



**Publicly Available Specification (PAS);
Intelligent Transport Systems (ITS);
MirrorLink®;
Part 13: Core Architecture**

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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 13 of a multi-part deliverable. Full details of the entire series can be found in part 1 [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 color display, audio input/output and user input mechanisms.

The present document defines the core MirrorLink architecture, linking the different MirrorLink related protocols together, and providing MirrorLink session management related information.

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 103 544-1 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 1: Connectivity".
- [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] ETSI TS 103 544-3 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 3: Audio".
- [4] ETSI TS 103 544-4 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 4: Device Attestation Protocol (DAP)".
- [5] ETSI TS 103 544-5 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 5: Common Data Bus (CDB)".
- [6] ETSI TS 103 544-6 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 6: Service Binary Protocol (SBP)".
- [7] ETSI TS 103 544-7 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 7: GPS Data Service".
- [8] ETSI TS 103 544-8 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 8: Location Data Service".
- [9] ETSI TS 103 544-9 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 9: UPnP Application Server Service".
- [10] ETSI TS 103 544-10 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 10: UPnP Client Profile Service".
- [11] ETSI TS 103 544-11 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 11: UPnP Notification Server Service".

- [12] ETSI TS 103 544-12 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 12: UPnP Server Device".
- [13] ETSI TS 103 544-14 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 14: Application Certificates".
- [14] ETSI TS 103 544-15 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 15: Application Programming Interface (API) Level 1 & 2".
- [15] ETSI TS 103 544-16 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 16: Application Developer Certificates".
- [16] ETSI TS 103 544-17 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 17: MirrorLink® over Wi-Fi Display (WFD)".
- [17] ETSI TS 103 544-18 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 18: IEEE 802.11™ Car Connectivity Consortium (CCC) Information Element".
- [18] ETSI TS 103 544-19 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 19: Network Information Data Service".
- [19] ETSI TS 103 544-20 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 20: Internet Accessibility".
- [20] ETSI TS 103 544-21 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 21: High Speed Media Link (HSML)".
- [21] ETSI TS 103 544-22 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 22: Android Specific Specifications enabling AIDL-based MirrorLink® Applications".
- [22] ETSI TS 103 544-23 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 23: Bluetooth® out-of-Band Pairing Data Service".
- [23] ETSI TS 103 544-24 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 24: Media Meta Data Service".
- [24] ETSI TS 103 544-25 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 25: Navigation Meta Data Service".
- [25] ETSI TS 103 544-26 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 26: Consumer Experience Principles and Basic Features".
- [26] ETSI TS 103 544-27 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 27: Basic Meta Data Service".
- [27] ETSI TS 103 544-28 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 28: Weather Data Service".
- [28] ETSI TS 103 544-29 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 29: Schedule Data Service".
- [29] UPnP™ Forum, "UPnP™ Device Architecture 1.1", 15 October 2008.

NOTE: Available at <http://upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.1.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.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

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.

Not applicable.

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

pointer event: touch screen action in which the user touches the screen with one (virtual) finger only at a single location

touch event: touch screen action in which the user touches the screen with two or more separate fingers at different locations

NOTE: Touch events are used to describe more complex touch action, like pinch-open or pinch-close.

3.2 Symbols

Void.

3.3 Abbreviations

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

A2DP	Bluetooth Advanced Audio Distribution Profile
AP	Access Point
API	Application Programming Interface
BT	Bluetooth
CDB	Common Data Bus
CDC	Communications Device Class

NOTE: Specified from USB Device Working Group.

DAP	Device Attestation Protocol
GENA	General Event Notification Architecture
GPS	Global Positioning System
HFP	Bluetooth Hands-free Profile
HSML	High-Speed Media Link
IE	Information Element
IP	Internet Protocol
MAC	Medium Access Control
NCM	Network Control Model; part of the CDC device class
RFB	Remote Framebuffer
RLE	(Scan-line based) Run Length Encoding
RTP	Real-time Transport Protocol
SBP	Service Binary Protocol

SOAP	Simple Object Access Protocol
SSDP	Simple Service Discovery Protocol
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
UI	User Interface
UPnP	Universal Plug and Play
URL	Universal Resource Locator
USB	Universal Serial Bus
VA	Video-Audio
VNC	Virtual Network Computing
WFD	Wi-Fi Display
WLAN	Wireless Local Area Network
XML	eXtensible Markup Language

4 Introduction to MirrorLink

MirrorLink provides a concept for integrating the mobile device (hereinafter referred to as the "MirrorLink Server") and the vehicle head-unit (hereinafter referred to as the "MirrorLink Client"). In a MirrorLink context, the control and interaction of applications and services running on the mobile device will be replicated into the car environment. Diverting display and audio output to the car head-unit come together with receiving key and voice control input from it are the main interaction streams, as shown in Figure 1.

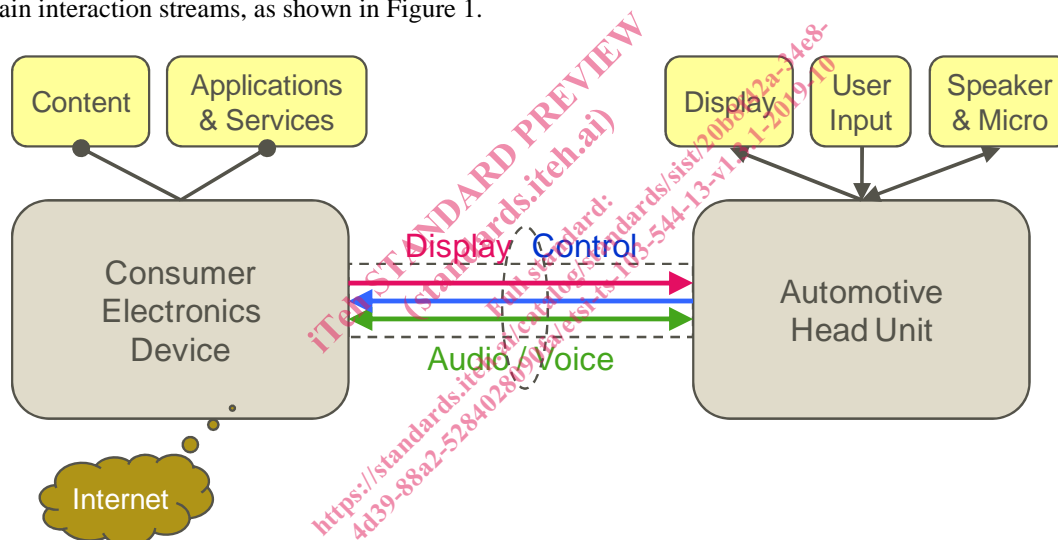


Figure 1: MirrorLink Concept

The result is a concept somewhere between running the applications natively in the mobile phone or in the car unit. From the user experience point of view it can offer "the best of the both worlds" where the large variety of mobile phone applications is complemented and enhanced by the car system providing convenient and safe means for using (i.e. controlling) these applications.

It is easier to add new consumer electronic functionalities into the vehicle environment via a mobile device than integrating them into the car infotainment system. In any case, the usage of those applications will become more convenient if the same device with the same content stored in it can be used in all the different environments from home to car, and providing Internet connectivity at the same time. On the other hand, the large displays of the car units can enhance the user experience from what the mobile device can offer by itself.

In addition, the mobile device typically provides the latest technologies, from radio connectivity, to multimedia codecs. At the same time, the openness of the platforms, allows delivery of new applications and services at any time.

The car systems comprise of several different methods for user interaction, like individual keys, rotating knobs, touch screen and even voice-activated control. For proper interoperability, the control method towards the mobile device should be the same regardless of the actual input mechanism on the car side.

The basic MirrorLink consumer experience principles and features are specified in [25].

5 MirrorLink Architecture

The MirrorLink high-level architecture is shown in Figure 2.

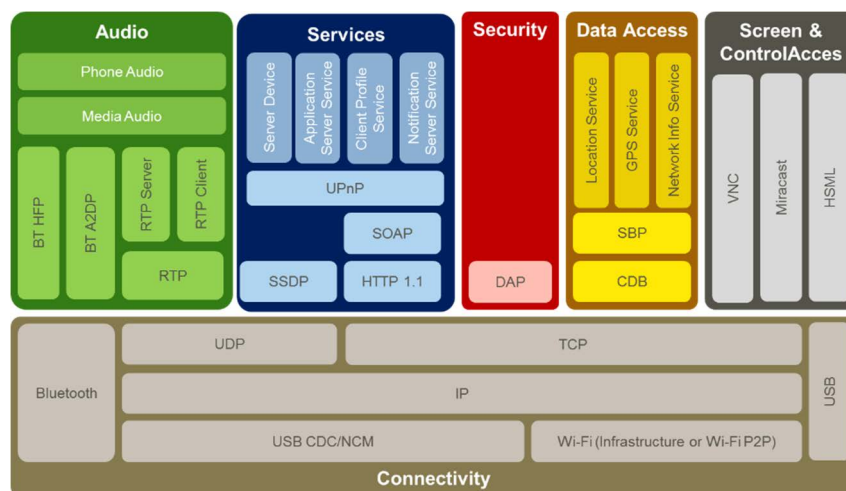


Figure 2: MirrorLink Architecture

MirrorLink 1.1 Architecture consists of a set of protocols, providing the following features:

- 1) Connectivity, as specified in [1], providing:
 - a) wired and wireless IP based connection-oriented and connection-less connectivity; and
 - b) dedicated Bluetooth connectivity.
- 2) UPnP based Services, providing:
 - a) mechanisms for advertisement of MirrorLink enabled Server devices as specified in [12];
 - b) mechanisms for application notifications, as specified in [11];
 - c) mechanisms for MirrorLink client profiles, as specified in [10]; and
 - d) mechanisms for advertisement and control of MirrorLink server based applications and their certification information, as specified in [9].
- 3) Access to Screen and Control, as specified in [2], providing:
 - a) replication of the MirrorLink Server's display content to the MirrorLink Client using VNC;
 - b) control channel of Key, Pointer and Touch events back to the MirrorLink Client; and
 - c) exchanging display and event related information and notifications.
- 4) Audio, as specified in [3], providing:
 - a) RTP audio streaming, for different payload types, outputting the MirrorLink Server.
 - b) RTP audio streaming, for different payload types, inputting the MirrorLink Server.
 - c) BT HFP based legacy phone audio.
 - d) BT A2DP based legacy media audio.
- 5) Access to Data Services, providing:
 - a) simple multiplexed, shared bus, hosting services, as specified in [5];
 - b) binary protocol framework for implementing various services, as specified in [6];

- c) GPS data service using the binary protocol framework, as specified in [7]; and
 - d) location data service, using the binary protocol framework, as specified in [8].
- 6) Security mechanisms, as specified in [4], providing:
- a) Attestation of MirrorLink Server devices and their main MirrorLink protocol components.
- 7) MirrorLink API:
- a) Introduced application certificates, as specified in [13].
 - b) Introduced application developer certificates, as specified in [15].
 - c) Introduced MirrorLink API Level 1, as specified in [14].

MirrorLink 1.2 Architecture is adding the following additional features:

- 1) Connectivity:
 - a) CCC specific IEEE 802.11 Information Element (OUI) as specified in [17].
 - b) Internet Accessibility supporting Group Ownership negotiation in Wi-Fi P2P networks, as specified in [19].
- 2) UPnP based Services:
 - a) No additional services; some smaller additions to some of the services, as highlighted in [9], [10] and [12].
- 3) Access to Screen and Control, providing:
 - a) Replication of MirrorLink Server's display contents to the MirrorLink Client using HSML as specified in [20].
 - b) Replication of MirrorLink Server's display contents to the MirrorLink Client using Wi-Fi Display, as specified in [16].
- 4) Audio:
 - a) No additions.
- 5) Data Services:
 - a) Network Management Data Service, providing dynamic information on network status, as specified in [18].
- 6) Security mechanisms:
 - a) Added WFD and HSML elements as highlighted in [4].
- 7) Mirrorlink API:
 - a) No additions.

MirrorLink 1.3 Architecture is adding the following additional features:

- 1) Connectivity:
 - a) No additions.
- 2) UPnP based Services:
 - a) Deprecation of element in UPnP A_ARG_TYPE_AppList, as specified in [9].
 - b) Deprecation of elements in UPnP A_ARG_TYPE_ClientProfile as specified in [10].