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Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 21: High Speed Media Link (HSML)

CAUTION

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

The present document is part 21 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.1].

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document is part of the MirrorLink® specification which specifies an interface for enabling remote user interaction of a mobile device via another device. The present document is written having a vehicle head-unit to interact with the mobile device in mind, but it will similarly apply for other devices, which provide a colour display, audio input/output and user input mechanisms.

The present document describes the High-Speed Media Link, a video transmission mechanism that utilizes the USB to project the screen of one device onto another device with a larger screen.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

[1] ETSI TS 103 544-3 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 3: Audio".

[2] ETSI TS 103 544-2 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 2: Virtual Network Computing (VNC) based Display and Control".

[3] USB IF: "Universal Serial Bus Specification", Revision 2.0, April 27, 2000.

NOTE: Available at http://sdphca.ucsd.edu/lab_equip_manuals/usb_20.pdf.

[4] IETF RFC 4122: "A Universally Unique Identifier (UUID) URN Namespace", July 2005.

NOTE: Available at http://www.ietf.org/rfc/rfc4122.txt.

[5] USB IF: "Universal Serial Bus, Communications Class, Subclass Specification for Ethernet Control Model Devices", Revision 1.2, February 9, 2007.

NOTE: Available at https://usb.org/sites/default/files/CDC1.2_WMC1.1_012011.zip - File ECM120.pdf.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TS 103 544-1 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 1: Connectivity".

3 Definition of terms, symbols and abbreviations

3.1 Terms

Void.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ARGB	Alpha-Red-Green-Blue
CCC	Car Connectivity Consortium
HSML	High Speed Media Link
IN	INput
PC	Personal Computer
RGB	Red-Green-Blue
RLE	(Scan-line based) Run Length Encoding
UI	User Interface
UPnP	Universal Plug and Play
USB	Universal Serial Bus
UUID	Universally Unique IDentifier
VNC	Virtual Network Computing
XML	eXtensible Markup Language

4 Introduction

High Speed Media Link (HSML) is a screen out technology. The main purpose is to let mobile users project their phones' screens to a larger one, like the display inside a car infotainment system or PC, and users can control their phones via an automotive head unit or PC. With bigger screens, users can have much better usage experience. Of course, the present document does not limit the usage scenarios only on mobile phones and automotive head units. The HSML can be applied to any device that conforms to the present document. As shown in Figure 1.

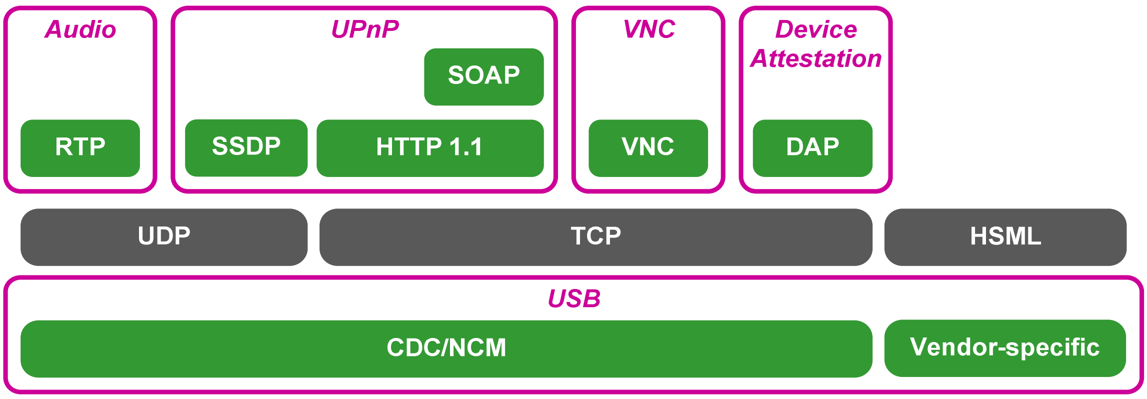

Figure 1: HSML Protocol Stack

There are two roles in the HSML architecture. The HSML source is the source of video data and the HSML sink is sink side. On the other hand, the control data is sent from HSML sink to HSML source.

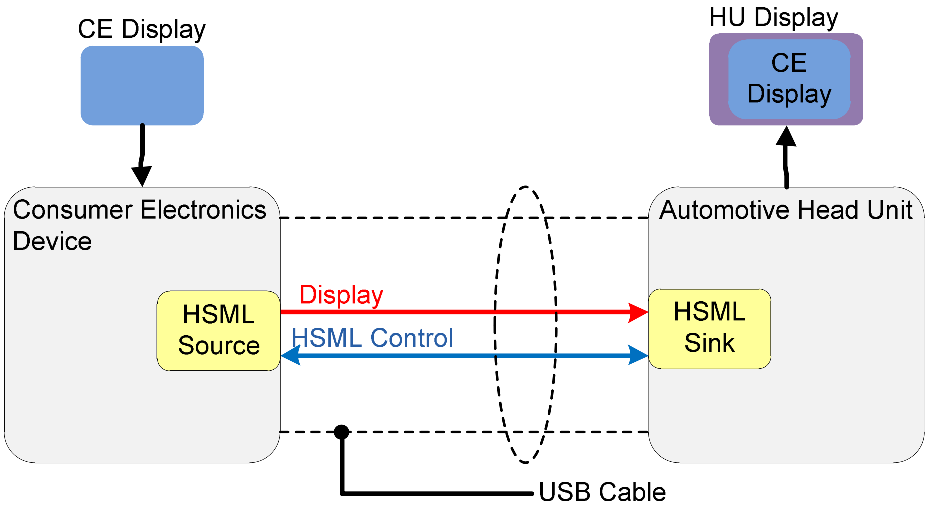

Figure 2: HSML Overview

The audio and additional display control mechanisms are handled by MirrorLink requirements defined in [1] and [2]. Therefore, any device that wants to comply with the present document shall implement MirrorLink as well.

The MirrorLink Client, providing HSML functionality, shall implement the HSML sink functionality.

The MirrorLink Server, providing HSML functionality, shall implement the HSML source functionality.

5 HSML USB Architecture

5.1 General

HSML is a USB function that can transfer display data efficiently. The figure below shows the USB architecture of HSML. Two pipes are established. The control pipe is used to send HSML specific requests. The framebuffer pipe is established for transmitting the uncompressed or compressed display data.

The device and host will be used in this clause to refer to HSML source and HSML sink respectively because this clause mainly describes HSML in the context of USB.

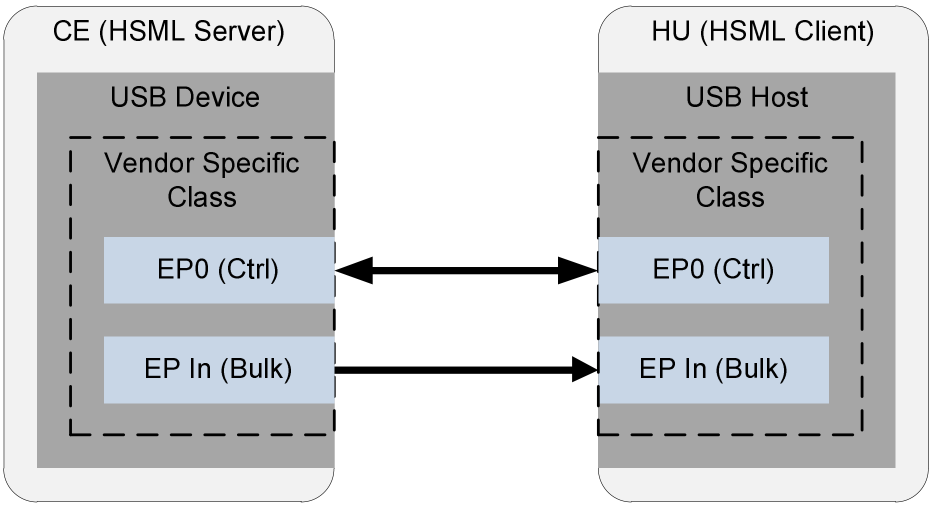

Figure 3: HSML USB Architecture

5.2 Functional Characteristics

5.2.1 General

The MirrorLink Server shall support at least two functions: one is HSML and the other is CDC/NCM which is compliant with HSML. The MirrorLink Server shall include the HSML USB interface into the same USB configuration as the CDC/NCM USB interface. The HSML function is used for video transmission and the CDC/NCM is used for carrying MirrorLink traffic.

5.2.2 Interface

The HSML interface shall be one of several interfaces the MirrorLink Server has in order to conform to the present document.

5.2.3 Endpoints

5.2.3.1 General

The device shall contain two endpoints: Ctrl (Default) and Bulk In (Framebuffer).

5.2.3.2 Default

The default endpoint uses the control transfers as defined in the USB specification [3]. All the standard and vendor-specific requests are transmitted through this endpoint. The endpoint number shall be zero (0).

5.2.3.3 Framebuffer

This endpoint is used to receive the framebuffer data from the device. This endpoint shall use bulk transfers and the direction shall be IN. The maximum packet size for USB 2.0 shall be 512 bytes and for USB 3.0 shall be 1 024 bytes.

5.3 Vendor-Specific Codes

Table 1 defines the interface class, subclass and protocol used in the HSML interface descriptor.

Table 1: Vendor-Specific Codes

Fields	Code	Description
Class	0xFF	Vendor specific class
Subclass	0xCC	CCC
Protocol	0x01	HSML

To comply with the present document, the device should not have another USB vendor-specific interface whose subclass field is 0xCC and protocol field is 0x01. The detail of descriptor class definition rule is following USB specification in [3].

5.4 Interface Descriptor

The HSML interface descriptor is just like a standard USB interface descriptor, except some fields are dedicated to HSML as follows.

Table 2: HSML Interface Descriptor

Offset	Fields	Size (Bytes)	Value	Description
0	bLength	1	Number	Size of this descriptor. (9 bytes)
1	bDescriptorType	1	Constant	Interface descriptor (0x04)
2	bInterfaceNumber	1	Number	Number of interface
3	bAlternateSetting	1	Number	Value used to select alternative setting
4	bNumEndpoints	1	Number	Number of Endpoints. This number shall be 1 for a Bulk IN.
5	bInterfaceClass	1	Class	Interface Class Code. (0xFF)
6	bInterfaceSubClass	1	SubClass	Interface Subclass Code. (0xCC)
7	bInterfaceProtocol	1	Protocol	Interface Protocol Code. (0x01)
8	bInterface	1	Index	Index of a string descriptor that describes this interface

Standard USB interface descriptor is defined in [3].

5.5 Endpoint Descriptors

The HSML interface requires 2 endpoints: one is default Control endpoint (endpoint 0), another is BULK IN endpoint as follows.

Table 3: HSML Bulk IN Endpoint Descriptor

Offset	Fields	Size	Value	Description
0	bLength	1	Number	Size of this descriptor. (7 bytes)
1	bDescriptorType	1	Constant	Endpoint descriptor (0x05)
2	bEndpointAddress	1	Number	Endpoint number and direction (The bit 7 should be 1 to indicates its direction is IN)
3	bmAttributes	1	Constant	Transfer type, Bulk. (0x02)
4	wMaxPacketSize	2	Number	Maximum packet size supported (For USB 2.0, this value shall be 512 and for USB 3.0, this value shall be 1 024)
6	bInterval	1	Number	Service interval. (not used)

Standard endpoint descriptor is defined in [3].

5.6 HSML Requests

5.6.1 General

Table 4 lists all of the HSML specific requests that are valid for the HSML interface. Requests marked as "Yes" in the mandatory field shall be implemented by any conforming HSML device.

Table 4: HSML Request List

Request	Code	Mandatory	Description
GetVersion	0x40	Yes	Get and provide HSML versions of the HSML source and sink.
GetParameters	0x41	Yes	Request the device to report its capabilities and configurations.
SetParameters	0x42	Yes	Configure the device according to the device's and the host's capabilities.