VIDEO DISTRIBUTION PROFILE

Abstract

This profile defines the requirements for *Bluetooth*® devices necessary for support of the video distribution. The requirements are expressed in terms of end-user services, and by defining the features and procedures that are required for interoperability between *Bluetooth* devices in the Video Distribution usage model.

Revision History

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D05r00	0.5	Apr 2002	Release to Associates
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V09r03	[redacted]	27 May 2004	Updated reflecting adoption as a Prototyping Specification
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Contributors

Morgan Lindqvist	Ericsson
Masatomo Hori	Matsushita Electric Industrial
Tsuyoshi Okada	Matsushita Electric Industrial
Kalervo Kontola	Nokia
Jurgen Schnitzler	Nokia
Miska M. Hannuksela	Nokia
Shaun Barrett	Philips
Christian Bouffioux	Philips
Frans de Bont	Philips
Emmanuel Mellery	Philips
Marc Vauclair	Philips
Masakazu Hattori	Sony
Harumi Kawamura	Sony
Rudiger Mosig	Sony
Yoshiyuki Nezu	Sony
Yoshiaki Takabatake (editor)	Toshiba
Makoto Kobayashi	Toshiba
Ichiro Tomoda	Toshiba
Kensaku Fujimoto	Toshiba

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Document Terminology

The Bluetooth SIG 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*).

Contents

1 Introduction

1.1 Scope

The Video Distribution Profile (VDP) defines the protocols and procedures that realize distribution of video content, using ACL channels. A typical usage case is streaming of video content from an observation camera to a monitor. The Video data is compressed in a specific format for efficient use of the limited bandwidth.

VDP focuses on video streaming, while the Advanced Audio Distribution Profile (A2DP) [2] specifies high quality audio streaming. Support of both profiles enables the distribution of video content accompanied with high-quality audio. The usage of video and audio streaming is described in Appendix B. VDP does not include remote control functions, and uses same transport architecture as A2DP (i.e. AVDTP [8] over L2CAP [3]). Devices may support remote control features on Bluetooth by implementing both VDP and the control profile as depicted, for example, in the usage scenario of Audio/Video Remote Control Profile [3].

Note1: VDP supports vendor specific extension to facilitate transport of multimedia content as a pre-multiplexed stream of audio and video. The multiplexing is performed on application level.

1.2 Profile Dependency

In Figure 1-1, the structure and the dependencies of the profiles are depicted. A profile is dependent upon another profile if it re-uses parts of that profile, by implicitly or explicitly referencing it. Dependency is illustrated in the figure. A profile has dependencies on the profile(s) in which it is contained – directly and indirectly.

As indicated in the figure, the VDP is dependent upon the Generic Access Profile (GAP), and also the Generic Audio/Video Distribution Profile (GAVDP) [4] that defines procedures required to setup an audio/video streaming. The VDP defines parameters and procedures that are specific for video streaming. The terminology, user interface and procedures as defined in the GAP and GAVDP are applicable to this profile, unless explicitly stated otherwise.

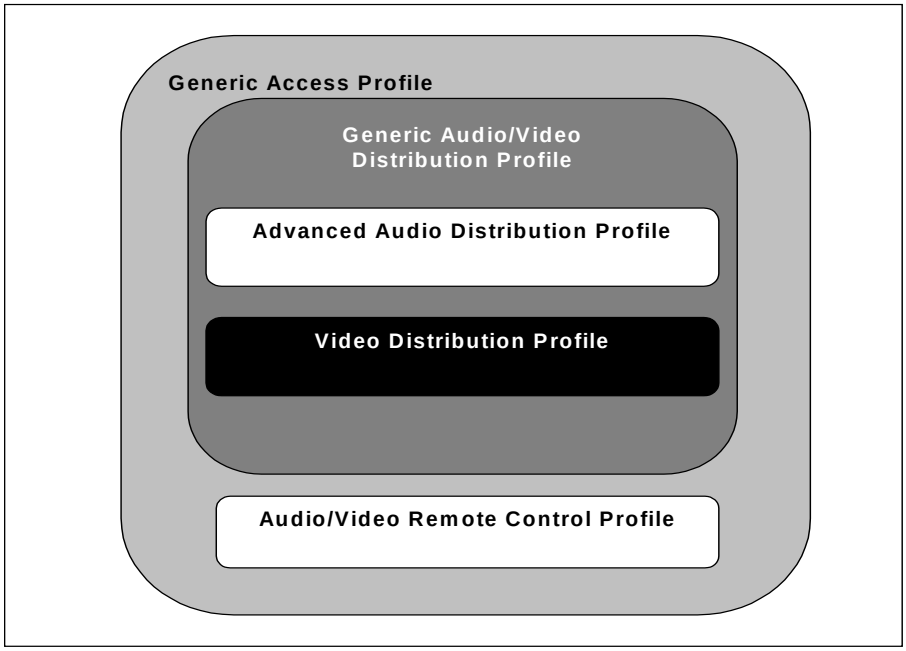

Figure 1-1: Profile Dependencies

1.3 Symbols and Conventions

1.3.1 Requirement Status Symbols

In this document the following symbols are used:

'M' for mandatory to support (used for capabilities that shall be used in the profile).

'O' for optional to support (used for capabilities that may be used in the profile).

'C' for conditional support (used for capabilities that shall be used in case a certain other capability is supported).

'X' for excluded (used for capabilities that may be supported by the unit, but which shall never be used in the profile).

'N/A' for not applicable (in the given context it is impossible to use this capability).

Some excluded capabilities are capabilities that, according to the relevant Bluetooth specification, are mandatory. These are features that may degrade operation of devices following this profile. Therefore, these features shall never be activated while a unit is operating as a unit within this profile.

1.3.2 Definition

1.3.2.1 RFA

Reserved for Future Additions. Bits with this designation shall be set to zero. Receivers shall ignore these bits.

1.3.2.2 RFD

Reserved for Future Definition. These bit value combinations or bit values are not allowed in the current specification but may be used in future versions. The receiver shall check that unsupported bit value combination is not used.

1.3.2.3 Forbidden

This bit value combination is not allowed in this specification. The receiver shall check that this bit value combination is not used.

1.3.3 Notation for Timers and Counters

Bluetooth timers and counters may be introduced in this profile. To distinguish them from timers and counters used in other parts of the specification, these timers and counters are named according to the following convention:

- "$T_{VDP}nnn$" for timers
- "$N_{VDP}nnn$" for counters

2 Profile Overview

2.1 Profile Stacks

The figure below shows the protocols and entities used in this profile.

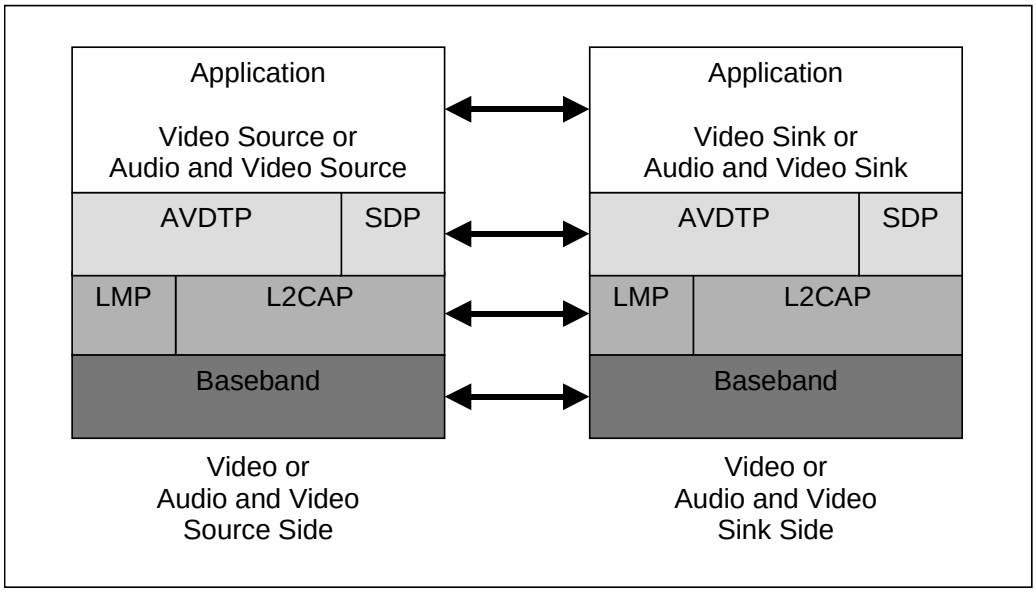

Figure 2-1: Protocol Model

The Baseband[1], LMP[1], L2CAP[1], SDP[1] are Bluetooth protocols defined in the Bluetooth Core specifications. AVDTP [5] consists of a signalling entity for negotiation of streaming parameters and a transport entity that can handle streaming itself.

The Application layer shown in Figure 2-1 is the entity in which the device can set application service and transport service parameters. The entity also adapts the video streaming data into/from the defined packet format.

For the shaded protocols/entities in Figure 2-1, the GAVDP applies, except in those cases where this profile explicitly states deviations.

2.2 Configurations and Roles

The following roles are defined for devices that implement this profile:

Source (SRC) – A device is the **SRC** when it acts as a source of a digital video stream that is delivered to the **SNK** of the piconet.

Sink (SNK) – A device is the **SNK** when it acts as a sink of a digital video stream delivered from the **SRC** on the same piconet.

Examples of configurations illustrating the roles for this profile are depicted in Figure 2-2.

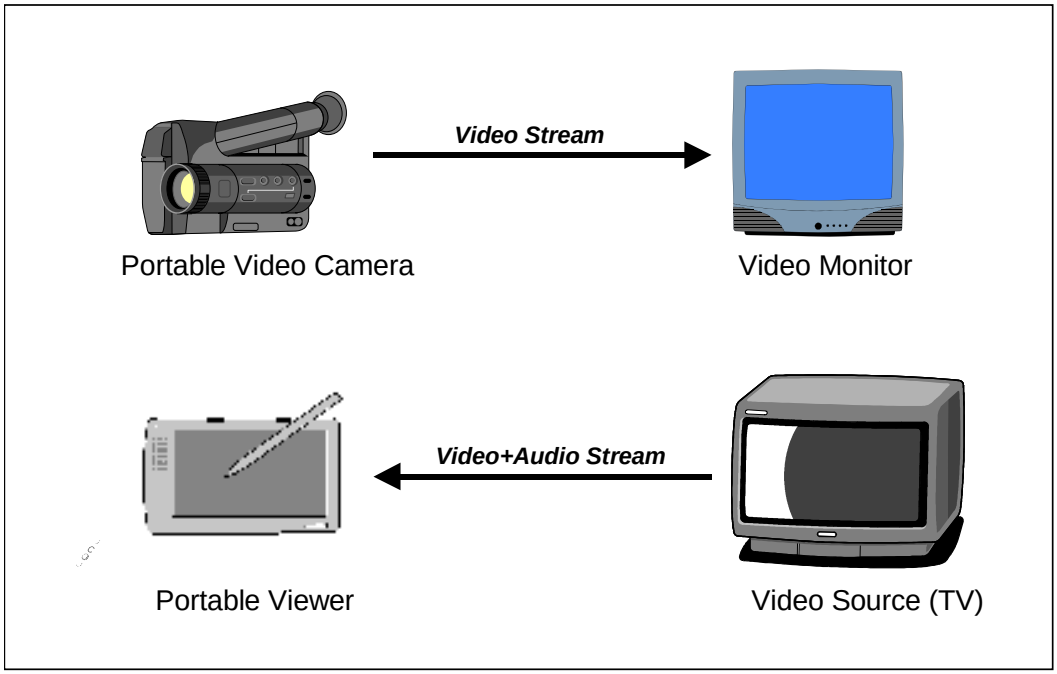

Figure 2-2: Example of Configuration

2.3 User Requirements and Scenarios

The following scenario is covered by this profile:

- Setup/control/manipulate a streaming of video or pre-multiplexed audio and video data from the **SRC** to the **SNK**(s).

The following restrictions are applied to this profile:

1 The profile does not support a synchronized point-to-multipoint distribution.

2 There exists certain delay between the **SRC** and the **SNK** due to radio signal processing, data buffering, and encode/decode of the stream data. Countering the effects of such delays depends on implementation.

The following requirements are set in this profile:

1 The required media stream (or pre-multiplexed audio and video) data rate shall be limited so as to allow packet retransmissions on the Bluetooth data link. Using packet retransmission will reduce the effects of packet loss, and improve the user experience.

2 The profile does not exclude any content protection method.

2.4 Profile Fundamentals

The profile fundamentals are same as defined in the GAVDP in addition to the following requirement.

- Content Protection is provided at the application level and is not a function of the Bluetooth link level security protocol.

2.5 Conformance

When conformance to this profile is claimed, all capabilities indicated mandatory for this profile shall be supported in the specified manner (process mandatory). This also applies for optional and conditional capabilities for which support is indicated. All mandatory, optional, and conditional capabilities, for which support is indicated, are subject to verification as part of the Bluetooth certification program.

3 Application Layer

This section describes the feature requirements on units complying with the VDP.

Table 3-1 shows the feature requirements for this profile.

Item No.	Feature	Support in SRC	Support in SNK
1	Video Streaming	M	M

Table 3-1:Application Layer Features

Table 3-2maps each feature to the procedures used for that feature, and shows whether the procedure is optional, mandatory, or conditional. The procedures are described in the reference section.

Item No.	Feature	Procedure	Ref.	Support in SRC	Support in SNK
1	Video Streaming	Send Video Stream	3.2.1	M	N/A
		Receive Video Stream	3.2.2	N/A	M

Table 3-2: Application Layer Features to Procedure Mapping

3.1 Video Streaming Set Up

When a device wishes to start streaming of video or pre-multiplexed audio and video content, the device firstly needs to set up a streaming connection. Signalling procedures and typical signalling flows are illustrated in Section 4.1 and Appendix A of GAVDP [4], respectively. During such set-up procedure, the devices select the most suitable video or pre-multiplexed audio and video streaming parameters. There are two kinds of services configured; one is an application service capability, and the other is a transport service capability. (For details, see Section 6.6 in AVDTP [5].) This profile specifies video and pre-multiplexed audio and video specific parameters necessary for these signalling procedures.

The application service capability for VDP consists of video codec capability, multimedia codec capability and content protection capability. Details of these parameters such as mode, frame rate, and bit rate are described in Section 4. The content protection capability is described in Appendix A as informative.

The transport service capability is to select the services provided by AVDTP in order to manipulate the streaming packets more intelligently. Such treatment will help effective use of bandwidth. Available modes, parameters and their requirements are explained in Section 5.1.

3.2 Video Streaming

Once streaming connection is established and *Start Streaming* procedure in GAVDP is executed, both SRC and SNK are in the STREAMING state, in which the SRC (SNK) is ready to send (receive) video stream. (See Section 4.1 in GAVDP.) The SRC uses the *Send Video Stream* procedure to send video data to the SNK, which in turn employs the *Receive Video Stream* procedure to receive the video data. The block diagram of these procedures and created packet format are shown in

Figure 3-1. In chapter 4 video-specific parameters in AVDTP header and media payload format are also specified.

Note again that the devices shall be in the STREAMING state to send/receive video stream. If the **SRC**/**SNK** wishes to send/receive the video stream whereas the state is still at OPEN, the **SRC**/**SNK** shall initiate *Start Streaming* procedure defined in GAVDP.

3.2.1 Send Video Stream

In the *Send Video Stream* procedure, the **SRC** may encode the data into a selected format in the signalling session, if needed. Then, the application layer of the **SRC** shall adapt the encoded data into the defined media payload format. The frame of encoded video or pre-multiplexed audio and video data is adapted to the defined payload format as defined in Chapter 4.

When content protection is in use, a content protection header may precede encrypted video content. This is content protection method dependent.

Afterwards, the stream data shall be handed down to the AVDTP entity through the exposed interface (Interface 4) defined in Chapter 2 of AVDTP. The stream data shall be sent out on the transport channel using the selected transport services defined in AVDTP, Section 5.5.

3.2.2 Receive Video Stream

The AVDTP entity of the **SNK** shall receive the stream data from the transport channel using the selected transport services and pass it to the application layer by exposed interface defined in Chapter 2 of AVDTP.

When a content protection method is active, the application layer of the **SNK** shall process the retrieved AVDTP payload as described by the content protection method. Typically, this processing entails content protection header analysis and decryption of associated encrypted content.

Finally the frame of video or pre-multiplexed audio and video data will be decoded according to the selected coding format.

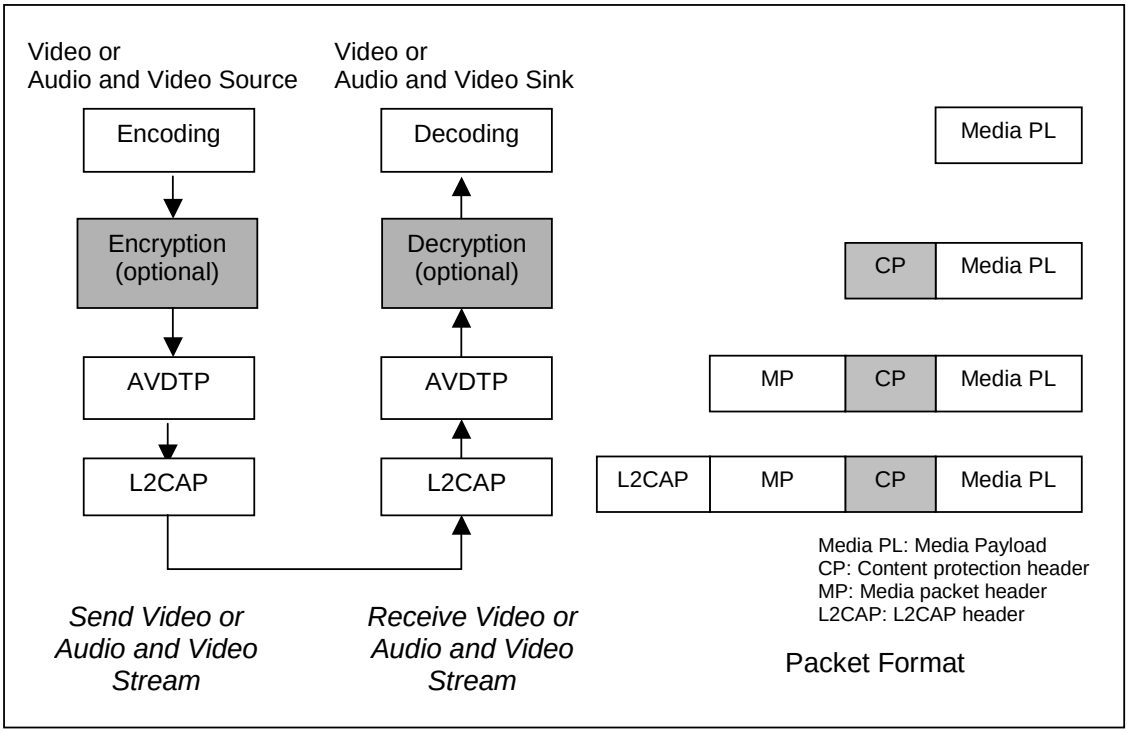

Figure 3-1: Block Diagram of Video Streaming Procedures and the Packet Format

4 Video and Multimedia Codec Interoperability Requirements

4.1 Overview

This chapter defines necessary information specific for video and multimedia codec. In Section 4.2 definition of codecs used in this profile and their requirements are fully described. Additional information about codecs introduced after the publication of this profile is described in Bluetooth Assigned Numbers [6].

Remaining sections provide reference for each codec as well as the following information:

- *Video codec capabilities* define the capability field for video codec and its parameters necessary for signalling procedures in the streaming set up. Related procedures in GAVDP are *Connection Establishment* and *Change Parameters* procedures.
- *Media packet header requirements* define video codec specific parameters in the media packet header, which shall be added to the media payload in the AVDTP entity. (See Figure 3-1)
- *Media payload format* defines the video codec specific payload format in the AVDTP packet, which shall be used in the *Video Streaming* procedures in Section 3.2 (See also Figure 3-1).
- *Multimedia codec capabilities* define the capability field for multimedia codec and its parameters necessary for signalling procedures in the streaming set up. Related procedures in GAVDP are *Connection Establishment* and *Change Parameters* procedures.

  Note: In VDP no multimedia codec capabilities are specified. The multimedia codec is treated as Non-VDP codec. (See Section 4.2.3)

4.2 Support of Codecs

Table 4-1 shows supported *Mandatory* and *Optional* codecs in this profile.

Codec Type	Support	Media Type	Ref.
H.263 baseline	C1	Video	4.3
MPEG-4 Visual Simple Profile	O	Video	4.4
H.263 profile 3	O	Video	4.5
H.263 profile 8	O	Video	4.6

Table 4-1: Supported codecs

C1:Optional if used like in the exception presented in 4.2.1.3 otherwise Mandatory

The following codecs are treated as *Non-VDP* codecs:

- The codecs that are not on Table 4-1.
- The *Mandatory* or *Optional* codecs on Table 4-1 used in non-conforming way.

Requirements for the use of *Non-VDP* codecs are defined in Section 4.2.3 and 4.7.

4.2.1 Mandatory Codec

The VDP mandates H.263 Baseline Profile (Profile 0) codec (H.263 baseline) to ensure the interoperability.

The device shall implement a H.263 baseline decoder when the device is the **SNK** and it uses a video decoder for rendering the received video stream.

4.2.1.1 SRC Device Supporting Video Encoder

The device shall implement a H.263 baseline encoder when the device is the **SRC** and it uses a video encoder for creating the video streaming.

4.2.1.2 SRC Device Using Pre-encoded Video Data

Pre-encoded video data is video data that is not encoded by the **SRC** device but is received from an external digital interface and possibly stored in the device. The pre-encoded video data can be in any of mandatory, optional or non-VDP format.

If the **SRC** device supports a capability to send pre-encoded video data and also implements a H.263 baseline encoder for creating the video streaming, the **SRC** device shall support the capability to send pre-encoded H.263 baseline video data format.

4.2.1.3 Mismatch Between SRC and SNK Video Data Format

If the **SRC** device supports a capability to send pre-encoded video data but the **SNK** device does not support that pre-encoded video data format then the **SRC** device is not required to transcode the pre-encoded data into the mandatory codec format.

4.2.2 Optional codecs

The device may also support *Optional* codecs to maximize its usability. When both **SRC** and **SNK** support the same *Optional* codec, this codec may be used instead of Mandatory codec. *Optional* codecs available in this profile are listed in Table 4-1.

4.2.3 Non-VDP Codecs

The device may support other codecs as *Non-VDP* codecs. A user of the *Non-VDP* codec (hereafter the Vendor) oneself defines parameters and any information necessary for use of the codec in VDP. The profile does not specify anything for *Non-VDP* codecs. The *Non-VDP* codec can be upgraded to *Optional* when the following items are prepared:

- Clear pointer to the specification, test vectors, and related documents
- Necessary parameters for Signalling

4.2.4 Codec Type Field Values

Refer to Bluetooth Assigned Numbers [6] for video codec types and multimedia codec types available in this profile. Message format of video codec capabilities and multimedia codec capabilities are defined in Section 8.19.2 of AVDTP.

4.2.5 Media Type Field Values

Refer to Bluetooth Assigned Numbers [6] for Media Type of video and multimedia codecs.

4.3 H.263 baseline

4.3.1 Reference

For H.263 baseline, refer to [11][12].

4.3.2 Codec Specific Information Elements

Figure 4-1 shows Codec Specific Information Elements for H.263 baseline used in the signalling procedures. The following section defines the field values and their requirements. If the packet includes improper settings, the error code shall be returned as specified in Section 5.1.3.

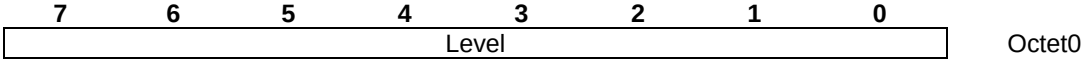

Figure 4-1: Codec Specific Information Elements for H.263 baseline

Note: In the Get Capabilities Response of AVDTP, one or more bits may be defined/set in each field. On the other hand, in the Set Configuration Command and the Reconfigure Command of AVDTP, only one bit shall be defined/set in each field.

4.3.2.1 Level

Table 4-2 shows the value of *Level* field for H.263 baseline. The **SRC** and **SNK** shall support H.263 baseline Level 10, Levels 20 and 30 are optional.

Position	Level	Support in SRC	Support in SNK
Octet0; b7	10	M	M
Octet0; b6	20	O	O
Octet0; b5	30	O	O
Octet0; b4	RFA	–	–
Octet0; b3	RFA	–	–
Octet0; b2	RFA	–	–
Octet0; b1	RFA	–	–
Octet0; b0	RFA	–	–

Table 4-2: Level for H.263 baseline

4.3.3 Media Packet Header Requirements

The media packet header requirements for H.263 baseline are contained in the specification of media payload format referenced in Section 4.3.4.

4.3.4 Media Payload Format

H.263 baseline uses payload format defined in [13].

4.4 MPEG-4 Visual Simple Profile

4.4.1 Reference

For MPEG-4 Visual Simple Profile, refer to [9].

4.4.2 Codec Specific Information Elements

Figure 4-2 shows *Codec Specific Information Elements* for MPEG-4 used in the signalling procedures. The following section defines the field values and their requirements. If the packet includes improper settings, the error code shall be returned as specified in Section 5.1.3.

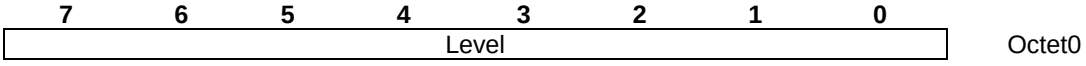

Figure 4-2: Codec Specific Information Elements for MPEG-4

Note: In the Get Capabilities Response of AVDTP, one or more bits may be defined/set in each field. On the other hand, in the Set Configuration Command and the Reconfigure Command of AVDTP, only one bit shall be defined/set in each field.

4.4.2.1 Level

Table 4-3 shows the value of Level field specified in Annex G of MPEG-4 specification [9]. The **SRC** and **SNK** shall support the Level 0, and Level 1, 2 and 3 are optional.

Position	Level	Support in SRC	Support in SNK
Octet0; b7	0	M	M
Octet0; b6	1	O	O
Octet0; b5	2	O	O
Octet0; b4	3	O	O
Octet0; b3	RFA	–	–
Octet0; b2	RFA	–	–
Octet0; b1	RFA	–	–
Octet0; b0	RFA	–	–

Table 4-3: Level of MPEG-4 Visual Simple Profile

4.4.3 Media Packet Header Requirements

The media packet header requirements for MPEG-4 are contained in the specification of media payload format referenced in Section 4.4.4.

4.4.4 Media Payload Format

MPEG-4 uses payload formats defined in [10].

4.5 H.263 Profile 3

4.5.1 Reference

For H.263 profile 3 (" Version 2 Interactive and Streaming Wireless Profile (Profile 3)"), refer to [11][12].

4.5.2 Codec Specific Information Elements

Figure 4-3 shows Codec Specific Information Elements for H.263 profile 3 used in the signalling procedures. The following section defines the field values and their requirements. If the packet includes improper settings, the error code shall be returned as specified in Section 5.1.3.

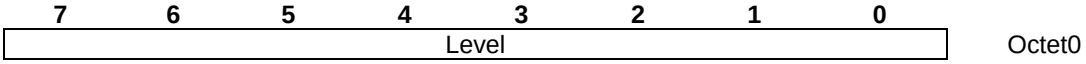

Figure 4-3: Codec Specific Information Elements for H.263 profile 3

Note: In the Get Capabilities Response of AVDTP, one or more bits may be defined/set in each field. On the other hand, in the Set Configuration Command and the Reconfigure Command of AVDTP, only one bit shall be defined/set in each field.

4.5.2.1 Level

Table 4-4 shows the value of *Level* field for H.263 profile 3. The **SRC** and **SNK** shall support H.263 baseline Level 10, Levels 20 and 30 are optional.

Position	Level	Support in SRC	Support in SNK
Octet0; b7	10	M	M
Octet0; b6	20	O	O
Octet0; b5	30	O	O
Octet0; b4	RFA	–	–
Octet0; b3	RFA	–	–
Octet0; b2	RFA	–	–
Octet0; b1	RFA	–	–
Octet0; b0	RFA	–	–

Table 4-4: Level for H.263 profile 3

4.5.3 Media Packet Header Requirements

The media packet header requirements for H.263 profile 3 are contained in the specification of media payload format referenced in Section 4.3.3.

4.5.4 Media Payload Format

H.263 profile 3 uses payload format defined in [13].

4.6 H.263 Profile 8

4.6.1 Reference

For H.263 profile 8 ("high latency profile"), refer to [11][12].

4.6.2 Codec Specific Information Elements

Figure 4-4 shows Codec Specific Information Elements for H.263 profile 8 used in the signalling procedures. The following section defines the field values and their requirements. If the packet includes improper settings, the error code shall be returned as specified in Section 5.1.3.

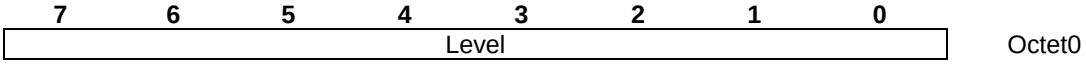

Figure 4-4: Codec Specific Information Elements for H.263 profile 8

Note: In the Get Capabilities Response of AVDTP, one or more bits may be defined/set in each field. On the other hand, in the Set Configuration Command and the Reconfigure Command of AVDTP, only one bit shall be defined/set in each field.

4.6.2.1 Level

Table 4-5 shows the value of *Level* field for H.263 profile 8. The **SRC** and **SNK** shall support H.263 baseline Level 10, Levels 20 and 30 are optional.

Position	Level	Support in SRC	Support in SNK
Octet0; b7	10	M	M
Octet0; b6	20	O	O
Octet0; b5	30	O	O
Octet0; b4	RFA	–	–
Octet0; b3	RFA	–	–
Octet0; b2	RFA	–	–
Octet0; b1	RFA	–	–
Octet0; b0	RFA	–	–

Table 4-5: Level for H.263 profile 8

4.6.3 Media Packet Header Requirements

The media packet header requirements for H.263 profile 8 are contained in the specification of media payload format referenced in Section 4.3.3.

4.6.4 Media Payload Format

H.263 profile 8 uses payload format defined in [13].

4.7 Non-VDP Codec

4.7.1 Reference

Definition and treatment of *Non-VDP* codec is defined in Section 4.2.3.

4.7.2 Codec Specific Information Elements

Figure 4-5 shows *Codec Specific Information Elements* for *Non-VDP* codec used in the signalling procedures. If the packet includes improper settings, the error code shall be returned as specified in Section 5.1.3.

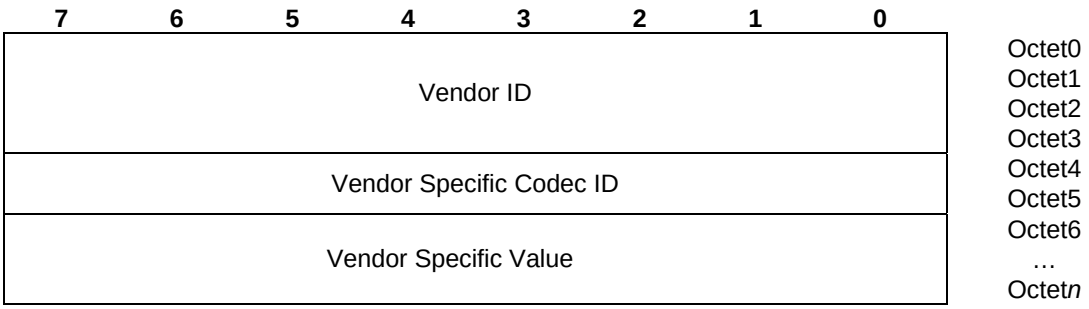

Figure 4-5: Codec Specific Information Elements for Non-VDP Codec

4.7.2.1 Vendor ID

The 32-bit Vendor ID defined in Bluetooth Assigned Numbers [6] shall be used.

4.7.2.2 Vendor Specific Codec ID

The *Vendor Specific Codec ID* field in Figure 4-5 contains 16-bit codec ID administered by the Vendor.

4.7.2.3 Vendor Specific Value

The *Vendor Specific Value* field in Figure 4-5 contains values specifically defined by the Vendor. Details are out of scope of this profile.

4.7.3 Media Packet Header Requirements

Media Packet Header requirements shall be defined by the Vendor.

4.7.4 Media Payload Format

Media Payload Format shall be defined by the Vendor.

5 GAVDP Interoperability Requirements

This profile requires compliance to the Generic A/V Distribution Profile (GAVDP). The following text together with the associated sub-clauses defines the requirements with regards to this profile, in addition to the requirements defined in GAVDP.

5.1 AVDTP Interoperability Requirements

5.1.1 Signalling procedures

In the Video Distribution Profile, it is mandatory for the **SRC** and optional for the **SNK** to be able to establish a streaming connection, start streaming and release the streaming connection. The **SRC** can assume the role of both **INT** and **ACP**, while the **SNK** device can assume the role of **ACP** and optionally the role of **INT**. Therefore, it is mandatory for **SRC** to support **ACP** role, so that signalling procedures can be manipulated between any combination of a **SRC** device and a **SNK** device.

	Role in GAVDP	Support in SRC	Support in SNK
1	**INT**	M	O
2	**ACP**	M	M

Table 5-1:Roles in GAVDP

5.1.2 Transport Services

Table 5-2 shows support of AVDTP transport capabilities for this profile. In this profile Basic service is mandatory to support.

Item no.	Capability	Ref.	Support
1	Basic service	7.2 in [5]	M
2	Reporting service	7.3 in [5]	O
3	Recovery service	7.4 in [5]	O
4	Multiplexing service	7.5 in [5]	O
5	Header compression service	7.6 in [5]	O

Table 5-2: AVDTP transport capabilities

5.1.3 Error Codes

If the *Codec Specific Information Elements* include improper settings, the error code shall be returned as follows. Apart from the error codes specified in GAVDP[4], Table 5-3 below lists additional error codes that shall be used by the application if applicable errors are found in the commands received.

Error ID	Related Signalling command	Related CODEC	Error Abbreviation	Error Description
0xC1	Set Configuration Reconfigure	ALL	INVALID_CODEC_TYPE	Media Codec Type is not valid
0xC2	Set Configuration Reconfigure	ALL	NOT_SUPPORTED_CODEC_TYPE	Media Codec Type is not supported

0xC3	Set Configuration Reconfigure	H.263 baseline MPEG-4 Visual Simple Profile H.263 Profile 3 H.263 Profile 8	INVALID_LEVEL	Level is not valid or multiple values have been selected
0xC4	Set Configuration Reconfigure	H.263 baseline MPEG-4 Visual Simple Profile H.263 Profile 3 H.263 Profile 8	NOT_SUPPORTED_LEVEL	Level is not supported
0xC5-0xDF				RFD
0xE0	Set Configuration Reconfigure	ALL	INVALID_CP_TYPE	The requested CP Type is not supported.
0xE1	Set Configuration Reconfigure Security Control	ALL	INVALID_CP_FORMAT	The format of Content Protection Service Capability/Content Protection Scheme Dependent Data is not correct.
0xE2-0xFF				RFD

Table 5-3: Error Codes

5.2 L2CAP Interoperability Requirements

For the L2CAP layer, no additions to the requirements as stated in the GAVDP shall apply except for the following requirements.

5.2.1 Maximum Transmission Unit

The minimum MTU that a L2CAP implementation for this profile shall support is 335bytes. (*Note*: DH5 packet size equals 339byte including 4-byte L2CAP header.)

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5.3 SDP Interoperability Requirements

This profile defines the following service records for the source and the sink respectively.

The codes assigned to the mnemonics used in the Value column as well as the codes assigned to the attribute identifiers (if not specifically mentioned in the AttrID column) can be found in Bluetooth Assigned Numbers[6].

Item	Definition	Type	Value	AttrID	Status	Default
Service Class ID List				See [6]	M	
Service Class #0		UUID	Video Source		M	
Protocol Descriptor List				See [6]	M	

Protocol #0		UUID	L2CAP		M	
Parameter #0 for Protocol #0	PSM	Uint 16	PSM= AVDTP		M	
Protocol #1		UUID	AVDTP		M	
Parameter #0 for Protocol #1	Version	Uint 16	0x0100*		M	
Bluetooth Profile Descriptor List				See [6]	M	
Profile #0		UUID	Video Distribution		M	
Parameter #0 for Profile #0	Version	Uint 16	0x0100*		M	
Provider Name	Displayable Text Name	String	Provider Name	See [6]	O	
Service Name	Displayable Text Name	String	Service-provider defined	See [6]	O	

* Indicating Version 1.0

Figure 5-1: Service Record for Source

Item	**Definition**	**Type**	**Value**	**AttrID**	**Status**	**Default**
Service Class ID List				See [6]	M	
Service Class #0		UUID	Video Sink		M	
Protocol Descriptor List				See [6]	M	
Protocol #0		UUID	L2CAP		M	
Parameter #0 for Protocol #0	PSM	Uint 16	PSM= AVDTP		M	
Protocol #1		UUID	AVDTP		M	
Parameter #0 for Protocol #1	Version	Uint 16	0x0100*		M	
Bluetooth Profile Descriptor List				See [6]	M	
Profile #0		UUID	Video Distribution		M	
Parameter #0 for Profile #0	Version	Uint 16	0x0100*		M	
Provider Name	Displayable Text Name	String	Provider Name	See [6]	O	
Service Name	Displayable Text Name	String	Service-provider defined	See [6]	O	

* Indicating Version 1.0.

Figure 5-2: Service Record for Sink

5.4 Link Manager Interoperability Requirements

For the LMP layer, no additions to the requirements as stated in the GAVDP shall apply.

5.5 Link Controller Interoperability Requirements

For the LC layer, the requirements as stated in the GAVDP shall apply. Furthermore the following packets shall be supported in both **SNK** and **SRC**:
DH3, DM3, DH5 and DM5.

Note: Requirements described in GAVDP is described for **INT**/**ACP**. For **SRC**, it is mandatory to support both **INT** and **ACP**. For **SNK**, it is mandatory to support **ACP** and it is optional to support **INT**.

5.5.1 Class of Device

For the Class of Device field the following applies:

1. Mandatory to set the ‘Rendering’ bit for the **SNK** and the ‘Capturing’ bit for the **SRC** in the Service Class field.
2. Recommended to set ‘Audio/Video’ as Major Device class both for the **SNK** and the **SRC**.
3. Select the appropriate Minor Device class as defined in the Bluetooth Assigned Numbers[6].

6 Generic Access Profile Interoperability Requirements

The Video Distribution profile requires compliance to the Generic Access Profile.

There is no change to the requirements as stated in the General Audio/Video Distribution Profile.

Note: Requirements described in GAVDP is described for **INT**/**ACP**. For **SRC**, it is mandatory to support both **INT** and **ACP**. For **SNK**, it is mandatory to support **ACP** and it is optional to support **INT**.

7 Timers and Counters

There are no specific timers and counters defined in the VDP Specification.

8 Testing

The Video Distribution profile requires interoperability test. The details of the test strategy are described in [7]. Tested functionality is defined in [8].

9 References

[1] Bluetooth SIG, Specification of the Bluetooth System, Core, Version 1.1 or later

[2] Bluetooth SIG, Specification of the Bluetooth System, Profiles, version 1.0 or later, Advanced Audio Distribution Profile

[3] Bluetooth SIG, Specification of the Bluetooth System, Profiles, version 1.0 or later, Audio/Video Remote Control Profile

[4] Bluetooth SIG, Specification of the Bluetooth System, Profiles, version 1.0 or later, Generic Audio/Video Distribution Profile

[5] Bluetooth SIG, Specification of the Bluetooth System, Core, version 1.0 or later, Audio/Video Distribution Transport Protocol

[6] Bluetooth SIG, Bluetooth Assigned Numbers, https://www.bluetooth.org/

[7] Bluetooth SIG, Specification of the Bluetooth System, TSS, version 1.0, Test Suite Structure (TSS) and Test Procedures (TP) for Video Distribution Profile

[8] Bluetooth SIG, Specification of the Bluetooth System, ICS, version 1.0, Profile ICS proforma for Video Distribution Profile

[9] ISO/IEC JTC 1/SC 29/WG 11, 14496-2: 1999 / Amendment 1: 2000

[10] IETF RFC 3016: " RTP Payload Format for MPEG-4 Audio/Visual Streams", http://www.ietf.org/

[11] ITU-T Recommendation H.263: Video coding for low bit rate communication. 02/1998.

[12] ITU-T Recommendation H.263, Annex X: Profiles and Levels Definition. 04/2001.

[13] IETF RFC 2429: " RTP Payload Format for the 1998 Version of ITU-T Rec. H.263 Video (H.263+) ", http://www.ietf.org/

[14] IETF RFC 1305: “Network Time Protocol (version 3) Specification, Implementation and Analysis", http://www.ietf.org/

[15] IETF RFC 3550/ RFC 1889 (obsoluted): “RTP: A Transport Protocol for Real-Time Applications” , http://www.ietf.org/

10 List of Figures

11 List of Tables

12 Appendix A (Informative): Video Streaming with Content Protection

This profile does not specify a particular content protection method rather it only provides support for various content protection methods. Specifically, AVDTP provides for the identification and negotiation of a particular content protection method via the *Get Capabilities* and *Stream Configuration* procedures.

The *Security Control* procedure in AVDTP provides for the exchange of the activated content protection method.

13 Appendix B (Informative): Video Streaming with High quality Audio

This section contains an example of typical signalling procedures defined in AVDTP for audio and video streaming set up. The audio streaming is defined in A2DP [2]. This section is informative only. For details, refer to GAVDP [4] and AVDTP [5]. In this example, the **SRC** of audio stream and video stream is assumed to be the **INT**, while the **SNK** to be the **ACP**.

13.1 Audio and Video Streaming Set Up

SRC device supports two *Stream Endpoints* (SEP1 and SEP2). SEP1 is the source of audio and SEP2 is the source of video. **SNK** device also supports two *Stream Endpoints* (SEP1 and SEP2). SEP1 is the sink of audio and SEP2 is the sink of video.

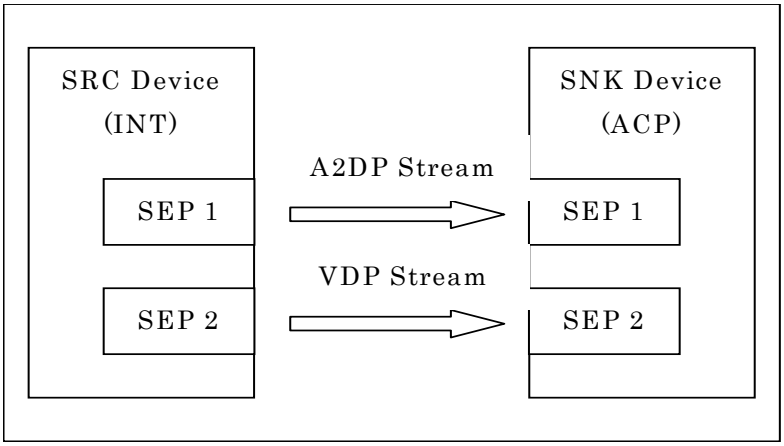

Figure 13-1: Example of High Quality Audio and Video Streaming

The initial states of the both devices are <IDLE>.

The **SRC** initiates *Stream Endpoint (SEP) Discovery* procedure. This procedure serves to return the media type and SEID for each stream end-point. The **SRC** finds the audio-type SEP (SEP1) and video-type SEP (SEP2) in the **SNK**.

Then, *Get Capabilities* procedure is initiated to collect service capabilities of these two SEPs in the **SNK**. There are two kinds of service capabilities; one is an application service capability and the other is a transport service capability. The application service capability of SEP1 consists of audio codec capability and content protection capability. The application service capability of SEP2 consists of video codec capability and content protection capability. Regarding the transport service capability, refer to Section 5.4 in AVDTP [5].

Based on collected SEP information and service capabilities, the **SRC** determines the most suitable audio streaming parameters (codec, content protection and transport service) for SEP1 in the **SNK** and video streaming parameters (codec, content protection and transport service) for SEP2 in the **SNK**. Then, the **SRC** requests the **SNK** to configure the audio streaming parameters of SEP1 and video streaming parameters of SEP2 in the **SNK** by using the *Stream Configuration* procedure. The **SRC** also configures the audio streaming parameters of SEP1 and video streaming parameters of SEP2 in it.

Then, L2CAP channels for both audio and video streams are established as defined in the *Stream Establishment* procedure. The **SRC** establishes the L2CAP channels between SEP1 in the **SRC** and SEP1 in the **SNK** for audio streaming, and also establishes the L2CAP channels between SEP2 in the **SRC** and SEP2 in the **SNK** for video streaming. Finally, the states of both devices are set at <OPEN>.

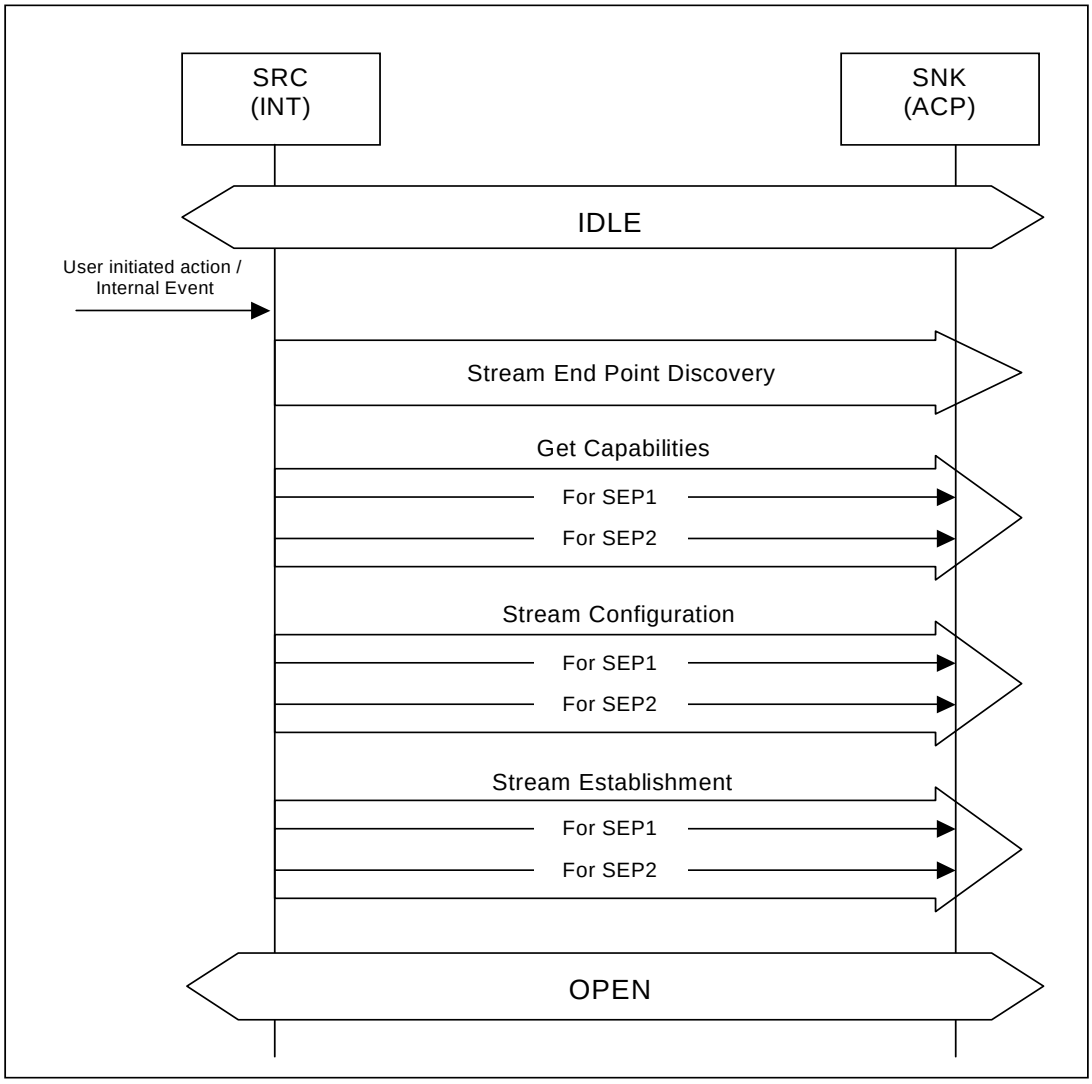

Figure 13-2: Audio and Video Streaming Set Up

13.2 Audio and Video Streaming Procedure

The **SRC** initiates *Start Streaming* procedure by a user initiated action or an internal event. This procedure indicates the **SNK** to start to send the audio stream from SEP1 and the video stream from SEP2 in the **SRC**. The states of both devices are changed from <OPEN> to <STREAMING>. Audio and video streaming is started after this procedure is completed.

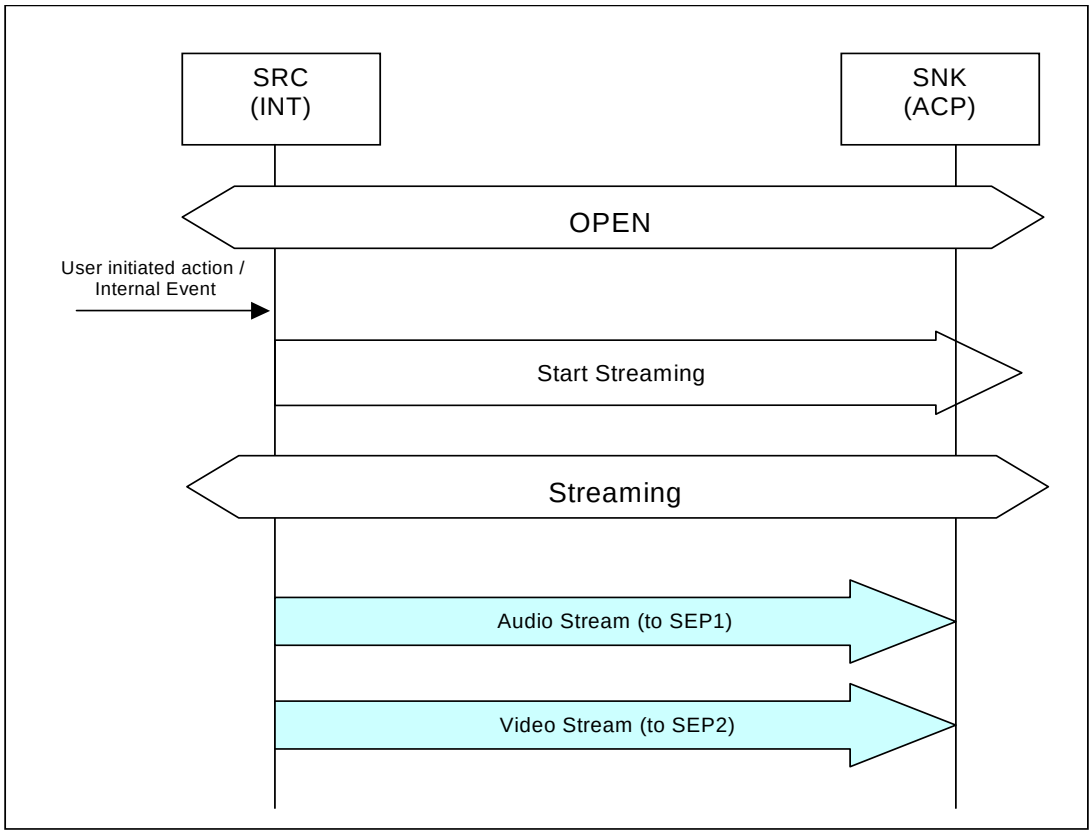

Figure 13-3: Audio and Video Streaming Procedure

13.3 Media Synchronization

There are some A/V applications that require the media synchronization between audio and video streams. The Basic Service and the Reporting Service defined by AVDTP [5] (used for the transport protocol of both A2DP and VDP) can provide the function of media synchronization.

The Basic Service specifies the media packet format that contains the time stamp field in its header area. The time stamp value is used to indicate the sampling instant of the first octet in the media packet from the **SRC** to the **SNK**. However, the value of the time stamp is added by the transport protocol, and it is independent from the wall clock value of the **SRC**.

The Reporting Service specifies the Sender Report Reporting packet to indicate some transport service information of the corresponding media stream from the **SRC** to the **SNK**. The Sender Report Reporting packet contains NTP[14] Time Stamp to indicate the wall clock value of the **SRC,** and RTP[15] Time Stamp to indicate the time stamp value in the media packet corresponding to the above NTP[14] Time Stamp value. The difference between the NTP[14] Time Stamp value and RTP[15] Time Stamp value in the Sender Report Reporting packet for the audio stream indicates the difference between the wall clock value and the time stamp value in the media packet of audio stream. It is the same for the video stream.

By using above mechanisms, when the **SNK** receives the media packets of audio stream and video stream from the **SRC**, the **SNK** can estimate the real sampling time of the first octet in the received media packets of audio stream and video stream. The **SNK** can then render synchronised audio and video.

14 Appendix C: Acronyms and Abbreviations

Acronym	Description
A/V	Audio/Video
A2DP	Advanced Audio Distribution Profile
ACP	Acceptor
AVDTP	Audio/Video Distribution Transport Protocol
AVRCP	Audio/Video Remote Control Profile
CP_Type	Content Protection Type
CRC	Cyclic Redundancy Check
GAP	Generic Access Profile
GAVDP	Generic Audio/Video Distribution Profile
ICS	Implementation Conformance Statement
IETF	Internet Engineering Task Force
INT	Initiator
LC	Link Controller
LM	Link Manager
LSB	Least Significant Bit (Byte)
MPEG	Moving Picture Expert Group
MSB	Most Significant Bit (Byte)
MTU	Maximum Transmission Unit
NTP	Network Time Protocol
PSM	Protocol/Service Multiplexer
QoS	Quality of Service
RFA	Reserved for Future Additions
RFD	Reserved for Future Definition
RTP	Real-time Transport Protocol
SDP	Service Discovery Protocol
SNK	Sink
SRC	Source
TSS	Test Suite Structure
VDP	Video Distribution Profile