and controlling capabilities simultaneously.

It is necessary to understand that you have to refer each profile specification document before following this guideline when you implement these profiles into products.

A2DP profile is defined as upper layer profile of GAVDP to be used with AVDTP commands for streaming high quality stereo or mono audio.

AVDTP and GAVDP define functions for setting-up, establishment and opening of streaming channel, but doesn't include functions for remote-controlling of Audio Video devices. This means one has to clearly understand the purpose of the audio streaming profile, which is neither to operate nor to change the mode of devices, but to control the audio path only.

AVRCP, along with AVCTP, is defined to remotely control Audio Video device. By sending the command specified in the profile the sender expects the receiver to operate, change mode, and/or report information.

The concept of these profiles and protocols is written in 2.1 Scope of each documentation.

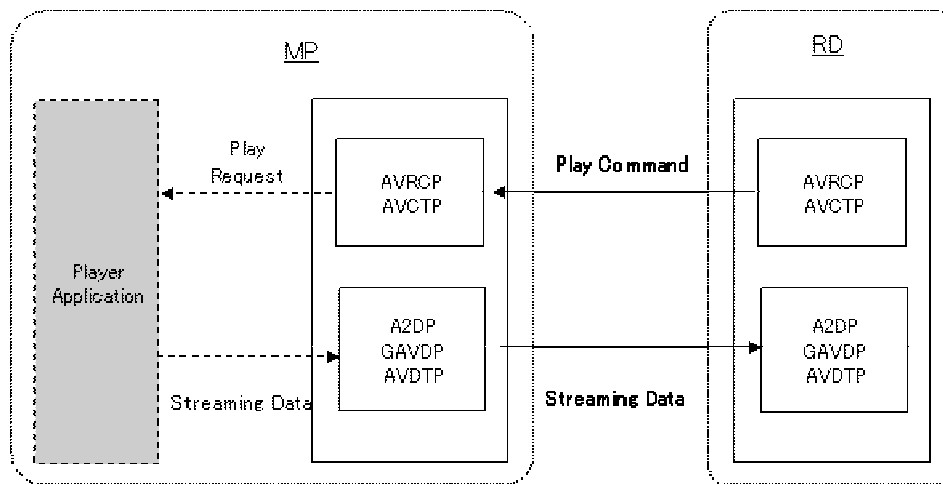


Figure 3.2 Example of command procedure

Figure 3.2 shows an example of command procedure between the RD and the MP where the MP receives an AVRCP Play command and then starts streaming to the RD. It is not defined whether the streaming is started or not after MP receives AVRCP_Play command from RD since there is no definition in profile specification and It depends on the implementation for player application. This document is to specify how to behave .

4. SCENARIOS

4.1 Use Cases for HFP + DUN

4.1.1 HFP+DUN; STARTING DATA COMMUNICATION UNDER PACKET-SWITCHED DATA MODE DURING ONGOING CALL

4.1.1.1 Pre-Conditions

In the table below the pre-conditions for this scenario are listed.

Device	AG_GW	HF_DT
Paired with	HF_DT	AG_GW
HFP service level connection established with	HF_DT	AG_GW
HFP SCO Connection established with	HF_DT	AG_GW
DUN connection established with	[HF_DT]	[AG_GW]
DUN (PACKET-SWITCHED DATA MODE) State	N/A	N/A

Table 4.1.1-1: Pre-conditions: HFP+DUN; STARTING DATA COMMUNICATION UNDER PACKET-SWITCHED DATA MODE DURING ONGOING CALL.

Note: [] means that the connection is optional.

4.1.1.2 User Action

User turns on DUN functionality on the HF_DT system.

4.1.1.3 Post Conditions

In the table below the Post Conditions for this scenario are listed.

Device	AG_GW	HF_DT
Paired with	HF_DT	AG_GW
HFP service level connection established with	HF_DT	AG_GW
HFP SCO Connection established with	HF_DT	AG_GW
DUN connection established with	HF_DT	AG_GW
DUN (PACKET-SWITCHED DATA MODE) State	Data Communication	Data Communication

Table 4.1.1-2: Post-Conditions: HFP+DUN; STARTING DATA COMMUNICATION UNDER PACKET-SWITCHED DATA MODE DURING ONGOING CALL.

4.1.1.4 Recommendation

The recommendation is to set SCO or eSCO Packet type to HV3 or EV3/2-EV3 as default.

If AG requests HV1 when SCO is established, it is recommended that HF requests HV3. However, if AG supports only HV1, HF shall accept HV1. In this case simultaneous use of HFP voice communication and DUN data communication is not possible.

4.1.1.5 Message Sequence Charts

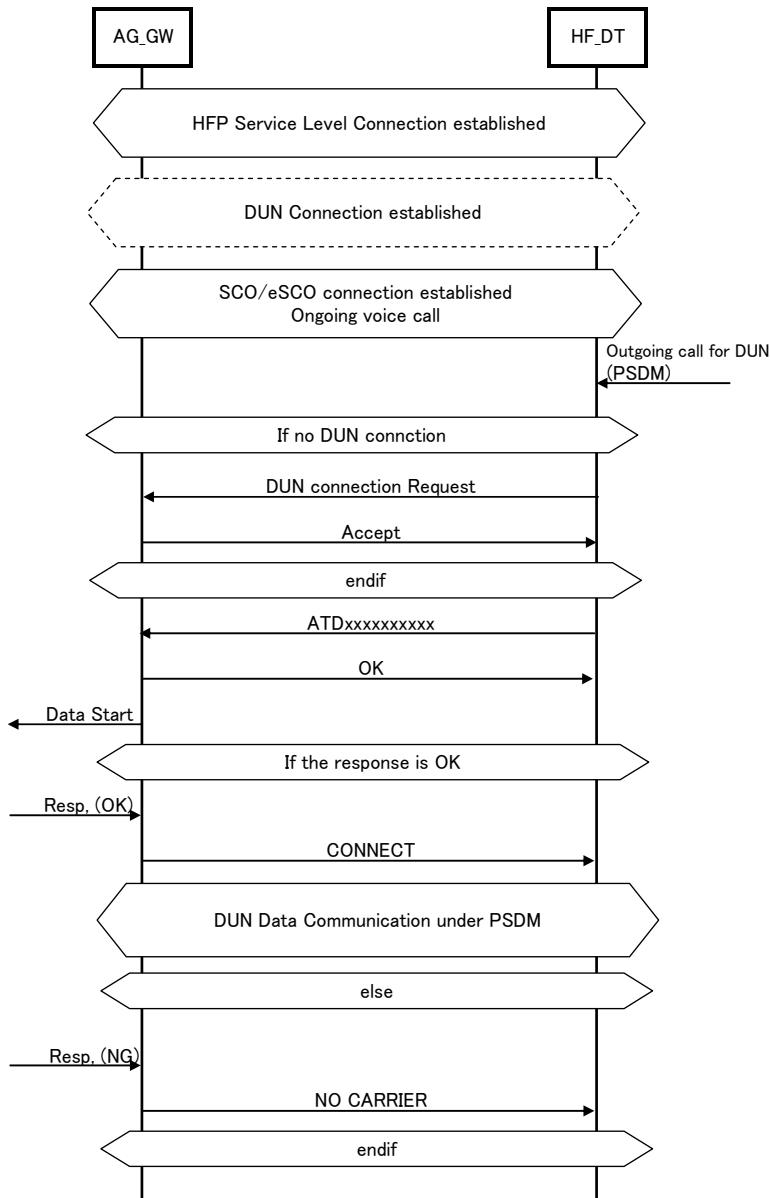


Figure 4.1.1.5 HFP+DUN; STARTING DATA COMMUNICATION UNDER PACKET-SWITCHED DATA MODE DURING ONGOING CALL.

Note: This guideline is based on the assumption that the cellular network can work voice call and data communication simultaneously. The sequence to apply when the cellular network can not handle the above case (i.e. an ATD error is returned) is left implementation specific.

4.1.2 HFP+DUN; STARTING DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE WHILE ONGOING CALL .

4.1.2.1 Pre-Conditions

In the table below the pre-conditions for this scenario are listed.

Device	AG_GW	HF_DT
Paired with	HF_DT	AG_GW
HFP service level connection established with	HF_DT	AG_GW
HFP SCO Connection established with	HF_DT	AG_GW
DUN connection established with	[HF_DT]	[AG_GW]
DUN (CIRCUIT-SWITCHED DATA MODE) State	N/A	N/A

Table 4.1.2.1: Pre-Conditions: HFP+DUN; STARTING DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE WHILE ONGOING CALL HFP.

Note: [] means that the connection is optional.

4.1.2.2 User Action

User waits for voice call termination before user turns on DUN functionality on the HF_DT system.

4.1.2.3 Post Conditions

In the table below the Post Conditions for this scenario are listed.

Device	AG_GW	HF_DT
Paired with	HF_DT	AG_GW
HFP service level connection established with	HF_DT	AG_GW
HFP SCO Connection established with	-	-
DUN connection established with	HF_DT	AG_GW
DUN (CIRCUIT-SWITCHED DATA MODE) State	Data Communication	Data Communication

Table 4.1.2.3: Post-Conditions: HFP+DUN; STARTING DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE WHILE ONGOING CALL HFP.

4.1.2.4 Recommendation

Under the Circuit-Switched data mode, it is impossible to use both HFP and DUN at the same time. Therefore voice call termination should be waited to start DUN communication.

4.1.2.5 Message Sequence Charts

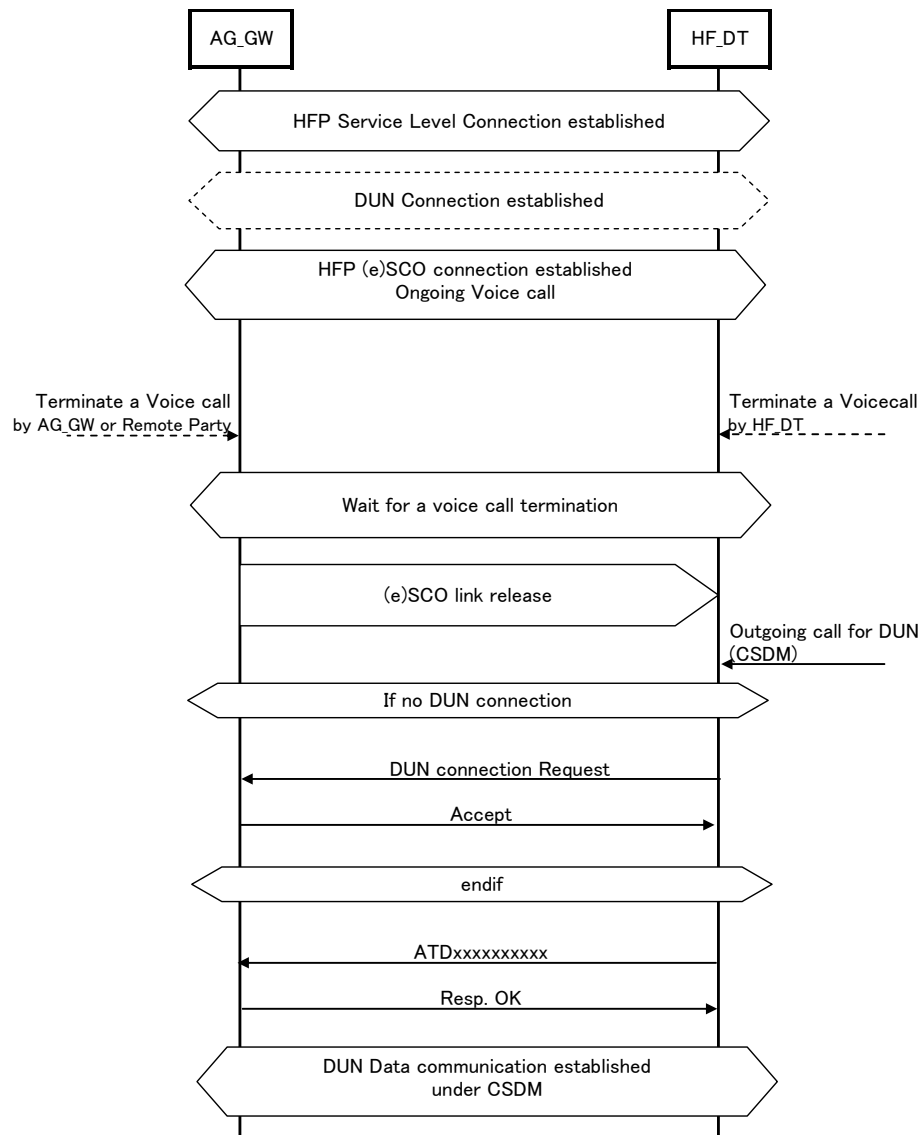


Figure 4.1.2.5 HFP+DUN; STARTING DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE WHILE ONGOING CALL HFP

Information : Under CIRCUIT-SWITCHED DATA MODE, dashed lines should be handled by Application layer of HF_DT / AG_GW

4.1.3 HFP+DUN;OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE

4.1.3.1 Pre-Conditions

In the table below the pre-conditions for this scenario are listed.

Device	AG_GW	HF_DT
Paired with	HF_DT	AG_GW
HFP service level connection established with	HF_DT	AG_GW
HFP SCO Connection established with	-	-
DUN connection established with	HF_DT	AG_GW
DUN(CIRCUIT-SWITCHED DATA MODE) State	Data communication	Data communication

Table 4.1.3.1: Pre-Conditions: HFP+DUN; OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE

4.1.3.2 User Action

User initiates a voice call during DUN data communication under CIRCUIT-SWITCHED DATA MODE.

4.1.3.3 Post Conditions

In the table below the Post Conditions for this scenario are listed.

Device	AG_GW	HF_DT
Paired with	HF_DT	AG_GW
HFP service level connection established with	HF_DT-	AG_GW
HFP SCO Connection established with	[HF_DT] *1	[AG_GW] *1
DUN connection established with	HF_DT	AG_GW
DUN(CIRCUIT-SWITCHED DATA MODE) State	N/A	N/A

Table 4.1.3.3:Post-Conditions: HFP+DUN; OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE

- *1 The possibility to be made the (e)SCO connection by outgoing call from the AG device depends on the implementation of AG. For example, the (e)SCO connection will not be established between HF and AG in case that the routing of audio path is set to AG.

4.1.3.4 Recommendation

Under the CIRCUIT-SWITCHED DATA MODE, it is impossible to make a phone call at the same time.

It is recommended to provide a way of terminating an ongoing data connection on HF_DT (by menu, button and so on) in case user wants to make a outgoing voice call.

HF_DT should not initiate outgoing call while DUN data communication is under CIRCUIT-SWITCHED DATA MODE because the application layer of HF_DT knows that DUN is under CIRCUIT-SWITCHED DATA MODE.

4.1.3.5 Message Sequence Charts

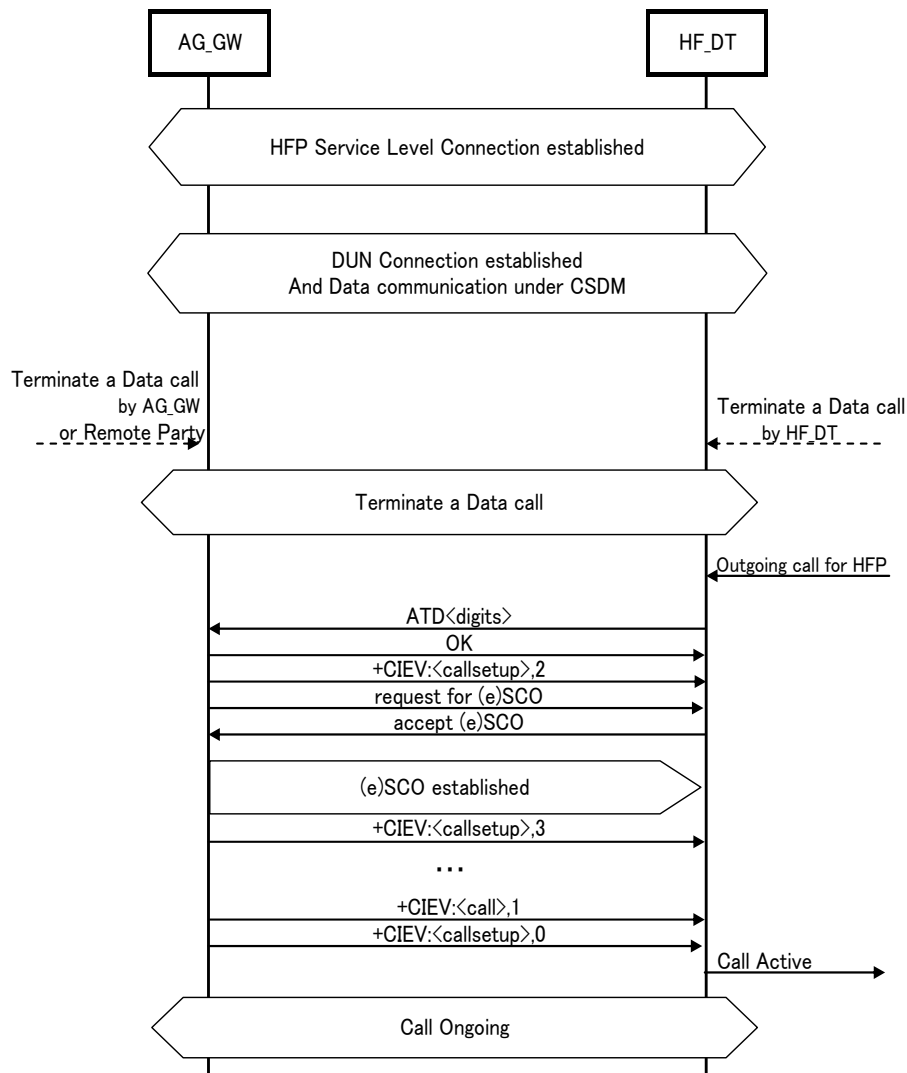


Figure 4.1.3.5. HFP+DUN; OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE (User initiates a voice call on HF_DT)

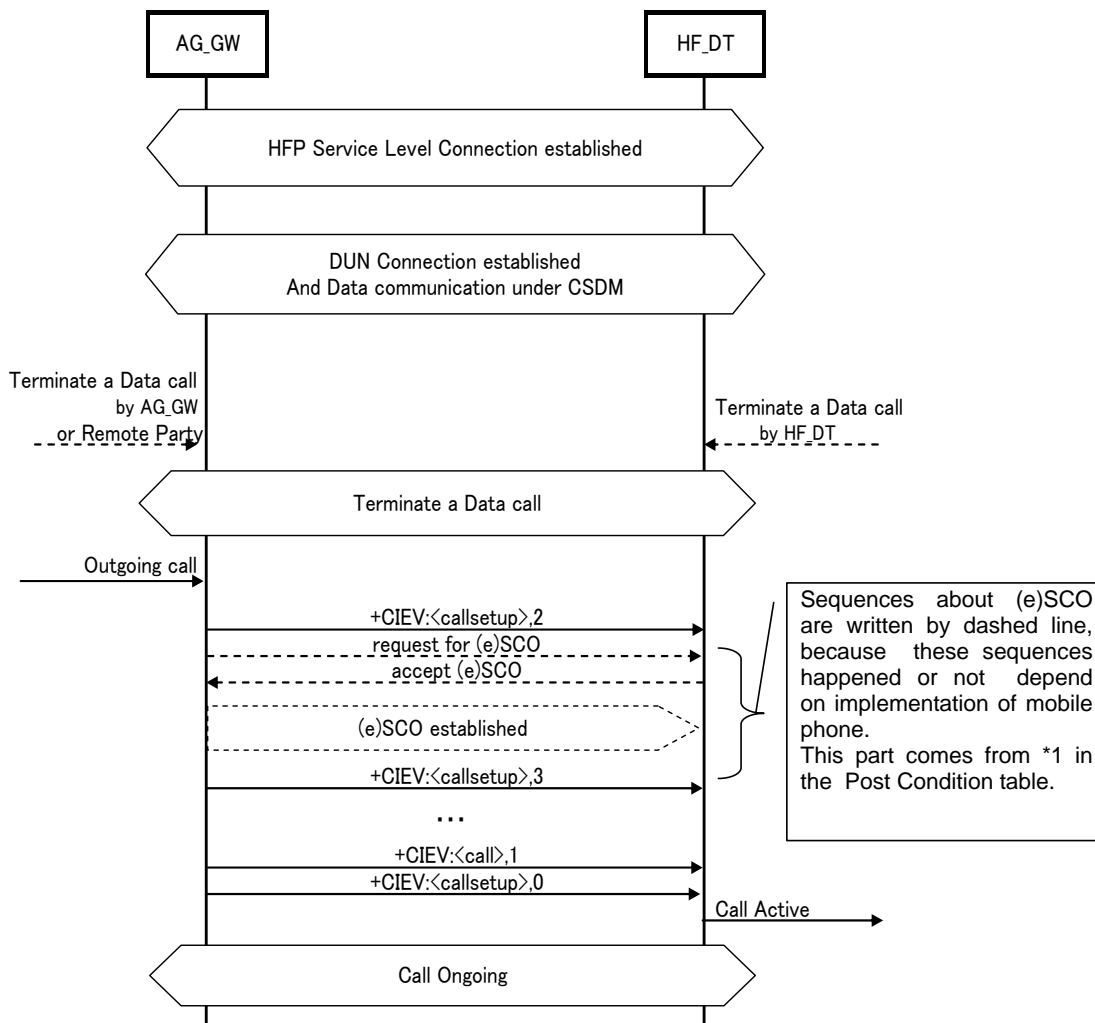


Figure 4.1.3.54.1.3.6 HFP+DUN; OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE (User initiates a voice call on AG_GW)

4.2 Use Cases for HFP+A2DP/VDP+AVRCP+DUN WITH SAME DEVICE

4.2.1 HFP + A2DP/VDP + AVRCP + DUN; DATA COMMUNICATION STARTING UNDER PACKET-SWITCHED DATA MODE WHILE LISTENING TO MUSIC.

4.2.1.1 Pre-Conditions

In the table below the pre-conditions for this scenario are listed.

Device	AG_MP_GW	HF_RD_DT
Paired with	HF_RD_DT	AG_MP_GW
HFP service level connection established with	HF_RD_DT	AG_MP_GW
AVDTP Signaling channel established with	HF_RD_DT	AG_MP_GW
AVDTP State	STREAMING	STREAMING
DUN connection established with	[HF_RD_DT]	[AG_MP_GW]
DUN (PACKET-SWITCHED DATA MODE) State	N/A	N/A

Table 4.2.1.1: Pre-Conditions: HFP + A2DP/VDP + AVRCP + DUN; DATA COMMUNICATION STARTING UNDER PACKET-SWITCHED DATA MODE WHILE LISTENING TO MUSIC.

Note: [] means that the connection is optional.

4.2.1.2 User Action

User turns on DUN functionality on HF_RD_DT system.

4.2.1.3 Post Conditions

In the table below the Post conditions for this scenario are listed.

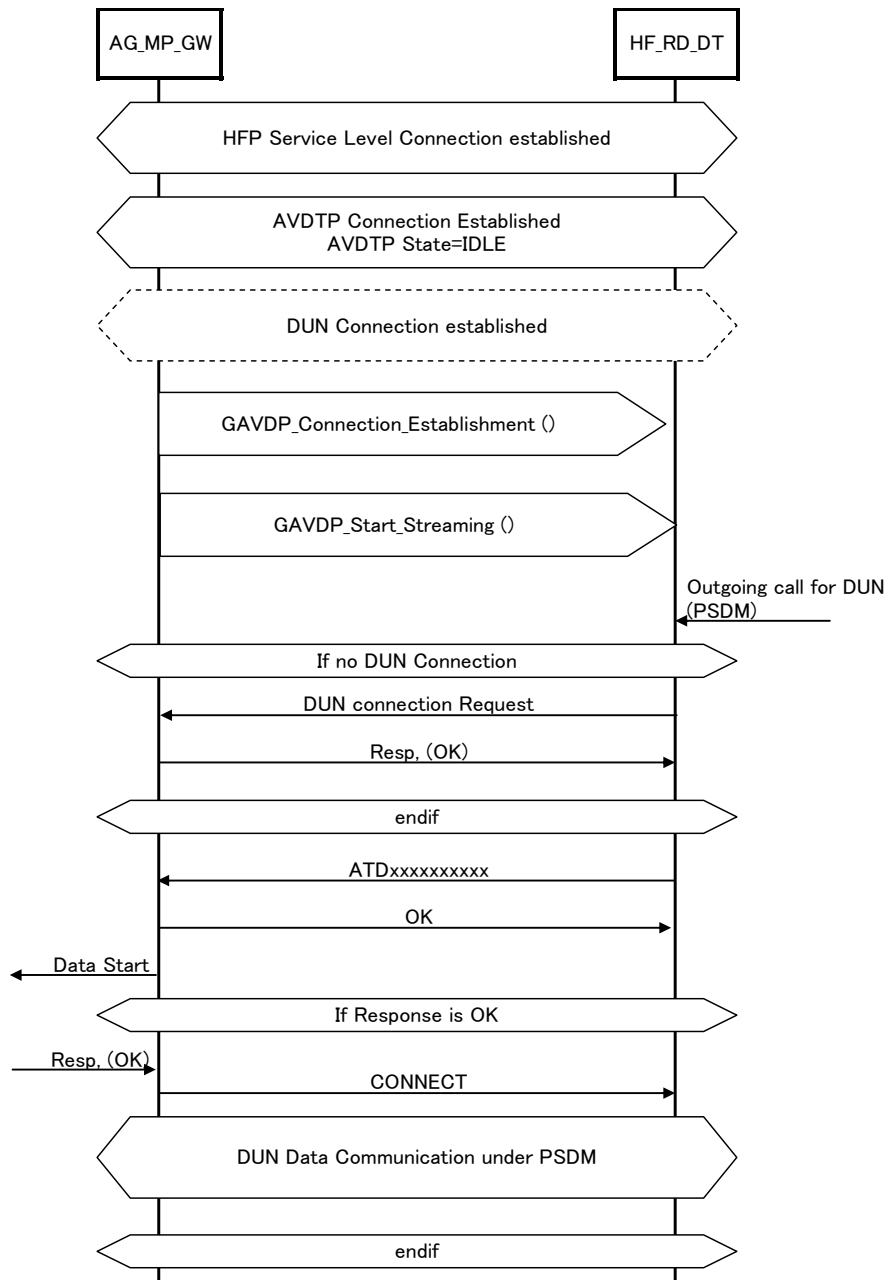
Device	AG_MP_GW	HF_RD_DT
Paired with	HF_RD_DT	AG_MP_GW
HFP service level connection established with	HF_RD_DT	AG_MP_GW
AVDTP Signaling channel established with	HF_RD_DT	AG_MP_GW
AVDTP State	STREAMING	STREAMING
DUN connection established with	HF_RD_DT	AG_MP_GW
DUN (PACKET-SWITCHED DATA MODE) State	Data communication	Data communication

Table 4.2.1.3: Post-Conditions: HFP + A2DP/VDP + AVRCP + DUN; DATA COMMUNICATION STARTING UNDER PACKET-SWITCHED DATA MODE WHILE LISTENING TO MUSIC

4.2.1.4 Recommendation

The recommendation is to support V.2.0 + EDR or later version for this scenario on both AG_MP_GW and HF_RD_DT system to keep enough band width.

4.2.1.5 Message Sequence Charts



(Continued)

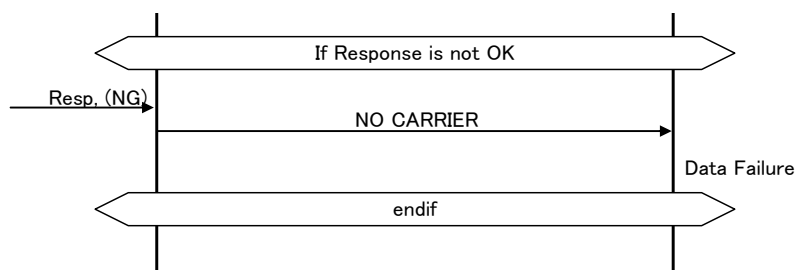


Figure 4.2.1.5. HFP + A2DP/VDP + AVRCP + DUN; DATA COMMUNICATION STARTING UNDER PACKET-SWITCHED DATA MODE WHILE LISTENING TO MUSIC

4.2.2 HFP + A2DP/VDP + AVRCP + DUN; DATA COMMUNICATION STARTING UNDER CIRCUIT-SWITCHED DATA MODE WHILE LISTENING TO MUSIC.

4.2.2.1 Pre-Conditions

In the table below the pre-conditions for this scenario are listed.

Device	AG_MP_GW	HF_RD_DT
Paired with	HF_RD_DT	AG_MP_GW
HFP service level connection established with	HF_RD_DT	AG_MP_GW
AVDTP Signaling channel established with	HF_RD_DT	AG_MP_GW
AVDTP State	STREAMING	STREAMING
DUN connection established with	[HF_RD_DT]	[AG_MP_GW]
DUN(CIRCUIT-SWITCHED DATA MODE) State	N/A	N/A

Table 4.2.2.1: Pre-Conditions: HFP + A2DP/VDP + AVRCP + DUN; DATA COMMUNICATION STARTING UNDER CIRCUIT-SWITCHED DATA MODE WHILE LISTENING TO MUSIC.

Note: [] means that the connection is optional.

4.2.2.2 User Action

User turns on DUN functionality on HF_RD_DT system.

4.2.2.3 Post Conditions

In the table below the Post conditions for this scenario are listed.

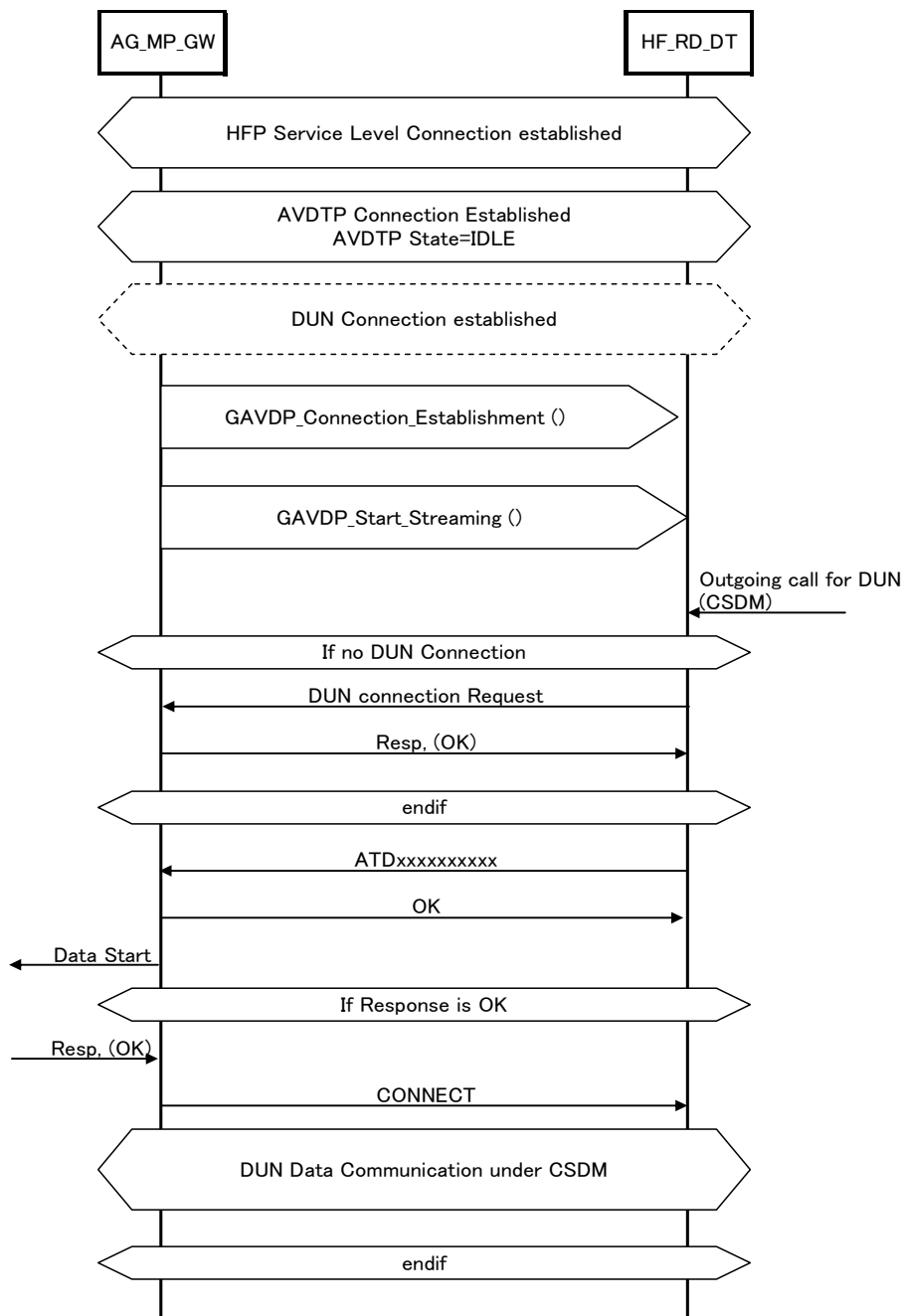
Device	AG_MP_GW	HF_RD_DT
Paired with	HF_RD_DT	AG_MP_GW
HFP service level connection established with	HF_RD_DT	AG_MP_GW
AVDTP Signaling channel established with	HF_RD_DT	AG_MP_GW
AVDTP State	STREAMING	STREAMING
DUN connection established with	HF_RD_DT	AG_MP_GW
DUN(CIRCUIT-SWITCHED DATA MODE) State	Data communication	Data communication

Table 4.2.2.3: Post-Conditions: HFP + A2DP/VDP + AVRCP + DUN; DATA COMMUNICATION STARTING UNDER CIRCUIT-SWITCHED DATA MODE WHILE LISTENING TO MUSIC.

4.2.2.4 Recommendation

The recommendation is to support V.2.0 + EDR or later version for this scenario on both AG_MP_GW and HF_RD_DT system, at least.

4.2.2.5 Message Sequence Charts



(Continued)

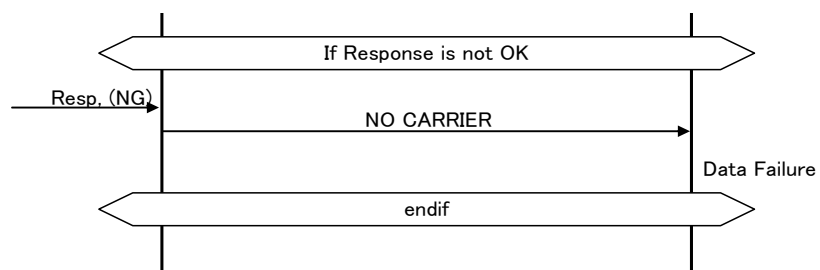


Figure 4.2.2.5. HFP + A2DP/VDP + AVRCP + DUN; DATA COMMUNICATION STARTING UNDER CIRCUIT-SWITCHED DATA MODE WHILE LISTENING TO MUSIC.

4.2.3 HFP+A2DP/VDP+AVRCP+DUN; INCOMING CALL UNDER PACKET-SWITCHED DATA MODE

Refer to 4.13 Answer an Incoming Call of HFP1.5.

Note: An incoming call received during an ongoing DUN Packet-Switched Data Connection with an A2DP session in idle state between the same two devices does not modify neither DUN nor A2DP state.

In case the cellular network does not support concurrent voice and data communication, data communication is suspended when outgoing/incoming voice calls are to be carried out.

4.2.4 HFP+A2DP/VDP+AVRCP+DUN; INCOMING CALL WITHOUT HQ RING TONE UNDER PACKET-SWITCHED DATA MODE AND LISTENING TO MUSIC FROM A SAME DEVICE

Refer to " 6.2.5 HFP+A2DP/VDP+AVRCP INCOMING CALL WHEN LISTENING TO MUSIC FROM THE SAME DEVICE, NO HQ RING SIGNAL" in the document of "SIMULTANEOUS USE OF HFP, A2DP, AND AVRCP PROFILES" published by Bluetooth SIG.

Note: An incoming call received during an ongoing DUN Packet-Switched Data Connection with an A2DP session in streaming state between the same two devices does not affect DUN connection state.

In case the cellular network does not support concurrent voice and data communication, data communication is suspended. Therefore incoming HFP calls only affect the A2DP session by interrupting any ongoing streaming. The sequence to resume streaming is described in the White Paper.

4.2.5 HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL UNDER PACKET-SWITCHED DATA MODE

4.2.5.1 Pre-Conditions

In the table below the pre-conditions for this scenario are listed.

Device	AG_MP_GW	HF_RD_DT
Paired with	HF_RD_DT	AG_MP_GW
AVDTP Signaling channel established with	HF_RD_DT	AG_MP_GW
AVDTP State	IDLE	IDLE
DUN connection established with	HF_RD_DT	AG_MP_GW
DUN(PACKET-SWITCHED DATA MODE) State	Data communication	Data communication
HFP service level connection established with	HF_RD_DT	AG_MP_GW
HFP SCO connection established with	-	-

Table 4.2.5.1: Pre-Conditions:HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL UNDER PACKET-SWITCHED DATA MODE.

4.2.5.2 User Action

User initiates a voice call or selects "Outgoing call" on HF_RD_DT while DUN No Data/Data communication is ongoing under PACKET-SWITCHED DATA MODE. And starting phone call.

4.2.5.3 Post Conditions

In the table below the post-conditions for this scenario are listed.

Device	AG_MP_GW	HF_RD_DT
Paired with	HF_RD_DT	AG_MP_GW
AVDTP Signaling channel established with	HF_RD_DT	AG_MP_GW
AVDTP State during call	IDLE	IDLE
DUN connection established with	HF_RD_DT	AG_MP_GW
DUN(PACKET-SWITCHED DATA MODE) State	Data communication	Data communication
HFP service level connection established with	HF_RD_DT	AG_MP_GW
HFP SCO connection established with	[HF_RD_DT] *1	[AG_MP_GW] *1

Table 4.2.5.3: Post-Conditions: HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL UNDER PACKET-SWITCHED DATA MODE.

- *1 The possibility to be made the (e)SCO connection by outgoing call from the AG device depends on the implementation of AG. For example, the (e)SCO connection will not be established between HF and AG in case that the routing of audio path is set to AG.

4.2.5.4 Recommendation

The recommendation is to set SCO or eSCO Packet type to HV3 or EV3/2-EV3 as default. If AG requests HV1 when SCO is established, it is recommended that HF requests HV3. However, if AG supports only HV1, HF shall accept HV1 and recognize that multi-connection is not available in this case.

4.2.5.5 Message Sequence Charts

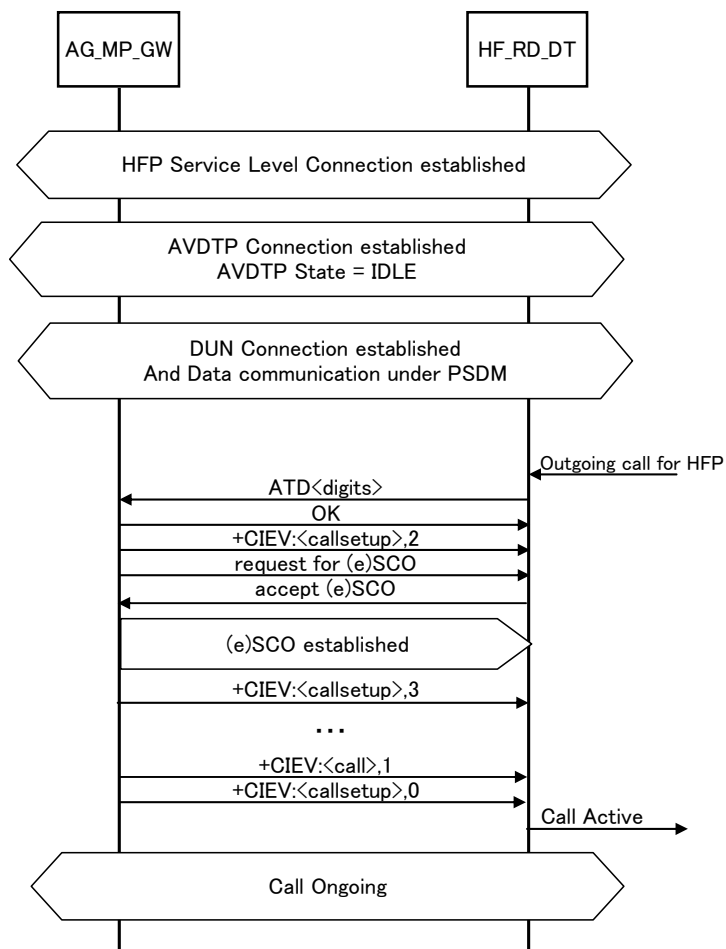


Figure 4.2.5.5. HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL UNDER PACKET-SWITCHED DATA MODE. (User initiates a voice call on HF_RD_DT)

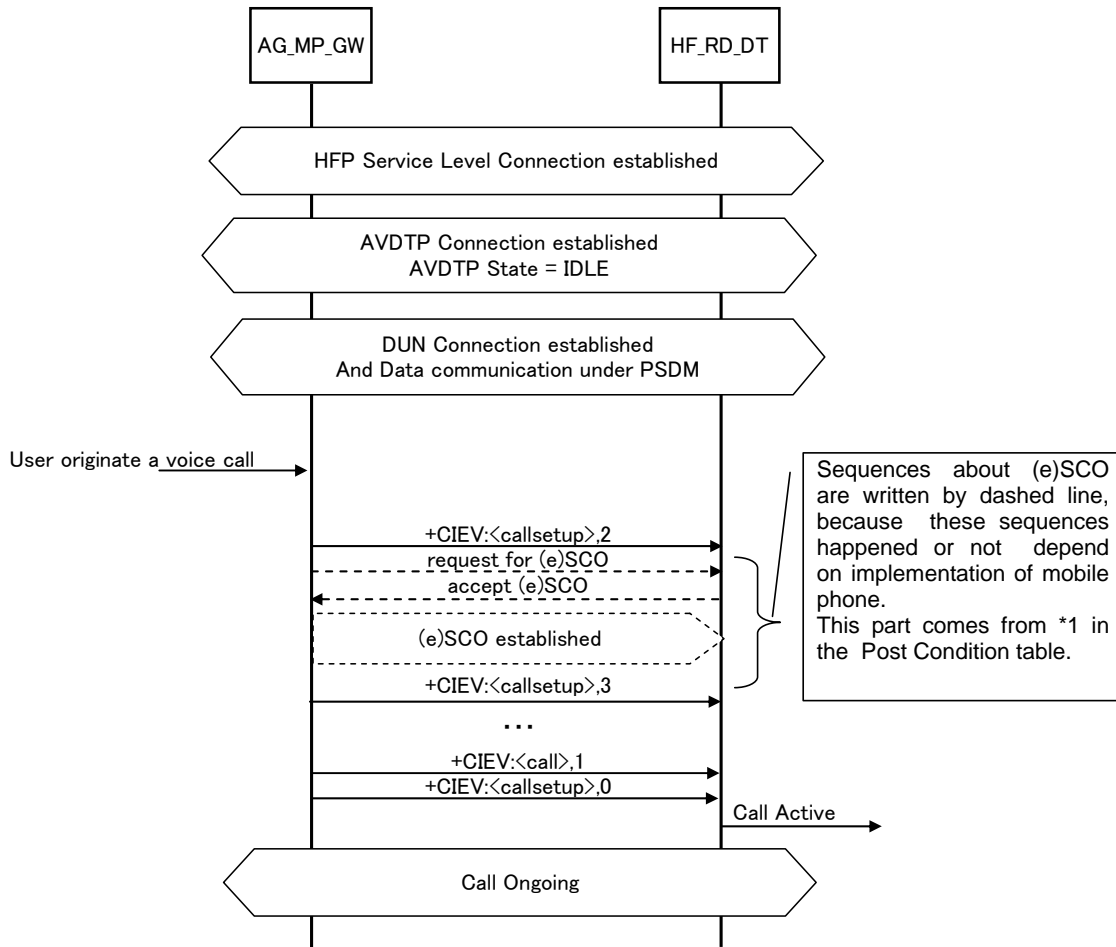


Figure 4.2.5.54.2-5-6. HFP+A2DP/VDP+AVRCP+DUN: OUTGOING CALL UNDER PACKET-SWITCHED DATA MODE.(User initiates a voice call on AG_MP_GW)

Note: This guideline is based on the assumption that the cellular network can work voice call and data communication simultaneously. The sequence to apply when the cellular network can not handle the above case (i.e. an ATD error is returned) is left implementation specific.

4.2.6 HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE

4.2.6.1 Pre-Conditions

In the table below the pre-conditions for this scenario are listed.

Device	AG_MP_GW	HF_RD_DT
Paired with	HF_RD_DT	AG_MP_GW
AVDTP Signaling channel established with	HF_RD_DT	AG_MP_GW
AVDTP State during call	IDLE	IDLE
DUN connection established with	HF_RD_DT	AG_MP_GW
DUN (CIRCUIT-SWITCHED DATA MODE) State	Data communication	Data communication
HFP service level connection established with	HF_RD_DT	AG_MP_GW
HFP SCO connection established with	-	-

Table 4.2.6.1: Pre-Conditions: HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE

4.2.6.2 User Action

User initiates a voice call or selects "Outgoing call" on HF_RD_DT while DUN Data communication is ongoing under CIRCUIT-SWITCHED DATA MODE.

4.2.6.3 Post Conditions

In the table below the post-conditions for this scenario are listed.

Device	AG_MP_GW	HF_RD_DT
Paired with	HF_RD_DT	AG_MP_GW
AVDTP Signaling channel established with	HF_RD_DT	AG_MP_GW
AVDTP State during call	IDLE	IDLE
DUN connection established with	HF_RD_DT	AG_MP_GW
DUN (CIRCUIT-SWITCHED DATA MODE) State	N/A(Terminated)	N/A(Terminated)
HFP service level connection established with	HF_RD_DT	AG_MP_GW
HFP SCO connection established with	[HF_RD_DT] *1	[AG_MP_GW] *1

Table 4.2.6.3: Post-Conditions: HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE.

- *1 The possibility to be made the (e)SCO connection by outgoing call from the AG device depends on the implementation of AG. For example, the (e)SCO connection will not be established between HF and AG in case that the routing of audio path is set to AG.

4.2.6.4 Recommendation

Under the Circuit-Switched data mode, it is impossible to make a phone call at the same time.

It is recommended to provide a way of terminating an ongoing data connection on HF_RD_DT (by menu, button and so on) in case user wants to make a outgoing voice call..

HF_RD_DT should not initiate outgoing call while DUN data communication is under Circuit-Switched data mode because the application layer of HF_RD_DT knows that DUN is under Circuit-Switched data mode.

4.2.6.5 Message Sequence Charts

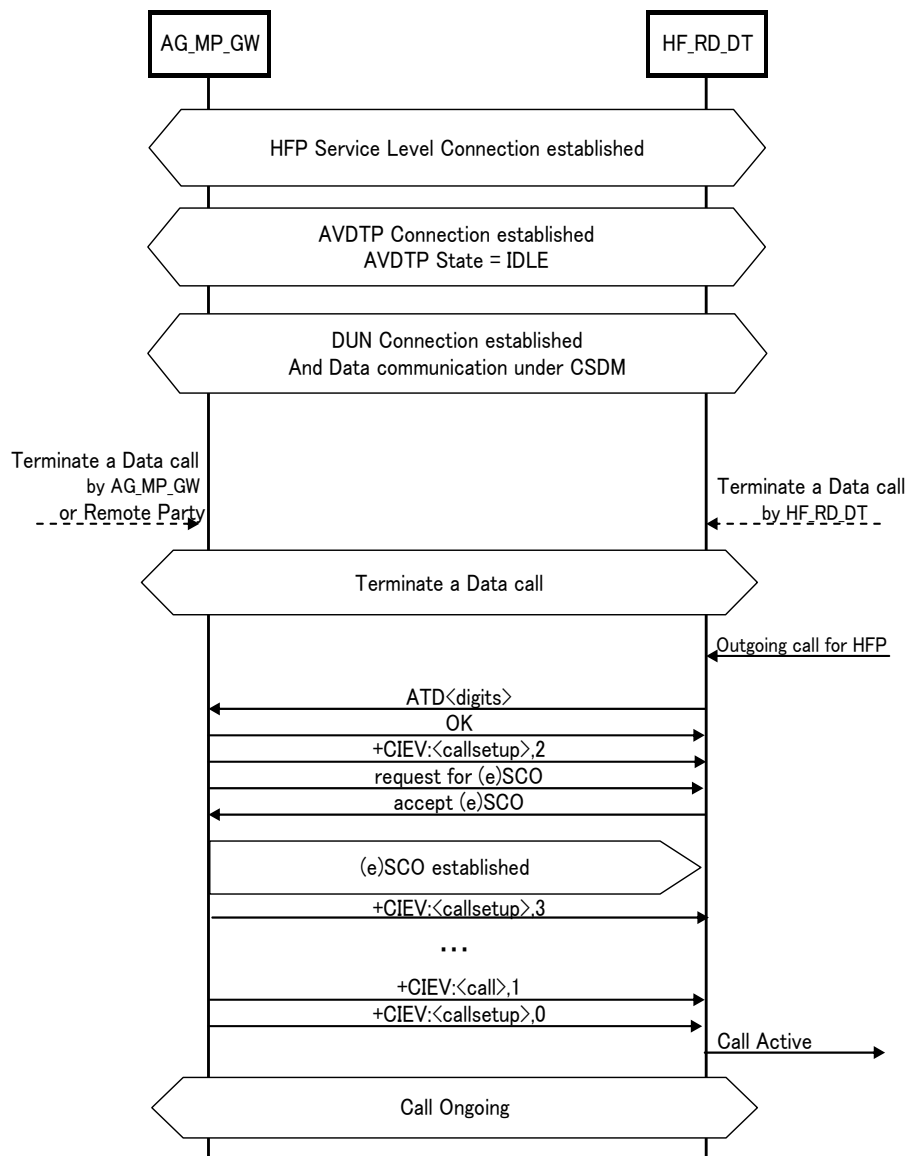


Figure 4.2.6.5. HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE. (HF_RD_DT initiated)

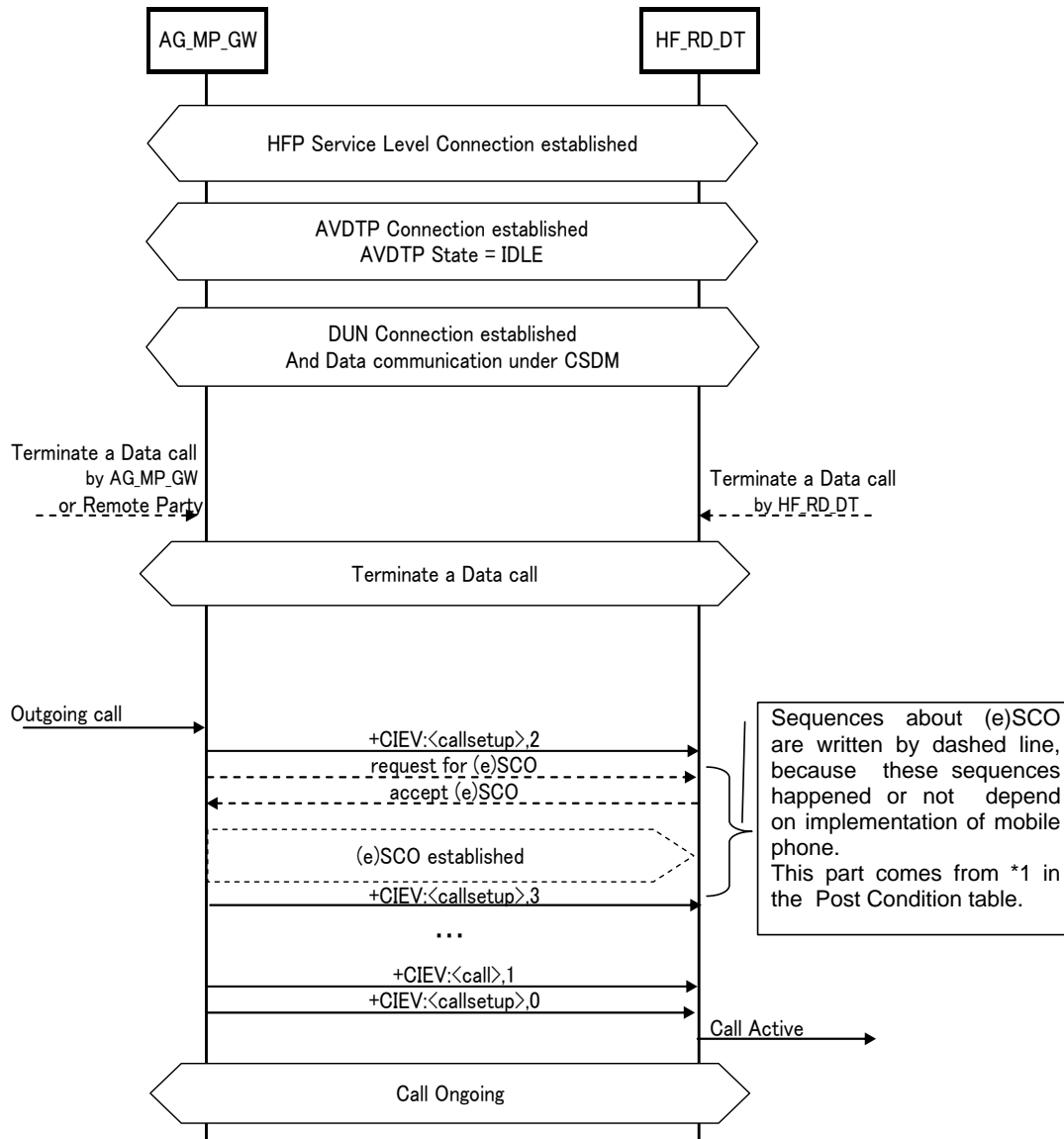


Figure 4.2.6.54.2-6.6. HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE. (AG_MP_GW initiated)

4.2.7 HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC AND DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE

4.2.7.1 Pre-Conditions

In the table below the pre-conditions for this scenario are listed.

Device	AG_MP_GW	HF_RD_DT
Paired with	HF_RD_DT	AG_MP_GW
AVDTP Signaling channel established with	HF_RD_DT	AG_MP_GW
AVDTP State	Streaming	Streaming
DUN connection established with	HF_RD_DT	AG_MP_GW
DUN (CIRCUIT-SWITCHED DATA MODE) State	Data communication	Data communication
HFP service level connection established with	HF_RD_DT	AG_MP_GW
HFP SCO connection established with	-	-

Table 4.2.7.14.2.7.1: Pre-Conditions: HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC AND DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE

4.2.7.2 User Action

User initiates a voice call or selects “Outgoing call” on HF_RD_DT while DUN Data communication is ongoing under Circuit-Switched data mode.

4.2.7.3 Post Conditions

In the table below the post-conditions for this scenario are listed.

Device	AG_MP_GW	HF_RD_DT
Paired with	HF_RD_DT	AG_MP_GW
AVDTP Signaling channel established with	HF_RD_DT	AG_MP_GW
AVDTP State during call	IDLE or OPEN (Suspended)	IDLE or OPEN (Suspended)
DUN connection established with	HF_RD_DT	AG_MP_GW
DUN (CIRCUIT-SWITCHED DATA MODE) State	N/A(Terminated)	N/A(Terminated)
HFP service level connection established with	HF_RD_DT	AG_MP_GW
HFP SCO connection established with during cal	[HF_RD_DT] *1	[AG_MP_GW] *1

Table 4.2.7.34.2.7.3: Post-Conditions: HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC AND DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE DURING CALL.

- *1 The possibility to be made the (e)SCO connection by outgoing call from the AG device depends on the implementation of AG. For example, the (e)SCO connection will not be established between HF and AG in case that the routing of audio path is set to AG.

Device	AG_MP_GW	HF_RD_DT
Paired with	HF_RD_DT	AG_MP_GW
AVDTP Signaling channel established with	HF_RD_DT	AG_MP_GW
AVDTP State after call	Streaming	Streaming
DUN connection established with	HF_RD_DT	AG_MP_GW
DUN (CIRCUIT-SWITCHED DATA MODE) State	N/A(Terminated)	N/A(Terminated)
HFP service level connection established with	HF_RD_DT	AG_MP_GW
HFP SCO connection established with after call	-	-

Table 4.2.7.34.2.7.4: Post-Conditions: HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC AND DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE

AFTER CALL

4.2.7.4 Recommendation

Under the Circuit-Switched data mode, it is impossible to make a phone call at the same time.

It is recommended to provide a way of terminating an ongoing data connection on HF_RD_DT (by menu, button and so on) in case user wants to make a outgoing voice call..

HF_RD_DT should not initiate outgoing call while DUN data communication is under Circuit-Switched data mode because the application layer of HF_RD_DT knows that DUN is under Circuit-Switched data mode.

The procedure of stop streaming at Outgoing call is same as 6.2.8 of SIG WP[9].

4.2.7.5 Message Sequence Charts

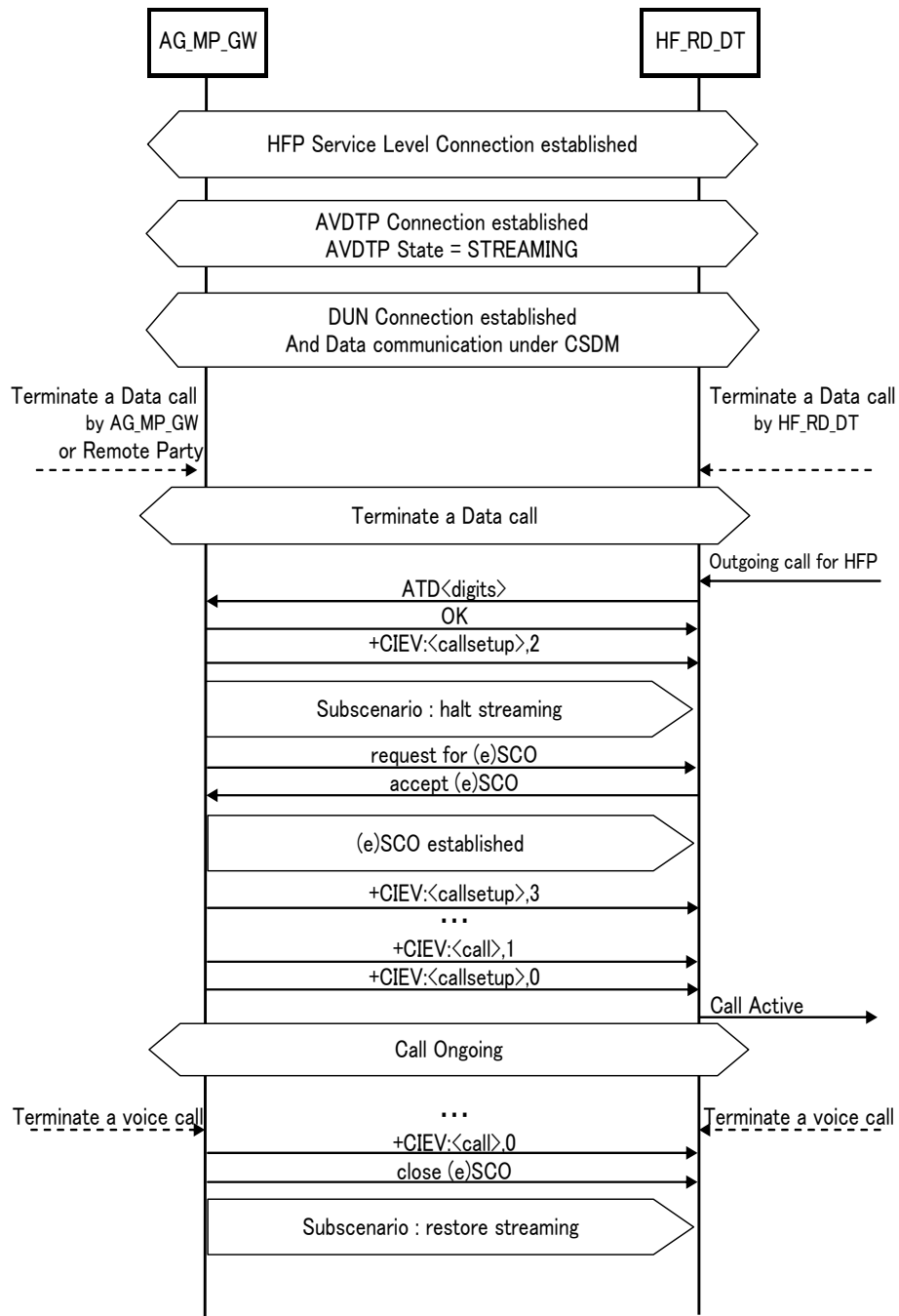


Figure 4.2.7.54.2.7.5. HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC AND DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE. (HF_RD_DT initiated)

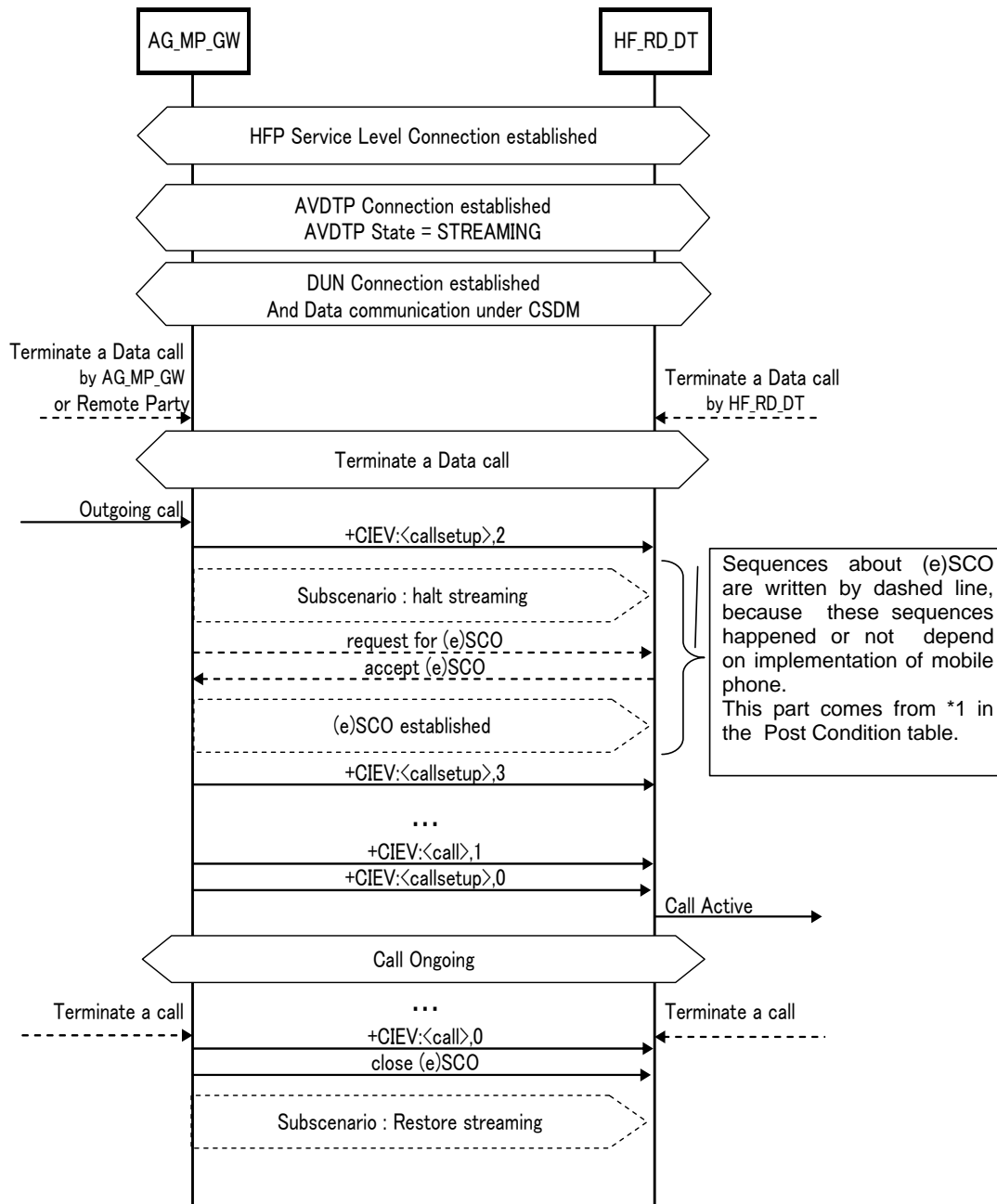


Figure 4.2.7.54.2.7.6. HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC AND DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE. (AG_MP_GW initiated)

Note: This guideline is based on the assumption that the cellular network can work voice call and data communication simultaneously. The sequence to apply when the cellular network can not handle the above case (i.e. an ATD error is returned) is left implementation specific.

4.3 Use Cases for HFP+A2DP/VDP+AVRCP+DUN WITH THE THIRD DEVICE

4.3.1 HFP+A2DP/VDP+AVRCP+DUN; DATA COMMUNICATION STARTING UNDER PACKET-SWITCHED DATA MODE WHILE LISTENING TO MUSIC FROM THE THIRD DEVICE.

In case the cellular network does not support concurrent voice and data communication, data communication is suspended when outgoing/incoming voice calls are to be carried out.

Refer to 4.2.1

Note: Regardless of the Streaming source (same device or third device), streaming is not affected by the DUN session. The sequence for DUN is therefore the same as in 4.2.1.

4.3.2 HFP+A2DP/VDP+AVRCP+DUN; DATA COMMUNICATION STARTING UNDER CIRCUIT-SWITCHED DATA MODE WHILE LISTENING TO MUSIC FROM THE THIRD DEVICE.

Refer to 4.2.2

Note: Regardless of the Streaming source (same device or third device), streaming is not affected by the DUN session. The sequence for DUN is therefore the same as in 4.2.2.

4.3.3 HFP+A2DP/VDP+AVRCP+DUN; INCOMING CALL WITHOUT HQ RING TONE UNDER PACKET-SWITCHED DATA MODE

Refer to 4.13 Answer an Incoming Call of HFP1.5 [1].

Note: An incoming call received during an ongoing DUN Packet-Switched Data Connection with an A2DP session in idle state with the third device does not modify neither DUN nor A2DP state. In case the cellular network does not support concurrent voice and data communication, data communication is suspended when outgoing/incoming voice calls are to be carried out but the DUN connection still exists.

Therefore, the sequence for HFP is as described in 4.13 Answer an Incoming Call of HFP1.5 [1] specification.

4.3.4 HFP+A2DP/VDP+AVRCP+DUN; INCOMING CALL WITHOUT HQ RING TONE UNDER PACKET-SWITCHED DATA MODE AND LISTENING TO MUSIC FROM THE THIRD DEVICE

Refer to “ 6.2.6 HFP+A2DP/VDP+AVRCP INCOMING CALL WHEN LISTENING TO MUSIC FROM A THIRD DEVICE, NO HQ RING SIGNAL[9]” in the document of “SIMULTANEOUS USE OF HFP, A2DP, AND AVRCP PROFILES” published by Bluetooth SIG

Note: An incoming call received during an ongoing DUN Packet-Switched Data session while an A2DP session is streaming data from the third device, does not affect the DUN session. In case the cellular network does not support concurrent voice and data communication, data communication is suspended when outgoing/incoming voice calls are executed. Therefore incoming HFP calls only affect the A2DP session by interrupting any ongoing streaming. The sequence to resume streaming is described in the White Paper[9].

4.3.5 HFP-A2DP/VDP-AVRCP+DUN; OUTGOING CALL DURING NO DATA/DATA COMMUNICATION UNDER PACKET-SWITCHED DATA MODE

Refer to 4.2.5

4.3.6 HFP + A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE(IN CASE OF THE THIRD DEVICE)

Refer to 4.2.6

4.3.7 HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC AND DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE (IN CASE OF THE THIRD DEVICE)

4.3.7.1 Pre-Conditions

In the table below the pre-conditions for this scenario are listed.

DEVICE	AG_GW	HF_RD_DT	MP
Paired with	HF_RD_DT	AG_GW, MP	HF_RD_DT
AVDTP Signaling channel established with	-	MP	HF_RD_DT
AVDTP State	N/A	Streaming	Streaming
AVCTP Signaling channel established with	-	MP	HF_RD_DT
DUN connection established with	HF_RD_DT	AG_GW	-
DUN (CIRCUIT-SWITCHED DATA MODE) State	Data communication	Data communication	N/A
HFP service level connection established with	HF_RD_DT	AG_GW	-
HFP SCO connection established with	-	-	-

Table 4.3.7.14.3.7.1: Pre-Conditions: HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC AND DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE

4.3.7.2 User Action

User initiates a voice call or selects “Outgoing call” on HF_RD_DT while DUN Data communication is ongoing under Circuit-Switched data mode.

4.3.7.3 Post Conditions

In the table below the post-conditions for this scenario are listed.

Device	AG_GW	HF_RD_DT	MP
Paired with	HF_RD_DT	AG_GW	HF_RD_DT
AVDTP Signaling channel established with	-	MP	HF_RD_DT
AVDTP State during call	N/A	IDLE	IDLE
AVCTP Signaling channel established with	-	MP	HF_RD_DT
DUN connection established with	HF_RD_DT	AG_GW	-
DUN(CIRCUIT-SWITCHED DATA MODE) State	N/A(Terminated)	N/A(Terminated)	N/A
HFP service level connection established with	HF_RD_DT	AG_GW	-
HFP SCO connection established with during call	[HF_RD_DT] *1	[AG_GW] *1	-

Table 4.3.7.34.3.7.3: Post-Conditions: HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC AND DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE DURING CALL.

- *1 The possibility to be made the (e)SCO connection by outgoing call from the AG device depends on the implementation of AG. For example, the (e)SCO connection will not be established between HF and AG in case that the routing of audio path is set to AG.

Device	AG_GW	HF_RD_DT	MP
Paired with	HF_RD_DT	AG_GW	HF_RD_DT
AVDTP Signaling channel established with	-	MP	HF_RD_DT
AVDTP State after call	N/A	Streaming	Streaming
AVCTP Signaling channel established with	-	MP	HF_RD_DT
DUN connection established with	HF_RD_DT	AG_GW	-
DUN(CIRCUIT-SWITCHED DATA MODE) State	N/A(Terminated)	N/A(Terminated)	N/A
HFP service level connection established with	HF_RD_DT	AG_GW	-
HFP SCO connection established with after call	-	-	-

Table 4.3.7.34.3.7.4: Post-Conditions: HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC AND DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE AFTER

CALL.

4.3.7.4 Recommendation

Under the Circuit-Switched data mode, it is impossible to make a phone call at the same time.

It is recommended to provide a way of terminating an ongoing data connection on HF_RD_DT (by menu, button and so on) in case user wants to make a outgoing voice call..

HF_RD_DT should not initiate outgoing call while DUN data communication is under Circuit-Switched data mode because the application layer of HF_RD_DT knows that DUN is under Circuit-Switched data mode.

The procedure of stop streaming at Outgoing call is same as 6.2.7 of SIG WP[9].

4.3.7.5 Message Sequence Charts

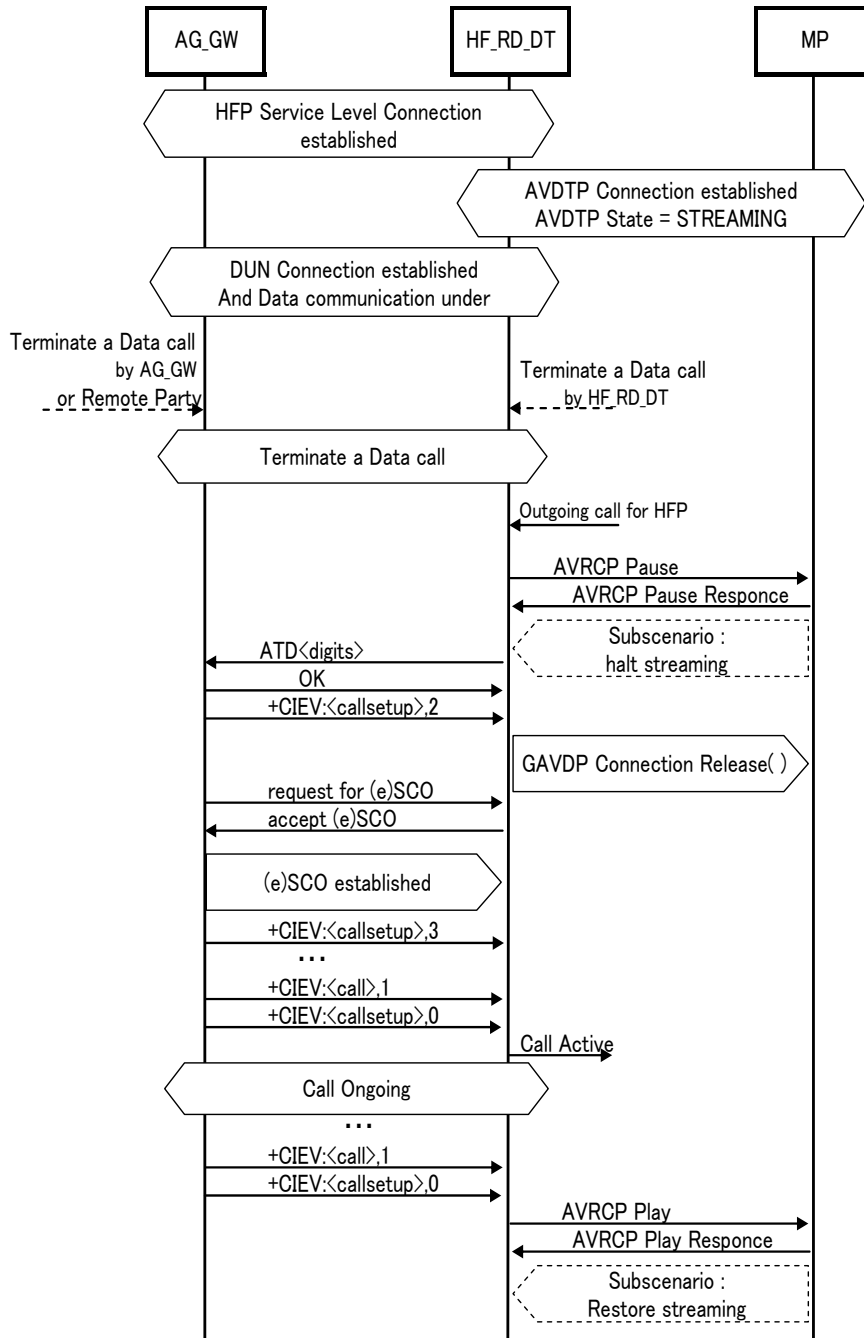


Figure 4.3.7.54.3.7.5. HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE IN CASE OF THE THIRD DEVICE. (HF_RD_DT initiated)

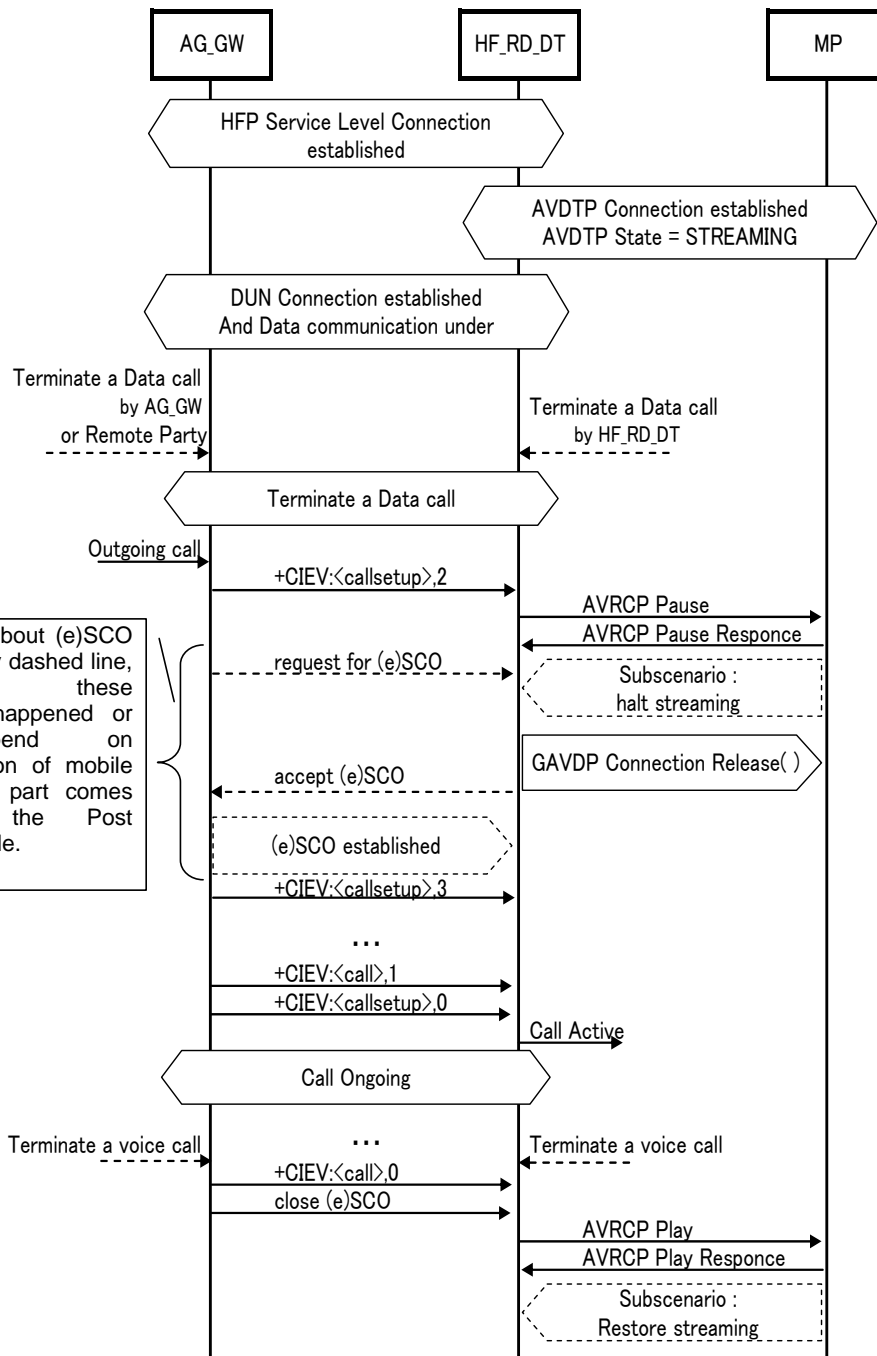


Figure 4.3.7.54.3.7.6. HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE IN CASE OF THE THIRD DEVICE. (AG_GW initiated)

Note: This guideline is based on the assumption that the cellular network can work voice call and

data communication simultaneously. The sequence to apply when the cellular network can not handle the above case (i.e. an ATD error is returned) is left implementation specific.

5. Appendix A (Multi Connection use cases)

Multi connection use cases discussed in this document are described in the following tables.

(1) Combination of Two Applications

				Pre-condition							
				HFP		DUN			A2DP		
				SLC	OnGoing	PSDM		CSDM	Streaming	IDLE	
						no DATA	DATA				
Event	Same Device Scenario	HFP	Incoming			*1		*3	*4 (covered by WP)	*1	
			Outgoing					4.1.3			
		DUN	PSDM	*1	4.1.1				Same as 4.2.1		
			CSDM		4.1.2				Same as 4.2.2		
		A2DP	IDLE		*2						
			Streaming								
	Third Device Scenario	HFP	Incoming						*5 (covered by WP)	*1	
			Outgoing								
		DUN	PSDM						Same as 4.3.1		
			CSDM						Same as 4.3.2		
		A2DP	IDLE	*1	*2						
			Streaming								

(2) Combination of Three Applications

(2-1) in case DUN event occurred

			Pre-condition			
			HFP=SLC		HFP=Ongoing	
			A2DP=Streaming	A2DP=IDLE	A2DP=Streaming	A2DP=IDLE
DUN Event	Same device Scenario	PSDM	4.2.1	Same as 4.2.1	*2	Same as 4.1.1
		CSDM	4.2.2	Same as 4.2.2		Same as 4.1.2
	Third device Scenario	PSDM	4.3.1	Same as 4.3.1		Same as 4.1.1
		CSDM	4.3.2	Same as 4.3.2		Same as 4.1.2

(2-2) in case A2DP event occurred

			Pre-condition			
			HFP=SLC		HFP=Ongoing	
			DUN= no DATA	DUN= DATA	DUN= no DATA	DUN= DATA
A2DP Event	Same device Scenario	IDLE	*1		*2	
		Streaming				
	Third device Scenario	IDLE				
		Streaming				

(2-3) in case HFP event occurred

			Pre-condition				
			A2DP=IDLE			A2DP=Streaming	
			DUN=PSDM		DUN= CSDM	DUN=PSDM	
			DUN= no DATA	DUN= DATA		DUN= no DATA	DUN= DATA
HFP Event	Same device Scenario	Incoming	4.2.3(No HQ Ring)	*3		4.2.4(No HQ Ring)	*3
		Outgoing	4.2.5	4.2.6		*6 (covered by WP)	4.2.7
	Third device Scenario	Incoming	4.3.3(No HQ Ring)	*3		4.3.4(No HQ Ring)	*3
		Outgoing	4.3.5	4.3.6		*7 (covered by WP)	4.3.7

*1 This case should not be cared because there isn't technical affection. Since the Pre-condition does not affect behavior of event, the message sequence charts when each profile (HFP, DUN, A2DP) is operated independently are applied in this case. Then behavior shall be referred to sequences for each profile.

*2 This case should not be cared because this combination of application is unusual.

*3 This case should not be cared because incoming call isn't available during CSDM data communication.

*4 This case is covered by SIMULTANEOUS USE OF HFP, A2DP, AND AVRCP PROFILES [9], 6.2.8 HFP+A2DP/VDP+AVRCP INCOMING CALL WHEN LISTENING TO MUSIC TO THE SAME DEVICE, NO HQ RING SIGNAL

*5 This case is covered by SIMULTANEOUS USE OF HFP, A2DP, AND AVRCP PROFILES [9], 6.2.9 HFP+A2DP/VDP+AVRCP INCOMING CALL WHEN LISTENING TO MUSIC FROM A THIRD DEVICE, NO HQ RING SIGNAL

*6 Even if a call is received or triggered during A2DP streaming with a concurrent DUN session in No Data or PSDM state, the DUN session is not affected. The sequence described in 6.2.8 of the SIMULTANEOUS USE OF HFP, A2DP, AND AVRCP PROFILES [9] therefore applies.

*7 Even if a call is received or triggered during A2DP streaming with a concurrent DUN session in No Data or PSDM state, the DUN session is not affected. The sequence described in 6.2.7 of the SIMULTANEOUS USE OF HFP, A2DP, AND AVRCP PROFILES [9] therefore applies.

6. Appendix B (Notes on the implementation)

In this chapter, several points to be noticed on the implementation are summarized in order to keep interoperability of Bluetooth communication.

B-1 Note on AVRCP Pass Through Command

In AVRCP, if a button remains pressed after a PASS THROUGH press command is sent a further PASS THROUGH press command shall be sent within 2 seconds of the previous press command. This must repeat until the button is released. This is according to AV/C Panel Subunit Specification[8] which is referred by AVRCP Specification[5].

7. Appendix C (HALT STREAMING Sub-scenarios)

In the following message sequence chart some procedures of the GAVDP specification are used. For the specific content of the procedures, please see the GAVDP specification.

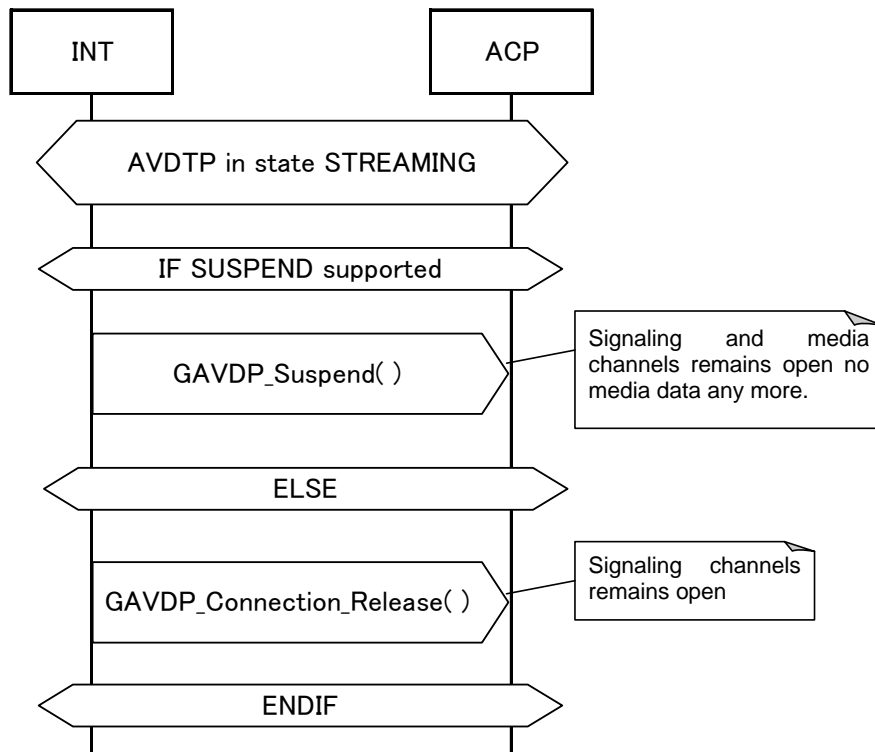


Figure 7.1: Sub-scenario halt streaming

Even if ACP supports SUSPEND, it shall be prepared that GAVDP_Connection_Release is used since AVDTP_SUSPEND is not a mandatory command.

8. Appendix D (RESTORE STREAMING Sub-scenarios)

In the following message sequence chart some procedures of the GAVDP specification are used. For the specific content of the procedures, please see the GAVDP specification.

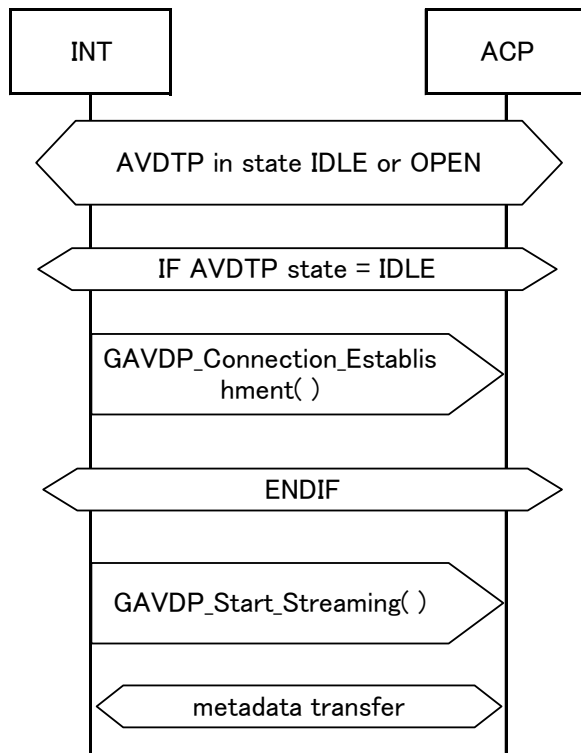


Figure 8.1: Sub-scenario restore streaming

If streaming was halted with GAVDP_Connection_Release it depends on the source implementation, how the stream is continued (e.g. last position or next song or ...)

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[Figure: 4.1.2.5. HFP+DUN; STARTING DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE WHILE ONGOING CALL HFP](#)

[Figure: 4.1.3.5. HFP+DUN; OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE \(User initiates a voice call on HF_DT\)](#)

[Figure: 4.2.1.5. HFP + A2DP/VDP + AVRCP + DUN; DATA COMMUNICATION STARTING UNDER PACKET-SWITCHED DATA MODE WHILE LISTENING TO MUSIC](#)

[Figure: 4.2.2.5. HFP + A2DP/VDP + AVRCP + DUN; DATA COMMUNICATION STARTING UNDER CIRCUIT-SWITCHED DATA MODE WHILE LISTENING TO MUSIC.](#)

[Figure 4.2.5.5. HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL UNDER PACKET-SWITCHED DATA MODE \(User initiates a voice call on HF_DT\).](#)

[Figure 4.2.5.6. HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL UNDER PACKET-SWITCHED DATA MODE. \(User initiates a voice call on AG_MP_GW\)](#)

[Figure 4.2.6.5. HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE. \(User initiates a voice call on HF_DT\)](#)

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[Figure ~~4.3.7.54.2.7.5~~ HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC AND DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE. \(HF_RD_DT initiated\)](#)

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[Figure 4.3.7.5. HFP+A2DP/VDP+AVRCP+DUN; OUTGOING CALL WHILE LISTENING TO MUSIC DATA COMMUNICATION UNDER CIRCUIT-SWITCHED DATA MODE IN CASE OF THE THIRD DEVICE. \(HF_RD_DT initiated\)](#)

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References

- [1] HFP specification 1.5 or later from www.bluetooth.org
- [2] AVDTP specification 1.0 or later from www.bluetooth.org
- [3] A2DP specification 1.0 or later from www.bluetooth.org
- [4] AVCTP specification 1.0 or later from www.bluetooth.org
- [5] AVRCP specification 1.0 or later from www.bluetooth.org
- [6] VDP specification 1.0 or later from www.bluetooth.org
- [7] GAVDP specification 1.0 or later from www.bluetooth.org
- [8] DUN specification 1.0 or later from www.bluetooth.org
- [9] SIMULTANEOUS USE OF HFP, A2DP, AND AVRCP PROFILES from www.bluetooth.org

MCPC TR-008 version 1.2 English
Bluetooth® Multi-Connection Technical Reference

1.

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