ETSI TS 103 544-15 V1.3.1 (2019-10)

TECHNICAL SPECIFICATION

Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 15: Application Programming Interface (API) Level 1 & 2

CAUTION

The present document has been submitted to ETSI as a PAS produced by CCC and approved by the ETSI Technical Committee Intelligent Transport Systems (ITS).

CCC is owner of the copyright of the document CCC-TS-038 and/or had all relevant rights and had assigned said rights to ETSI on an "as is basis". Consequently, to the fullest extent permitted by law, ETSI disclaims all warranties whether express, implied, statutory or otherwise including but not limited to merchantability, non-infringement of any intellectual property rights of third parties. No warranty is given about the accuracy and the completeness of the content of the present document.

Reference

RTS/ITS-98-15

Keywords

interface, ITS, PAS, smartphone

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:
http://www.etsi.org/standards-search

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at
https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx

If you find errors in the present document, please send your comment to one of the following services:
https://portal.etsi.org/People/CommiteeSupportStaff.aspx

Copyright Notification

Contents

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (https://ipr.etsi.org/).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Foreword

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

The present document is part 15 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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

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 MirrorLink API specifies an interface to the MirrorLink Server, which allows any application to either get information about MirrorLink Server's or Client's properties or to set them to specific values. In addition, the API specifies callback functions, which are used from the MirrorLink Server to inform the application about any change.

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.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference.

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 necessary for the application of the present document.

[1] W3C: "JSpeech Grammar Format".

NOTE: Available at https://www.w3.org/TR/jsgf/.

[2] 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".

[3] IETF RFC 2397: 'The "data" URL scheme', August 1998.

NOTE: Available at http://tools.ietf.org/html/rfc2397.

[4] ETSI TS 103 544-9 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 9: UPnP Application Server Service".

[5] Car Connectivity Consortium CCC-RQ-005: "Application Requirements for Drive Certification".

NOTE: Available at https://carconnectivity.org/wp-content/uploads/2019/09/CCC-RQ-005-MirrorLink-_ApplicationRequirements_2.0.8.pdf.

[6] 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".

[7] ETSI TS 103 544-6 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 6: Service Binary Protocol (SBP)".

[8] ETSI TS 103 544-10 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 10: UPnP Client Profile Service ".

[9] ETSI TS 103 544-12 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 12: UPnP Server Device".

[10] ETSI TS 103 544-11 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 11: UPnP Notification Server Service".

[11] IEEE Std 754-2019$^{\text{TM}}$: "IEEE Standard for Floating-Point Arithmetic", 22 July 2019.

NOTE: Available at https://ieeexplore.ieee.org/document/8766229.

[12] ISO 639-1: "Codes for the representation of names of languages -- Part 1: Alpha-2 code".

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.

[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:

ACMS	Application Certification Management System
API	Application Programming Interface
AV	Audio-Video
BT	Bluetooth
BVRA	Bluetooth Voice Recognition Activation
CCC	Car Connectivity Consortium
CDB	Common Data Bus
HFP	Bluetooth Hands-Free Profile
HSML	High-Spead Media Link
IPL	Initial Playback Latency
LSS	Latency Switched Sources
ML	MirrorLink
OS	Operating System
PCM	Pulse-Code Modulation
RFB	Remote Framebuffer
RTP	Real-Time Protocol
SBP	Service Binary Protocol
TTS	Text-To-Speach
UDN	Unique Device Name

UI	User Interface
UID	Unique IDentifier
UPnP	Universal Plug and Play
URI	Uniform Resource Identifier
URL	Universal Resource Locator
USB	Universal Serial Bus
UTF	Unicode Transformation Format
UUID	Universally Unique IDentifier
VNC	Virtual Network Computing
WFD	Wi-Fi Display

4 Introduction

The MirrorLink API specifies an interface to the MirrorLink Server, which allows any application to either get information about MirrorLink Server's or Client's properties or to set them to specific values. In addition, the API specifies callback functions, which are used from the MirrorLink Server to inform the application about any change. Callback functions shall be implemented from the applications for any evented function.

The MirrorLink APIs define a baseline API that shall be made accessible to 3rd party app developers and does in no way restrict private APIs that can be developed by a MirrorLink Server vendor to satisfy his proprietary needs.

The MirrorLink API specifies the interface in a platform/OS independent manner. Platform specific specification will describe the detailed platform specific view of the MirrorLink API, which shall be implemented from any MirrorLink Server device.

The platform specific implementation of the MirrorLink API shall provide method to implement the features specified in the present document, with at least the values provided in the present document.

A specific API function can be marked as Mandatory or Optional:

- Any Mandatory marked function shall be fully implemented from the MirrorLink Server.
- Any Optional marked function should be fully implemented from the MirrorLink Server. In case the function is not fully implemented, the MirrorLink Server shall implement an empty shell, which responds with defined default values and a success flag set to "False" (if available).

The MirrorLink API specifies functions with three types of API functions:

- **Get:** The function is providing read access to information available on the MirrorLink Server.
- **Set:** The function is providing write access to information available on the MirrorLink Server.
- **Callback:** The function is a callback function, invoked from the MirrorLink Server. The implementation of the callback functionality will be specified in the platform specific specifications.

All three functions may have a Success return value specified. The return value is set to True, if the action has been successful or the information requested is available. Otherwise the return value is set to False.

Some of the data provided via the MirrorLink API will not be available from MirrorLink 1.0 clients. In such case, the MirrorLink Server shall provide a default value as specified.

The MirrorLink API uses a set of Data Types, given in Table 1. The platform specific API may use other data types, as long as the original intend of the MirrorLink API is not compromised. Therefore, the platform specific implementation of the MirrorLink API may use existing platform APIs are sub-classed versions of them.

Table 1: Data Types and Default Values

Data Type	Description
bool	Data type representing the logical values true and false The representation of false is all-bits-zero, and the representation of true is unspecified except that it shall have at least one bit set Default: FALSE
uint8	Data type representing integer values ranging from 0 to positive 255 (0xFF) Default: 0
uint16	Data type representing integer values ranging from 0 to positive 65,535 (0xFFFF) Default: 0
uint32	Data type representing integer values ranging from 0 to positive 4,294,967,295 (0xFFFFFFFF) Default: 0
int8	Data type representing integer values ranging from negative 128 (0x80) to positive 127 (0x7F) Default: 0
int16	Data type representing integer values ranging from negative 32,768 (0x8000) to positive 32,767 (0x7FFF) Default: 0
int32	Data type representing an integer values ranging from negative 2,147,483,648 (0x80000000) to positive 2,147,483,647 (0x7FFFFFFF) Default: 0
float	Data type representing a 32-bit floating point value, single-precision [11] Default: 0.0
double	Data type representing a 64-bit floating point value, double-precision [11] Default: 0.0
string8	Array of UTF8 characters. Each character takes 1 byte (UTF8) Default: ""
string16	Array of UTF16 characters. Each character takes 2 bytes (UTF16) Default: ""
url	Data type representing a URL Default: ""
typeName[]	Data type representing an array of values of type *typeName* Default: Zero-length array
structureName	Data type representing the Structure *structureName*, as specified in Clause Definitions Default: Default value for each element of the structure
*void**	Pointer to a data structure Default: "0x0"

The MirrorLink API does not intend to specify, how information provided via MirrorLink has to be used to fulfil driver distraction guidelines [5]. This information is provided from driver distraction guideline documents [5] and associated test plans.

If the MirrorLink API replicates functionality, available via OS/Platform APIs, then those API shall be used, as defined in the Platform specific specifications.

The platform specific API may rearrange the defined parameter, or add additional parameter. The platform specific API shall not remove any parameter.

5 Definitions

5.1 0xE001 - Structure Rect

Table 2: Structure Rect

Feature Name	Description	Type	API Level
x	Horizontal offset of the upper left corner	uint16	1+
y	Vertical offset of the upper left corner	uint16	1+
width	Width of the rectangle	uint16	1+
height	Height of the rectangle	uint16	1+

5.2 0xE002 - Structure ServiceInfo

Table 3: Structure ServiceInfo

Feature Name	Description	Type	API Level
Minor Version	Minor service version	uint8	1+
Major Version	Major service version	uint8	1+
Service ID	Service identifier	uint16	1+
Name	Service name	string8	1+
isSource	True if the Service is implemented as a source on the server	bool	2+
isConfiguration Available	True if the Service exposes configuration objects and no application has claimed write access to them. Always False when IsSource is True	bool	2+

5.3 0xE003 - Structure Action

Table 4: Structure Action

Feature Name	Description	Type	API Level
actionID	Action identifier; shall be non-zero. The *actionID* shall be unique within one notification. Otherwise the MirrorLink Server will reject the notification	uint16	1+
name	Action name	string8	1+
launchApp	Flag whether to launch the app **Default**: False	bool	1+
iconUrl	URL to the icon associated with the action Icon shall be of mimetype `"image/png"` with a color depth of 24 iconUrl can make use of the data URI scheme [3] to provide immediate access to the icon data **Default**: No Icon	url	1+
actionType	Action type identifier. If left unspecified, maps to the UPnP Launch action [4]. (ACTION_CREATE_SHORTCUT, ACTION_CALL, ACTION_MAP, ACTION_ROUTE, etc.)	Platform dependent	2+

5.4 0xE004 - FbContext

Table 5: Structure FbContext

Feature Name	Description	Type	API Level
applicationCategory	Category of the application.	uint32	1+
videoContentCategory	Category of the framebuffer video content.	uint32	1+
framebufferArea	Framebuffer rectangle for the specified region.	Rect	1+

6 MirrorLink API Elements

6.1 Introduction

The MirrorLink API consists of multiple optional and mandatory modules. Their availability and obligation of a module is dependent on the API level as defined in, as listed in Table 6.

Table 6: MirrorLink API Modules

Common API Module	API Level	Module Reference	Obligation
Common API Info	1	0xF001 - 0xF002	Mandatory
	2	0xF001 - 0xF003	Mandatory
Device Info	1	0x0101 - 0x0105	Mandatory
	2	0x0101 - 0x0114	Mandatory
Certification Information	1	0x0201 - 0x0204	Mandatory
	2	0x0205 - 0x0209	Mandatory
Connection Information	1, 2	0x0301 - 0x0306	Mandatory
Display Information	1, 2	0x0401 - 0x0406	Mandatory
Event Information	1	0x0501 - 0x0505	Mandatory
	2	0x0501 - 0x0505	Deprecated
Client Virtual Keyboard	1	0x0601 - 0x0603	Optional
	2	0x0601 - 0x0603	Deprecated
Key Event Listing	1	0x0701 - 0x0702	Optional
	2	0x0701 - 0x0702	Deprecated
Context Information	1	0x0801 - 0x0806	Mandatory
	2	0x0801 - 0x080A	Mandatory
Device Status Information	1	0x0901 - 0x0907	Mandatory
	2	0x0901 - 0x0904	Mandatory
Data Services	1	0x0A01 - 0x0A0C	Optional
	2	0x0A01 - 0x0A0D	Mandatory
Notifications	1	0x0B01 - 0x0B09	Optional
	2	0x0B01 - 0x0B0C	Mandatory
Actions	2	0x0C01 - 0x0C07	Mandatory

A function may be available only from a specific API level onwards. The minimum API level is given in the function description. If no API level is given, the function is available from API level 1 onwards. In case a function's behaviour or response is dependent on the API level, this is specified within the function's description. Unless specified, all functions shall behave and response the same way, independent of the API level.

A MirrorLink Server shall support all MirrorLink API levels, from 1 to its maximum supported API level, simultaneously. A MirrorLink 1.3 Server shall support MirrorLink API levels 1 and 2. A MirrorLink Server shall support its maximum supported API level even if the MirrorLink session is downgraded. Some MirrorLink application may use API level 1, while others use a different API level. Nevertheless, a MirrorLink application shall register to only one MirrorLink API Service at a time. The MirrorLink Server behaviour, in case an application is using an API level bigger than supported by the MirrorLink Server, is implementation specific.

Any MirrorLink Server shall implement all mandatory modules and all functions within that module. Any application using the MirrorLink API shall implement all given callback functions required for the operation of the application; the platform specific specification may provide conditions for the obligation of individual callback functions.

Any MirrorLink Server shall implement all functions within an optional module, if it supports that module. The MirrorLink Server shall provide a mechanism to check, whether a module is available. Any application using an optional module of the MirrorLink API shall implement all given callback functions required for the operation of the application; the platform specific specification may provide conditions for the obligation of individual callback functions.

The MirrorLink applications shall use the 0x0301 MirrorLink API Call and the 0x0302 MirrorLink API Callback to determine, whether a MirrorLink session is established. MirrorLink applications should use the other MirrorLink API modules only, while a MirrorLink session is running. Return values outside of a MirrorLink session are implementation dependent.

MirrorLink Servers shall have the MirrorLink API modules available at all times.

6.2 0xF0xx - MirrorLink API Info

6.2.1 0xF001 - MirrorLink API Version

Description: Implemented MirrorLink API Version from the MirrorLink Server

Obligation: Mandatory

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
API Level	MirrorLink API level	uint16	Read

6.2.2 0xF002 - MirrorLink API Module Available

Description: Check, whether MirrorLink Server supports a specific MirrorLink API module

Obligation: Mandatory

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Module Reference	Module reference as defined in Table 6	uint16	Write
Available	Flag, to indicate whether the module is available	bool	Read

6.2.3 0xF003 - Server Device Identifier

Description: Reports the Server Device Identifier, reported by the server when getting Application developer certificates from the ACMS

Developer shall include the Server Device Identifier of their test devices in their Developer Certificate to be able to test their applications with certified MirrorLink Clients during development

Shall return "00000000-0000-0000-0000-000000000000" if the server does not support or is not configured for being used for MirrorLink application development

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Device Id	MirrorLink Server developer ID, formatted as a version 5 variant 2 UUID. In case the device is not in developer mode, returned Device ID shall be: 00000000-0000-0000-0000-000000000000	String8	Read

6.3 0x01xx - MirrorLink Device Info

6.3.1 0x0101 - MirrorLink Version

Description: Available MirrorLink Version for the established connection, as agreed between the MirrorLink Server and Client. This information shall be available as soon as the MirrorLink session is connected (refer to clause 6.5.2)

Obligation: Mandatory

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Major Version	MirrorLink major version; return 1 if version information is not available	uint16	Read
Minor Version	MirrorLink minor version; return 0 if version information is not available	uint16	Read
Success	Flag, to indicate whether the information is available	bool	Read

6.3.2 0x0102 - MirrorLink Version Callback

Description: Indicates that the MirrorLink Version information has changed or became available

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Major Version	MirrorLink major version; return 1 if version information is not available	uint16	Read
Minor Version	MirrorLink minor version; return 0 if version information is not available	uint16	Read

6.3.3 0x0103 - MirrorLink Client Manufacturer and Model Information

Description: Provided MirrorLink client manufacturer and model information, as received through the UPnP Client Profile Service [8]; This information shall be available as soon as the MirrorLink session is connected (refer to clause 6.5.2)

Obligation: Mandatory

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Client Identifier	Identifier of the MirrorLink client	string8	Read
Friendly Name	Short user-friendly description of the MirrorLink client	string8	Read
Manufacturer	Manufacturer Name of the MirrorLink client	string8	Read
Model Name	Model name of the MirrorLink client	string8	Read
Model Number	Model number of the MirrorLink client	string8	Read
Success	Flag, to indicate whether the information is available	bool	Read

6.3.4 0x0104 - MirrorLink Client Manufacturer and Model Information Callback

Description: Indicates that the Client information has changed

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Client Identifier	Identifier of the MirrorLink client	string8	Read
Friendly Name	Short user-friendly description of the MirrorLink client	string8	Read
Manufacturer	Manufacturer Name of the MirrorLink client	string8	Read
Model Name	Model name of the MirrorLink client	string8	Read
Model Number	Model number of the MirrorLink client	string8	Read

6.3.5 0x0105 - Server Device Virtual Keyboard Support

Description: Provides information about the available virtual keyboard from the MirrorLink Server, which can be used from application, during a MirrorLink session. Handling of the virtual keyboard is following regular platform specific means

NOTE: The availability of a virtual keyboard from the MirrorLink Client is covered in clause 6.8.

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Available	Flag, to indicate the availability of a virtual keyboard from the MirrorLink Server.	bool	Read
Touch Support	Flag, to indicate whether the virtual keyboard supports touch events.	bool	Read
Knob Support	Flag, to indicate whether the virtual keyboard supports knob events.	bool	Read
Drive Mode	Flag, to indicate whether the virtual keyboard is compliant with CCC drive requirements, as defined in [6].	bool	Read

6.3.6 0x0106 - MirrorLink Client Driver Distraction Information

Description: Provided driver distraction regulation support information of MirrorLink Client, as received through the UPnP Client Profile Service [8]; any later change to the provided information shall be notified via the callback function defined in clause 6.3.7

In case the information is unavailable, the MirrorLink Application shall assume that the MirrorLink Client supports driver distraction regulation

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Driver Distraction Support	Flag, to indicate whether the ML Client device supports driver distraction regulation	bool	Read
Success	Flag, to indicate whether the information is available	bool	Read

6.3.7 0x0107 - MirrorLink Client Driver Distraction Information Callback

Description: Indicates that information about the driver distraction support information available from the MirrorLink Client has changed

Obligation: Mandatory

API Level: 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Driver Distraction Support	Boolean flag, which Indicates whether MirrorLink Client supports driver distraction regulation	bool	Read

6.3.8 0x0108 - MirrorLink Client Character Set Support

Description: Provided MirrorLink Client Character Set information, as received through the UPnP Client Profile Service [8]; any later change to the provided information shall be notified via the callback function defined in clause 6.3.9

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Character Set	Comma-separated list of entry points into the UniCode Character Code Charts, which are supported from the MirrorLink Client device. (UTF-8 encoded string; each entry point is given in hexadecimal format (with "0x" prefix)	string8	Read
Success	Flag, to indicate whether the information is available	Bool	Read

6.3.9 0x0109 - MirrorLink Client Character Set Support Callback

Description: Indicates that information about the character set supported from the MirrorLink Client has changed

Obligation: Mandatory

API Level: 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Character Set	Comma-separated list of entry points into the UniCode Character Code Charts, which are supported from the MirrorLink Client device. (UTF-8 encoded string; each entry point is given in hexadecimal format (with "0x" prefix)	string8	Read

6.3.10 0x010A - MirrorLink Client Audio Latency Characteristics Information

Description: Provided MirrorLink Client Audio Latency information, as received through the UPnP Client Profile Service [8]; any later change to the provided information shall be notified via the callback function defined in clause 6.3.11

These values describe the average and maximum latency for switching to an audio source filled via MirrorLink

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
LSS Max	Maximum time the MirrorLink client takes to make the MirrorLink audio stream from the MirrorLink server audible on the Clients speakers. Value is in ms. The LSS Max value is taken from the connected MirrorLink clients profile "clientProfile/lssMax".	in16	Read
LSS Avg	Average time the MirrorLink client takes to make the MirrorLink audio stream from the MirrorLink server audible on the Clients speakers. Value is in ms. The LSS Avg value is taken from the connected Mir-rorLink clients profile "clientProfile/lssAvg".	int16	Read
Success	Flag, to indicate whether the information is available.	bool	Read

6.3.11 0x010B - MirrorLink Client Audio Latency Characteristics Callback

Description: Indicates that information about the audio latency characteristics of the MirrorLink Client has changed

Obligation: Mandatory

API Level: 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
LSS Max	Maximum time the MirrorLink client takes to make the MirrorLink audio stream from the MirrorLink server audible on the Clients speakers. Value is in ms. The LSS Max value is taken from the connected MirrorLink Client's profile "clientProfile/lssMax".	int16	Read
LSS Avg	Average time the MirrorLink client takes to make the MirrorLink audio stream from the MirrorLink server audible on the Clients speakers. Value is in ms. The LSS Avg value is taken from the connected MirrorLink Client’s profile "clientProfile/lssAvg".	int16	Read

6.3.12 0x010C - MirrorLink Voice Interaction Support Information

Description: Indicates that the MirrorLink Session supports voice-based interactions, by matching the capabilities advertised by the MirrorLink Server and MirrorLink Client (matching RTP and Payload support) and the information as received through the UPnP Client Profile Service [8]; any later change to the provided information shall be notified via the callback function defined in clause 6.3.13

Obligation: Mandatory

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Voice Interaction Support	Indicates that the current MirrorLink session is able to support voice-based interactions	bool	Read
Success	Flag, to indicate whether the information is available	bool	Read

6.3.13 0x010D - MirrorLink Voice Interaction Support Information Callback

Description: Indicates that the MirrorLink Session support of voice interaction support status has changed

Obligation: Mandatory

API Level: 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Voice Interaction Support	Indicates that the current MirrorLink session is able to support voice-based interactions	bool	Read

6.3.14 0x010E - MirrorLink UI Mode Information

Description: Indicates the MirrorLink UI mode used within the current session; any later change to the provided information shall be notified via the callback function defined in clause 6.3.15

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Mode	Indicates which UI mode has been selected for the current MirrorLink session, either "immersive", "classic" or "legacy".	string8	Read
Success	Flag, to indicate whether the information is available.	bool	Read

6.3.15 0x010F - MirrorLink UI Mode Information Callback

Description: Indicates that the MirrorLink Session UI mode has changed

Obligation: Mandatory

API Level: 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Mode	Indicates that the current MirrorLink session has changed UI mode.	string8	Read

6.3.16 0x0110 - MirrorLink Server Manufacturer and Model Information

Description: Provided MirrorLink server manufacturer and model information, as sent through the UPnP Device Description [9].

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Server Identifier	Identifier of the MirrorLink server (UPnP Device UDN [9])	string8	Read
Friendly Name	Short user-friendly description of the MirrorLink Server	string8	Read
Manufacturer	Manufacturer Name of the MirrorLink Server	string8	Read
Model Name	Model name of the MirrorLink Server	string8	Read
Model Number	Model number of the MirrorLink Server	string8	Read
Success	Flag, to indicate whether the information is available	bool	Read

6.3.17 0x0111 - MirrorLink UI Control Information

Description: Indicates the MirrorLink supported UI control mechanism within the current session; any later change to the provided information shall be notified via the callback function defined in clause 6.3.18

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Controls	Indicates which UI controls are available for the current MirrorLink session, as a comma separated list of values taken out of clientProfile/misc/mlUiControl/control	string8	Read
Success	Flag, to indicate whether the information is available	bool	Read

6.3.18 0x0112 - MirrorLink UI Control Information Callback

Description: Indicates that the MirrorLink Session supported UI control mechanisms have changed

Obligation: Mandatory

API Level: 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Controls	Indicates which UI controls are now available for the current MirrorLink session, as a comma separated list of values taken out of clientProfile/misc/mlUiControl/control	string8	Read

6.3.19 0x0113 - MirrorLink Server Status Indicators Information

Description: Indicates which server status indicator the MirrorLink Client intends to display on its native UI or the dashboard; any later change to the provided information shall be notified via the callback function defined in clause 6.3.20

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Indicators	Indicates which server status indicator are being displayed on the client native UI, as a comma separated list of values taken out of clientProfile/misc/serverInfo/info.	string8	Read
Success	Flag, to indicate whether the information is available.	bool	Read

6.3.20 0x0114 - MirrorLink Server Status Indicators Information Callback

Description: Indicates that the MirrorLink Client displayed server status indicators have changed

Obligation: Mandatory

API Level: 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Indicators	Indicates which server status indicator are now being displayed on the client native UI, as a comma separated list of values taken out of clientProfile/misc/serverInfo/info.	string8	Read

6.4 0x02xx - Certification Information

6.4.1 0x0201 - Get Application Certification Status

Description: Provided application certificate status, as captured from the application certificate

Obligation: Mandatory

API Level: 1 Only; **deprecated** as of Level 2 (use Get Any Application Certification Status)

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Certificate Available	Flag, indicating whether the MirrorLink server has a valid certificate for the application.	bool	Read
Advertised as Certified App	Flag, indicating, whether the MirrorLink server has included the application into its UPnP advertisements [4] as a certified application.	bool	Read

6.4.2 0x0202 - Get Application Certifying Entities

Description: Provide information on the certifying entities

Obligation: Mandatory

API Level: 1 Only; **deprecated** as of Level 2 (use Get Any Application Certifying Entities)

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Entity	Comma-separated list of certifying entities, which certified the application	string8	Read

6.4.3 0x0203 - Get Application Certification Information

Description: Provided application certificate information; any later change to the provided information shall be notified via the callback function defined in clause 6.4.4

Obligation: Mandatory

API Level: 1 Only; **deprecated** as of Level 2 (use Get Any Application Certification Information)

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Entity	Name of the certifying entity	string8	Write
Certified	Flag, whether the application has been certified from the given entity	bool	Read
Restricted	Comma-separated list of locales for which the application has been certified for restricted use (drive-level) from the given entity	string8	Read
Non Restricted	Comma-separated list of locales for which the application has been certified for non-restricted use (base-level) from the given entity	string8	Read

6.4.4 0x0204 - Get Application Certification Information Callback

Description: Indicate that the application certificate information changed

Obligation: Mandatory

API Level: 1 Only; **deprecated** as of Level 2 (use Get Certified Applications List Changed Callback)

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Entity	Name of the certifying entity	string8	Write
Certified	Flag, whether the application has been certified from the given entity	bool	Read

Feature Name	Description	Type	Direction
Restricted	Comma-separated list of locales for which the application has been certified for restricted use (drive-level) from the given entity	string8	Read
Non Restricted	Comma-separated list of locales for which the application has been certified for non-restricted use (base-level) from the given entity	string8	Read

6.4.5 0x0205 - Get Certified Applications Identifier List

Description: Provide the list of applications holding a valid certificate on the device, retrieved from the Application Certification Management System

This shall be consistent with the result of the *SetAllowedApplicationsList* UPnP action [4] in MirrorLink 1.3 sessions, or the result of the *GetCertifiedApplicationsList* action [4] in MirrorLink 1.2 sessions or below. Outside of an established MirrorLink connection, this shall be consistent with the expected result of the UPnP Application Server Service *GetCertifiedApplicationsList* action [4] invoked without a Manufacturer entity set and the default *AppCertFilter*

Determining, if each application is considered drive or base certified by the client, shall be done by using the clause 6.4.6 Get Any Application Certification Status method

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Application Platform Identifier List	A list of Identifiers, indicating which applications on the device are currently considered certified.	Platform dependent	Read

6.4.6 0x0206 - Get Any Application Certification Status

Description: Provide application certification status, as captured from the application certificate for any given application and in relation with the connected MirrorLink client

Within an established MirrorLink connection, the returned Advertised as Certified App parameter shall be consistent with the expected result of the UPnP Application Server Service *GetAppCertificationStatus* Action [4]. Outside of an established MirrorLink connection, the returned Advertised as Certified App parameter shall be consistent with the expected result of the UPnP Application Server Service *GetAppCertificationStatus* action [4] invoked without a Manufacturer entity set and the default *AppCertFilter*

The returned Advertised as Certified App parameter shall be consistent with the result/input to UPnP Application Server Service *SetAllowedApplication* action [4] if used by the MirrorLink Client within an established MirrorLink connection

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Application Platform Identifier	Identifier, indicating which application to retrieve the application certification status for.	Platform dependent	Write
Certificate Available	Flag, indicating whether the MirrorLink server has a valid certificate for the application.	bool	Read
Advertised as Drive Certified App	Flag, indicating, whether the MirrorLink server has included the application into its UPnP advertisements [4] as a drive-certified application.	bool	Read
Advertised as Base Certified App	Flag, indicating, whether the MirrorLink server has included the application into its UPnP advertisements [4] as a base-certified application.	bool	Read
Restricted grace expiry	Integer, indicating the number of days remaining before the restricted grace period of the application certificate expires.	uint16	Read
Non Restricted grace expiry	Integer, indicating the number of days remaining before the restricted grace period of the application certificate expires.	uint16	Read

6.4.7 0x0207 - Get Any Application Certifying Entities

Description: Provide information on the certifying entities present in the application certificate, independent of the grace periods applying to the current certificate

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Application Platform Identifier	Identifier, indicating which application to retrieve the application certification status for	Platform dependent	Write
Entity	Comma-separated list of certifying entities, which certified the application	string8	Read

6.4.8 0x0208 - Get Any Application Certification Information

Description: Provided application certificate information pertaining to a particular entity present in the application certificate, independent of the grace periods actually applying to the current certificate (i.e. restricted and non-restricted information are provided unaltered)

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Application Platform Identifier	Identifier, indicating which application to retrieve the application certification status for	Platform dependent	write
Entity	Name of the certifying entity	string8	Write

Feature Name	Description	Type	Direction
Certified	Flag, whether the application has been certified from the given entity	bool	Read
Restricted	Comma-separated list of locales for which the application has been certified for restricted use (drive-level) from the given entity	string8	Read
Non Restricted	Comma-separated list of locales for which the application has been certified for non-restricted use (base-level) from the given entity	string8	Read

6.4.9 0x0209 - Get Certified Applications List Changed Callback

Description: Indicate that the list or status of applications holding a valid certificate has changed

This shall be consistent with the result of the *SetAllowedApplicationsList* UPnP action [4] in MirrorLink 1.3 sessions, or the result of the *GetCertifiedApplicationsList* action [4] in MirrorLink 1.2 sessions or below. Outside of an established MirrorLink connection, this shall be consistent with the expected result of the UPnP Application Server Service *GetCertifiedApplicationsList* action [4] invoked without a Manufacturer entity set and the default *AppCertFilter*

Determining if each application is considered drive or base certified by the client shall be done by using the clause 6.4.6 Get Any Application Certification Status method

Obligation: Mandatory

API Level: 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Application Platform Identifier List	A list of Identifiers, indicating which applications on the device are currently considered certified.	Platform dependent	read

6.5 0x03xx - Connection Information

6.5.1 0x0301 - Established MirrorLink Connection

Description: Established MirrorLink connection; any later change to the provided information shall be notified via the callback function defined in clause 6.5.2

Obligation: Mandatory

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Connection	Flag, whether MirrorLink connection has been established.	bool	Read

6.5.2 0x0302 - Established MirrorLink Connection Callback

Description: Indicate that the MirrorLink connection status changed. The callback shall be provided to all applications, which have registered to the MirrorLink API, independent on whether the application has been launched within or outside a MirrorLink session

A MirrorLink connection is *established* latest in the following situation (whatever comes first):

- MirrorLink Client sends a UPnP *SetClientProfile* action [8] with a non-empty Client Profile string.
- MirrorLink Client sends the first UPnP Application Server service action [4].

A MirrorLink connection is *terminated* latest in the following situation (whatever comes first):

- MirrorLink Clients sends a UPnP *SetClientProfile* action [8] with an empty Client Profile string.
- MirrorLink Server sends a *SSDP:byebye* message.
- Loss of the physical connection (e.g. pulling the USB cable, switching of Wi-Fi).

Obligation: Mandatory

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Connection	Flag, whether MirrorLink connection has been established.	Bool	Read

6.5.3 0x0303 - Established Audio Connections

Description: Established Audio connections within MirrorLink setup; any later change to the provided information shall be notified via the callback function defined in clause 6.5.4

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Media Audio Out	Identifier of the audio connection for media audio (output) 0x00: Not established 0x01: BT A2DP 0x02: RTP 0xFF: Not available (API level 2 onwards, API level 1 will return 0x00 instead)	uint8	Read
Media Audio In	Identifier of the audio connection for media audio (input) 0x00: Not established 0x02: RTP 0xFF: Not available (API level 2 onwards, API level 1 will return 0x00 instead)	uint8	Read

Feature Name	Description	Type	Direction
Voice Control	Identifier of the audio connection for Voice Control audio (input) 0x00: Not established 0x01: BT HFP + BVRA (Voice Control is outside MirrorLink Server's responsibility; application shall use existing platform APIs) 0x02: RTP 0xFF: Not available (API level 2 onwards, API level 1 will return 0x00 instead)	uint8	Read
Phone Audio	Identifier of the audio connection for Phone audio (input & output) 0x00: Not established 0x01: BT HFP 0x02: RTP 0xFF: Not available (API level 2 onwards, API level 1 will return 0x00 instead)	uint8	Read
RTP Payload Types	Comma separated list of supported RTP payload types in case an RTP connection is used. Set to "99" in case of WFD.	string8	Read
IPL	Initial Playback Latency value (in ms) Defines the expected initial latency (e.g. due to audio buffer filling at the MirrorLink client), before any audio is heard via the MirrorLink Client's speaker system	uint32	Read

NOTE: In case the established Remote Display Connection is WFD, the Media Audio Out stream is included in the WFD's AV RTP stream.

NOTE: In case the established Remote Display Connection is WFD, the outgoing Phone Audio stream is included in the WFD's AV RTP stream. The incoming RTP stream is separate from the WFD's AV RTP stream.

6.5.4 0x0304 - Established Audio Connections Callback

Description: Indicate that the audio connections changed

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Media Audio Out	Identifier of the audio connection for media audio (output) - see definitions above	uint8	Read
Media Audio In	Identifier of the audio connection for media audio (input) - see definitions above	uint8	Read
Voice Control	Identifier of the audio connection for Voice Control audio (input) - see definitions above	uint8	Read
Phone Audio	Identifier of the audio connection for Phone audio (input & output) - see definitions above	uint8	Read
RTP Payload Types	Comma separated list of supported RTP payload types in case an RTP connection is used	string8	Read

Feature Name	Description	Type	Direction
IPL	Initial Playback Latency value (in ms) Defines the expected initial latency (e.g. due to audio buffer filling at the MirrorLink client), before any audio is heard via the MirrorLink Client's speaker system	uint32	Read

6.5.5 0x0305 - Established Remote Display Connection

Description: Established remote display connection; any later change to the provided information shall be notified via the callback function defined in clause 6.5.6

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Connection	Identifier of the remote display type. it shall uniquely identify the following types 0x00: No connection established 0x01: VNC 0x02: HSML (MirrorLink ≥ 1.2 only) 0x03: WFD (MirrorLink ≥ 1.2 only) 0xFF: Other	uint8	Read

6.5.6 0x0306 - Established Remote Display Connection Callback

Description: Indicate that the remote display connections changed

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Connection	Identifier of the remote display type. It shall uniquely identify the following types - see definitions above	uint8	Read

6.6 0x04xx - Display Information

6.6.1 General

The MirrorLink API does not specify how information provided via MirrorLink has to be used to fulfil driver distraction.

6.6.2 0x0401 - Display Configuration

Description: Access information on the display properties of the MirrorLink Session; this information is used by MirrorLink certified applications to adapt its user interface to fulfil driver distraction guidelines [5], in particular regarding font sizes; Requires an established VNC connection; any later change to the provided information shall be notified via the callback function defined in clause 6.6.3

The provided framebuffer resolutions are modelling the following framebuffer pipeline:

1) The application renders its user interface into a framebuffer available in full to the application (App Horizontal / Vertical Resolution)

NOTE: If the application is using the MirrorLink Server's physical framebuffer, then the App Horizontal / Vertical Resolution is the resolution of the MirrorLink Server Device Display.

2) The MirrorLink Server scales that framebuffer to better fit the MirrorLink Client's framebuffer properties (Server Horizontal / Vertical Resolution)

3) The MirrorLink Server adds pad rows and/or columns to the scaled framebuffer (Server Pad Rows / Columns)

4) The MirrorLink Server transmits that framebuffer to the MirrorLink Client

5) The MirrorLink Client scales the received framebuffer to fit into its framebuffer (Client Horizontal / Vertical Resolution); the MirrorLink Client may add pad rows or columns (but not both) to compensate for differences in the framebuffer aspect ratio. Those pad rows or columns to not take away any resolution from the transmitted MirrorLink Server framebuffer

All pixel-based resolutions shall be based on a pixel aspect ratio of 1 (one), i.e. a squared pixel

Obligation: Mandatory

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
App Horizontal Resolution	Horizontal resolution in pixel of the framebuffer, the application is rendering into. NOTE: In many cases, the App Horizontal Resolution equals the horizontal resolution of the MirrorLink Server's display.	uint16	Read
App Vertical Resolution	Vertical resolution in pixel of the framebuffer, the application is rendering into. NOTE: In many cases, the App Vertical Resolution equals the vertical resolution of the MirrorLink Server's display.	uint16	Read
Server Horizontal Resolution	Horizontal resolution in pixel, after the MirrorLink Server has scaled the application framebuffer.	uint16	Read
Server Vertical Resolution	Vertical resolution in pixel, after the MirrorLink Server has scaled the application framebuffer.	uint16	Read
Server Pad Rows	Number of pad rows added from the MirrorLink Server to the scaled application framebuffer.	uint16	Read
Server Pad Columns	Number of pad columns added from the MirrorLink Server to the scaled application framebuffer.	uint16	Read
Client Horizontal Resolution	Horizontal resolution in pixel of the MirrorLink Client framebuffer, available for rendering the MirrorLink Server's screen.	uint16	Read

Feature Name	Description	Type	Direction
Client Vertical Resolution	Vertical resolution in pixel of the MirrorLink Client framebuffer, available for rendering the MirrorLink Server's screen.	uint16	Read
Width	Physical width in mm of the MirrorLink Client display, where the MirrorLink Server's screen appears.	uint16	Read
Height	Physical height in mm of the MirrorLink Client display, where the MirrorLink Server's screen appears.	uint16	Read
Distance	Physical distance in mm of the MirrorLink Client display from the driver's head position.	uint16	Read
App Pixels Per Client mm	Number of application-level pixels, which will fit into 1 mm of Client Display space. NOTE: This value is the same for the horizontal and vertical dimension.	float	Read
Success	Flag, to indicate whether the information is available.	bool	Read

6.6.3 0x0402 - Display Configuration Callback

Description: Display Configuration has changed

Obligation: Mandatory

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
App Horizontal Resolution	Horizontal resolution in pixel of the framebuffer, the application is rendering into. NOTE: In many cases, the App Horizontal Resolution equals the horizontal resolution of the MirrorLink Server's display.	uint16	Read
App Vertical Resolution	Vertical resolution in pixel of the framebuffer, the application is rendering into. NOTE: In many cases, the App Vertical Resolution equals the vertical resolution of the MirrorLink Server's display.	uint16	Read
Server Horizontal Resolution	Horizontal resolution in pixel, after the MirrorLink Server has scaled the application framebuffer.	uint16	Read
Server Vertical Resolution	Vertical resolution in pixel, after the MirrorLink Server has scaled the application framebuffer.	uint16	Read
Server Pad Rows	Number of pad rows added from the MirrorLink Server to the scaled application framebuffer.	uint16	Read
Server Pad Columns	Number of pad columns added from the MirrorLink Server to the scaled application framebuffer.	uint16	Read
Client Horizontal Resolution	Horizontal resolution in pixel of the MirrorLink Client framebuffer, available for rendering the MirrorLink Server's screen.	uint16	Read
Client Vertical Resolution	Vertical resolution in pixel of the MirrorLink Client framebuffer, available for rendering the MirrorLink Server's screen.	uint16	Read

Feature Name	Description	Type	Direction
Width	Physical width in mm of the MirrorLink Client display, where the MirrorLink Server's screen appears.	uint16	Read
Height	Physical height in mm of the MirrorLink Client display, where the MirrorLink Server's screen appears.	uint16	Read
Distance	Physical distance in mm of the MirrorLink Client display from the driver's head position.	uint16	Read
App Pixels Per Client mm	Number of application-level pixels, which will fit into 1 mm of Client Display space. NOTE: This value is the same for the horizontal and vertical dimension.	float	Read

6.6.4 0x0403 - Client Pixel Format

Description: Access information about the pixel format of the framebuffer data, being transmitted to the MirrorLink Client; requires established VNC connection; any later change to the provided information shall be notified via the callback function defined in clause 6.6.5

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Pixel Format	Pixel format value, as given below: 0x01: ARGB888 0x05: RGB444 0x02: RGB888 0x06: RGB343 0x03: ARGB565 0x07: 16-Bit-Gray 0x04: RGB555 0x08: 8-Bit-Gray	uint8	Read
Success	Flag, to indicate whether the information is available	bool	Read

6.6.5 0x0404 - Client Pixel Format Callback

Description: Pixel format has changed

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Pixel Format	Pixel format value, as given below - see definition above.	uint8	Read

6.6.6 0x0405 - Set Framebuffer Orientation Support

Description: Inform the MirrorLink Server about the application's framebuffer orientation support; unless otherwise set by the application, the VNC Server shall assume that the application will only support Landscape

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Framebuffer Orientation	Orientation of the Application Framebuffer Unique values for at least the following configurations: 0x01: Landscape only (**default**) 0x02: Portrait only 0x03: Landscape and Portrait	uint8	Write
Success	Flag, indicating whether the action is successful	bool	Read

The application shall use platform specific APIs to switch its framebuffer orientation. If the new orientation is not supported from the MirrorLink client, the application will receive a Switch Framebuffer Orientation Callback as specified in clause 6.6.7.

6.6.7 0x0406 - Switch Framebuffer Orientation Callback

Description: MirrorLink Server requests a framebuffer orientation switch from the application. The actual switch will happen via regular OS/platform mechanisms. An application shall switch its orientation, if it has indicated support for Landscape and Portrait in clause 6.6.6

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Framebuffer Orientation	Requested orientation of the Application Framebuffer true: Landscape false: Portrait	bool	Read

6.7 0x05xx - Event Information

6.7.1 0x0501 - Event Configuration

Description: Access information on the event properties of the MirrorLink connection, i.e. the event properties, which are supported from both, the MirrorLink Server and MirrorLink Client; details on the event configuration are specified in the VNC specification; Requires established VNC connection; any later change to the provided information shall be notified via the callback function defined in clause 6.7.2

Obligation: Mandatory

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Knob Support	Supported knob events from the MirrorLink Server and Client. Bit mask as defined in the VNC specification.	uint32	Read
Device Key Support	Supported device key events from the MirrorLink Server and Client. Bit mask as defined in the VNC specification.	uint32	Read
Multimedia Key Support	Supported multimedia key events from the MirrorLink Server and Client. Bit mask as defined in the VNC specification.	uint32	Read
Function Key Support	Number of supported function keys from the MirrorLink Server and Client.	uint8	Read
ITU Key Support	Support for ITU keys from the MirrorLink Server and Client.	bool	Read
Touch event support	Number of simultaneous touch events, supported from the MirrorLink Server and Client: 0x00: No touch support. 0x01: Single-Touch events only. Other: Multi-Touch support (Gestures).	uint8	Read
Pressure Mask	The pressure mask indicates how many pressure levels can be distinguished from the MirrorLink Server and Client.	uint8	Read
Keyboard Language	Language & country codes for Virtual Keyboard setting at the MirrorLink Client, e.g. "en/us".	string8	Read
UI Language	Language & country codes for UI Language setting at the MirrorLink Client, e.g. "en/us".	string8	Read
Success	Flag, to indicate whether the information is available.	bool	Read

6.7.2 0x0502 - Event Configuration Callback

Description: Client event configuration information has changed

Obligation: Mandatory

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Knob Support	Supported knob events from the MirrorLink Server and Client. Bit mask as defined in the VNC specification.	uint32	Read
Device Key Support	Supported device key events from the MirrorLink Server and Client. Bit mask as defined in the VNC specification.	uint32	Read
Multimedia Key Support	Supported multimedia key events from the MirrorLink Server and Client. Bit mask as defined in the VNC specification.	uint32	Read
Function Key Support	Number of supported function keys from the MirrorLink Server and Client.	uint8	Read
ITU Key Support	Support for ITU keys from the MirrorLink Server and Client.	bool	Read
Touch event support	Number of simultaneous touch events, supported from the MirrorLink Server and Client - see definitions above.	uint8	Read
Keyboard Language	Language & country codes for Virtual Keyboard setting at the MirrorLink Client, e.g. "en/us".	string8	Read
UI Language	Language & country codes for UI Language setting at the MirrorLink Client, e.g. "en/us".	string8	Read

Feature Name	Description	Type	Direction
Pressure Mask	The pressure mask indicates how many pressure levels can be distinguished from the MirrorLink Server and Client.	uint8	Read

6.7.3 0x0503 - Get Remapped Events

Description: Mapping MirrorLink Client events to local MirrorLink Server events; this API call gives access to the MirrorLink Client events, which are internally mapped to a different local MirrorLink Server event than specified in the Platform Specific Specification; requires an established VNC connection; an application shall use the function described in clause 6.7.4 to retrieve the mapping information; any later change to the provided information shall be notified via the callback function defined in clause 6.7.5

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Event List	Array of MirrorLink Client key events, which are mapped within the MirrorLink Server to a different key symbol value than specified within the Platform Specific Specification.	uint32[]	Read
Success	Flag, to indicate whether the information is available.	bool	Read

6.7.4 0x0504 - Get Event Mapping

Description: Mapping MirrorLink Client events to local MirrorLink Server events; this API call gives access to the internal mapping in the MirrorLink Server; Requires established VNC connection; any later change to the provided information shall be notified via the callback function defined in clause 6.7.5

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Remote Event	Key event value of the remote event.	uint32	Write
Local Event	Key event value of the local event, as it will be emulated on the MirrorLink Server device in response to the received remote event. Will be Zero if no mapping is implemented.	uint32	Read
Success	Flag, to indicate whether the information is available.	bool	Read

6.7.5 0x0505 - Get Event Mapping Callback

Description: The application shall be notified, whenever the MirrorLink Server or Client changes a mapping

Obligation: Mandatory

API Level: 1 only, **deprecated** as of Level 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Remote Event	Key event value of the remote event, which got changed.	uint32	Read
Local Event	Key event value of the local event, as it will be emulated on the MirrorLink Server device in response to the received remote event. Will be Zero if no mapping is implemented.	uint32	Read

6.8 0x06xx - Client Virtual Keyboard

6.8.1 0x0601 - Show Client Virtual Keyboard

Description: Trigger a virtual keyboard at the MirrorLink Client; requires an established VNC connection

Obligation: Conditional - Virtual Keyboard Module available

API Level: 1 only, **deprecated** as of Level 2

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Virtual Keyboard Flag	Flag, to identify whether to show or a remove a virtual keyboard	bool	Write
Text Entry	Text entry, to be used from the virtual keyboard	string16	Write
Key Event List	A key event list is provided separately (after this call)	bool	Write

6.8.2 0x0602 - Client Virtual Keyboard Support

Description: Check, whether MirrorLink client and server support virtual keyboard

Obligation: Conditional - Virtual Keyboard Module available

API Level: 1 only, **deprecated** as of Level 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Virtual Keyboard Flag	Flag to indicate whether a virtual keyboard is supported; it shall be set to FALSE, if no VNC connection is established.	bool	Read
Text Entry Flag	Flag to indicate whether text entry exchange is supported.	bool	Read
Text length	Maximum length of text entry. A value of 0 indicates no constraint.	uint8	Read

6.8.3 0x0603 - Client Virtual Keyboard Text Entry Callback

Description: Provide completed text entry; this callback is used when the text entry is completed on the MirrorLink Client

Obligation: Conditional - Application uses Virtual Keyboard Module

API Level: 1 only, **deprecated** as of Level 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Text Entry	Text entry, as completed from the virtual keyboard on the MirrorLink Client.	string16	Read

6.9 0x07xx - Key Event Listing

6.9.1 0x0701 - Key Event List

Description: Provide a white list of key events; key events are following the MirrorLink client device language setting; requires established VNC connection

Obligation: Conditional - Key Event Listing Module available

API Level: 1 only, **deprecated** as of Level 2

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Key Event List	List of supported key events (full white list)	uint32[]	Write

6.9.2 0x0702 - Key Event List Support

Description: Check, whether MirrorLink client and server support key event listing; requires established VNC connection

Obligation: Conditional - Key Event Listing Module available

API Level: 1 only, **deprecated** as of Level 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Key Event Listing Flag	Flag to indicate whether key event listing is supported; it shall be set to FALSE, if no VNC connection is established.	bool	Read

6.10 0x08xx - Context Information

6.10.1 0x0801 - Framebuffer Context Information

Description: Provides information of the current framebuffer context; the MirrorLink Server shall use the application and content category values from the UPnP advertisements [4], unless otherwise stated from the application using this SET function. The MirrorLink Server shall use the latest values until a new SET function call is issued

Obligation: Mandatory

API Level: 1+

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Framebuffer Context Information	Framebuffer context information. Setting the value to a Zero pointer will reset the video content category to the value provided in the UPnP application advertisement [4].	fbContext[]	Write
Handle Blocking	Flag, whether the application will take care of the blocking, in case the MirrorLink Client blocks the content. MirrorLink Servers may ignore the provided value, as they are responsible for handling the blocking, independent of the application's ability.	bool	Write

6.10.2 0x0802 - Framebuffer Blocking Information Callback

Description: Framebuffer is blocked from the MirrorLink Client

The MirrorLink Server will handle the Framebuffer Blocking. This may include terminating the application

Obligation: Mandatory

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Framebuffer Area	Framebuffer rectangle for the specified region.	Rect	Read
Blocking Reason	Reason for blocking.	uint16	Read

The MirrorLink Server shall pass the notification to the respective application, as soon as it receives a framebuffer blocking notification message from the MirrorLink Client; deprecated blocking reasons may be ignored. All blocking reasons shall be handled from the MirrorLink Server. The framebuffer blocking is provided to the respective applications for information purpose only.

- **Bit 0 - Not allowed content category**

  Deprecated.

- **Bit 1 - Not allowed application category**

  Application is blocked because MirrorLink aware applications with given application category are not supported in park mode.

- **Bit 2 - Not sufficient content trust level**

  Deprecated.

- **Bit 3 - Not sufficient application trust level**

  Application is blocked for certification status reason; either because of missing base certification in park mode or for missing drive certification in drive-mode.

- **Bit 4 - Content rules not followed**

  Deprecated.

- **Bit 5 - Not allowed application ID**

  Application is blocked because it is unknown.

- **Bit 8 - UI not in focus on remote display**

  Deprecated.

- **Bit 9 - UI not visible on remote display**

  The MirrorLink Client has moved the application into the background on its display.

- **Bit 10 - UI layout not supported (after a Desktop Size Pseudo Encoding)**

  The MirrorLink Client does not support the new orientation. The MirrorLink Server shall switch back to the previous orientation.

NOTE: The MirrorLink Server should use the Switch Framebuffer Orientation Callback (0x0406).

6.10.3 0x0803 - Audio Context Information

Description: Provides information of the current audio context and whether the application is currently providing audio; The MirrorLink Server shall use the application category value from the UPnP advertisements [4], unless otherwise stated from the application using this SET function. The MirrorLink Server shall use the given values until a new SET function call is issued

The application shall continue updating the information, whenever the context changes, even when the audio is blocked (0x0804) by the MirrorLink Client. The MirrorLink Server shall store the latest update and use it, whenever needed

Obligation: Mandatory

API Level: 1+

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Audio Content	Application is providing Audio content. If set to True, the application is going to start an audio stream. If set to False, the application has stopped the audio stream.	bool	Write

Feature Name	Description	Type	Direction
Audio Content Category	Array of Application Categories for the Audio Content of the audio stream. Array shall be sorted in priority order. Top priority is at position [0]. Setting the value to a Zero pointer will reset the audio content category to the value provided in the UPnP application advertisement [4]. The following audio content categories are defined: • "0x00030000" (General Media): Default for audio, not otherwise specified below; describes entertainment audio, like Music, Podcasts, or streaming audio. Normally without a pre-defined end. • "0x00050000" (Navigation): Short sound bites for navigation related information. High-priority announcements. • "0x00080000" (Announcements): Short sound bites for informing the driver. Lower priority than navigation announcements. • "0xF0000020" (Telephone): Phone call audio; undefined length • "0xF0000010" (Speech): Short audio interactions between Server and Client; Voice command audio;	uint32[]	Write
Handle Blocking	Flag, whether the application will take care of the blocking, in case the MirrorLink Client blocks the content. MirrorLink certified applications shall handle audio blocking, unless the underlying platform is able to handle it, as specified in the MirrorLink platform specific specification (e.g. the Android-specific specifications are available in [2]. MirrorLink Servers may ignore the provided value.	bool	Write

The MirrorLink Server is responsible for mixing the different audio streams, i.e. application audio as well as system audio, into a single audio stream for the MirrorLink Client. The provided audio context information is attached from the MirrorLink Server to the audio packets, prior sending them out to the MirrorLink Client.

The Audio Context information is used from the MirrorLink Client to mix the received MirrorLink Server audio stream with the internal MirrorLink Client audio. Therefore, the audio context information shall be timely synchronized with the actual audio content. Based on the received context information, the MirrorLink Client has the following basic mixing options:

1) The received MirrorLink audio is **blocked**. An audio blocking message will be sent from the MirrorLink Client (see following API call).

2) The received MirrorLink audio is **mixed** with the local MirrorLink Client audio. MirrorLink audio goes either into the foreground or into the background. Local audio continues, alone after MirrorLink audio finished.

3) The received MirrorLink audio **replaces** the local MirrorLink Client audio. Local MirrorLink audio may pause or stop and later resume or restart once the MirrorLink audio finishes.

The provided audio context information is for audio purpose only, and does not necessarily need to classify the application as such, i.e. the audio context information may differ from the provided framebuffer context information.

6.10.4 0x0804 - Audio Blocking Information Callback

Description: Audio is blocked from the MirrorLink Client; the application shall remove the blocked content

Obligation: Mandatory

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Blocking Reason	Reason for blocking	uint16	Read

The MirrorLink Server shall pass the notification to the respective application, as soon as it receives an audio blocking notification message from the MirrorLink Client, with a reason flag other than 0x00. MirrorLink base and drive certified applications, as well as MirrorLink aware applications shall either stop, pause or mute the current audio playback, when receiving an audio blocking callback via the MirrorLink API, unless the underlying platform is able to handle it, as specified in CCC's MirrorLink platform specific specification (e.g. the Android-specific specifications are available in ETSI TS 103 544-22 [2]).

MirrorLink specified a set of audio blocking reason flags, as outlined below:

- **Bit 0 - Not allowed application category**

  Audio from MirrorLink-aware applications not supported for given application category.

- **Bit 1 - Not sufficient application trust level**

  Audio is blocked for certification status reason; either because of missing base certification in park mode or for missing drive certification in drive-mode.

- **Bit 2 - Not allowed application ID**

  Deprecated.

- **Bit 3 - Global audio muted**

  Global audio mute.

- **Bit 4 - Audio stream, as given by application ID, muted**

  Audio stream of the respective application muted due to higher priority internal audio playback, typically initiated by the user.

6.10.5 0x0805 - Framebuffer Unblocking Callback

Description: Framebuffer is unblocked from the MirrorLink Client and is being moved into the foreground. This signal will be emitted, if the MirrorLink Server has previously blocked part of the framebuffer using the API call 0x0802 or via internal handling

Obligation: Mandatory

API Level: 1+

Type: Callback

Feature List: None

The MirrorLink Server shall send a framebuffer unblocking callback to the respective applications, as soon as the MirrorLink Client moves the MirrorLink Server framebuffer back into the foreground on the MirrorLink Client display. I.e. the MirrorLink Server starts to receive two consecutive Framebuffer Update Request messages with no Framebuffer Blocking Notification in between.

6.10.6 0x0806 - Audio Unblocking Callback

Description: Audio is unblocked from the MirrorLink Client. This signal will be emitted, if the MirrorLink Client has previously blocked application's audio stream

Obligation: Mandatory

API Level: 1+

Type: Callback

Feature List: None

The MirrorLink Server shall send an audio unblocking callback to the respective applications, as soon as it receives an audio blocking notification message from the MirrorLink Client, with a reason flag of 0x00.

6.10.7 0x0807 - Audio In Foreground

Description: Check, whether MirrorLink audio is currently played from the MirrorLink Client's speaker. In case it is played, new audio can be played almost instantly, i.e. the MirrorLink will immediately respond with as Audio-In Foreground callback, otherwise it may take additional time for the MirrorLink Client to switch to the MirrorLink audio source, delaying the Audio-In Foreground callback

Note that there is no guarantee that the MirrorLink Client will not block the new audio source, as it might have less priority than the currently playing audio source

Obligation: Mandatory

Type: Callback

API Level: 2

Feature List:

Feature Name	Description	Type	Direction
Audio in Foreground	Flag indicating whether the MirrorLink Client is currently playing MirrorLink audio.	bool	Read

6.10.8 0x0808 - Audio In Foreground Callback

Description: Audio is now being outputted from the MirrorLink Client. This signal will be emitted in response to a change in Audio Context Information, if the MirrorLink Client has some latency when switching from any of its native media source to MirrorLink as a media source

Obligation: Mandatory

Type: Callback

API Level: 2

Feature List: None

6.10.9 0x0809 - UI In Foreground

Description: Check, whether MirrorLink UI is currently shown by the MirrorLink Client

Note that there is no guarantee that the MirrorLink Client will not block the UI content, as it might have less priority than native content or might not comply with driver safety regulation

Obligation: Mandatory

Type: Callback

API Level: 2

Feature List:

Feature Name	Description	Type	Direction
UI in Foreground	Flag indicating whether the MirrorLink Client is currently showing MirrorLink UI.	bool	Read

6.10.10 0x080A - UI In Foreground Callback

Description: MirrorLink UI is now being displayed by the MirrorLink Client. This signal will be emitted after an application has been launched as soon as its UI is being available on the client, or following a Framebuffer Unblocking notification

Obligation: Mandatory

Type: Callback

API Level: 2

Feature List: None

6.11 0x09xx - Device Status Information

6.11.1 0x0901 - Drive Mode

Description: Check the drive mode status on the MirrorLink Server; requires established VNC connection

Obligation: Mandatory

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Drive Mode	Flag enabling drive mode for the application	bool	Read

6.11.2 0x0902 - Drive Mode Callback

Description: Enable drive mode on the MirrorLink Server application; requires established VNC connection

Obligation: Mandatory

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Drive Mode	Flag enabling drive mode for the application	bool	Read

6.11.3 0x0903 - Night Mode

Description: Check the night mode on the MirrorLink Server; requires established VNC connection

Obligation: Mandatory

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Night Mode	Flag enabling night mode for the application	bool	Read

6.11.4 0x0904 - Night Mode Callback

Description: Enable night mode on the MirrorLink Server application; requires established VNC connection

Obligation: Mandatory

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Night Mode	Flag enabling night mode for the application	bool	Read

6.11.5 0x0905 - Microphone State

Description: Check the status of the Microphone from the MirrorLink Client; requires established VNC connection

Obligation: Conditional - Voice Control or Phone Audio supported over RTP

API Level: 1 only; **deprecated** as of Level 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Mic Input	Flag whether mic input is enabled on MirrorLink Client	bool	Read
Voice Input	Flag whether voice input is enabled	bool	Read

6.11.6 0x0906 - Open Microphone Callback

Description: Response on opening the Microphone from the MirrorLink Client; requires established VNC connection

Obligation: Conditional - Voice Control or Phone Audio supported over RTP

API Level: 1 only; **deprecated** as of Level 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Mic Input	Flag whether mic input is enabled on MirrorLink Client	bool	Read
Voice Input	Flag whether voice input is enabled	bool	Read

6.11.7 0x0907 - Set Open Microphone

Description: Open the Microphone on the MirrorLink Client; requires established VNC connection

Obligation: Conditional - Voice Control or Phone Audio supported over RTP

API Level: 1 only; **deprecated** as of Level 2

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Mic Input	Flag enabling mic input on the MirrorLink Client.	bool	Write
Voice Input	Flag enabling voice input on the MirrorLink Client. The application shall set the Mic Input flag to TRUE, if the Voice input flag is set to TRUE.	bool	Write

6.12 0x0Axx - Data Services

6.12.1 General

These API functions provide access to Data Services provided from the MirrorLink Client and from MirrorLink applications running on the MirrorLink Server.

Data Sources, which are implemented from the MirrorLink Server, without using the MirrorLink API, shall expose a behaviour in line with a data service, using the MirrorLink API.

6.12.2 0x0A01 - Get Available Services

Description: Retrieves the list of available Services provided from the MirrorLink Client and supported from the MirrorLink Server; requires an established CDB connection; any later change to the provided information shall be notified via the callback function defined in clause 6.12.3

The MirrorLink Server will need to check for the application's certification type and the information regarding service certification (using *serviceList* element in *A_ARG_TYPE_AppCertificateInfo*) before returning the list of services to the application, i.e. an application may not have access to a particular data service, if the MirrorLink Client has limited access to only specific certified applications

Applications that act as a data source for a service shall include `"{service-name-as-specified}.source"` in the `<serviceList/>` element of their certificate xml extension

Applications that act as a data sink for a service should include `"{service-name-as-specified}"` in the `<serviceList/>` element of their certificate xml extension

The returned list shall not include services, to which the application does not have access to

Obligation: Conditional - Data Services Module available

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Services Provided	List of provided services; an empty array is returned if the CDB connection has not been established. **Default**: Empty array.	ServiceInfo[]	Read

6.12.3 0x0A02 - Available Services Callback

Description: Change in available services. Callback shall be called, when CDB connection is established whenever the list of the status of services is changing, due to a certificate update or write access becoming available for example, or whenever the *ServiceInfo* structure for any service has changed

The returned list shall not include services, to which the application does not have access to

Obligation: Conditional - Data Services Module available

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Services Provided	List of provided services; an empty array is returned if the CDB connection has not been established. **Default**: Empty array.	ServiceInfo[]	Read

6.12.4 0x0A03 - Register to a Service

Description: Register to an available Service; requires an established CDB connection; asynchronous response is provided by the callback specified in clause 6.12.5.

For API Level 1, Applications can only register as a Sink to a service via this method, and will have READ and SUBSCRIBE access to all service objects and WRITE Access to all non-configuration objects, as specified by the respective source service.

If an application tries to register to a service to which it does not have access to, the MirrorLink Server shall return an Error in clause 6.12.5 Register to a Service callback.

Starting from API Level 2, Applications can register to act as a Sink (data object consumer) or a Source (data object producer) to a service via this method. When doing so, Applications shall indicate their role respective to the service (i.e. sink or source) and if they require write access to any configuration object offered by the service.

Applications, registering to a service via this method with the *configurationAccess* set to `true`, will have READ, SUBSCRIBE and WRITE access to all service objects, as specified by the respective service. WRITE access to configuration objects is exclusive. The registration will fail, if another application has already registered for Configuration Write Access.

If registration for the service becomes available again, the service information for the service shall be updated and a notification shall be send via the callback function defined in clause 6.12.3. Registration shall fail, if another application has already registered Configuration Write Access for the service.

If an application tries to subscribe to a service to which it does not have access to, the MirrorLink Server shall return an Error in clause 6.12.5 Register to a Service callback.

The MirrorLink Server should wait until an application has registered as a sink to start the client advertised source using the CDB *startService* command. The MirrorLink Server should stop the client advertised source using the CDB *stopService* command once all applications have unregistered sinks for the corresponding service.

The MirrorLink Server shall include a service for which it supports application registering as a source in its CDB *ServicesSupported* message, only after a MirrorLink application has successfully registered to the service as a Source using this API.

Obligation: Conditional - Data Services Module available

API Level: 1 (Sink), 2 (Sink & Source)

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Service ID	Service identifier	uint16	Write
asSource	Indicates that the application is willing to act as a source for the service. Defaults to false for API Level 1	bool	Write
configuration Access	Indicates that the application can use the Set Object Method to update a service configuration object when connected as a Sink. Ignored if *asSource* is equal to true. Defaults to false for API Level 1	bool	Write

6.12.5 0x0A04 - Register to a Service Callback

Description: Registration completed; asynchronous response to the function specified in clause 6.12.4

The MirrorLink Server shall use this callback with *Success* set to true, in case a service, registered as a source, has been started by the MirrorLink Client

The MirrorLink Server shall use this callback with *Success* set to false, in case a service, registered as a source, has been stopped by the MirrorLink Client

Obligation: Conditional - Data Services Module available

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Service ID	Service identifier.	uint16	Read
Success	Flag, to indicate whether the action is successful and the corresponding source could be started when registering to a sink.	bool	Read

Figure 1 shows an example message flow, which shows the use of the Register to Service Callback in response to a Start Service and Stop Service action on the CDB.

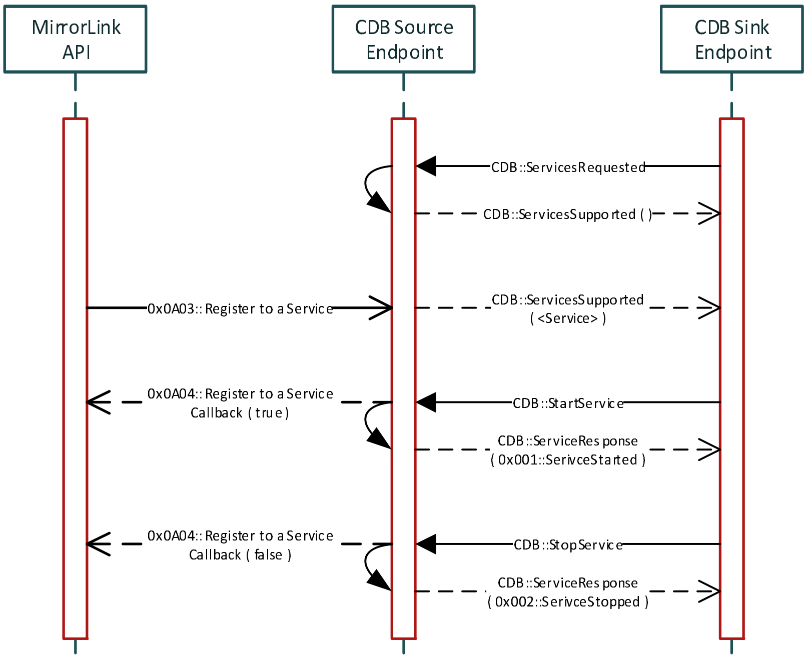
MirrorLink API
CDB Source Endpoint
CDB Sink Endpoint
CDB::ServicesRequested
CDB::ServicesSupported ( )
0x0A03:: Register to a Service
CDB::ServicesSupported (<Service>)
0x0A04:: Register to a Service Callback (true)
CDB::StartService
CDB::ServiceResponse (0x001::SerivceStarted)
0x0A04:: Register to a Service Callback (false)
CDB::StopService
CDB::ServiceResponse (0x002::SerivceStopped)

Figure 1: Register to Service and Register to Service Callback Message Flow

6.12.6 0x0A05 - Unregister from a Service

Description: Unregister from an available Service; requires an established CDB connection

The MirrorLink Server shall terminate the CDB service and shall send a *ServicesSupported* CDB message with the unregistered service excluded, if the service was registered as a source, and no other MirrorLink application is currently registered as a source

Obligation: Conditional - Data Services Module available

API Level: 1+

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Service ID	Service identifier	uint16	Write

Figure 2 shows an example message flow how a MirrorLink application, can unregister from a data source.

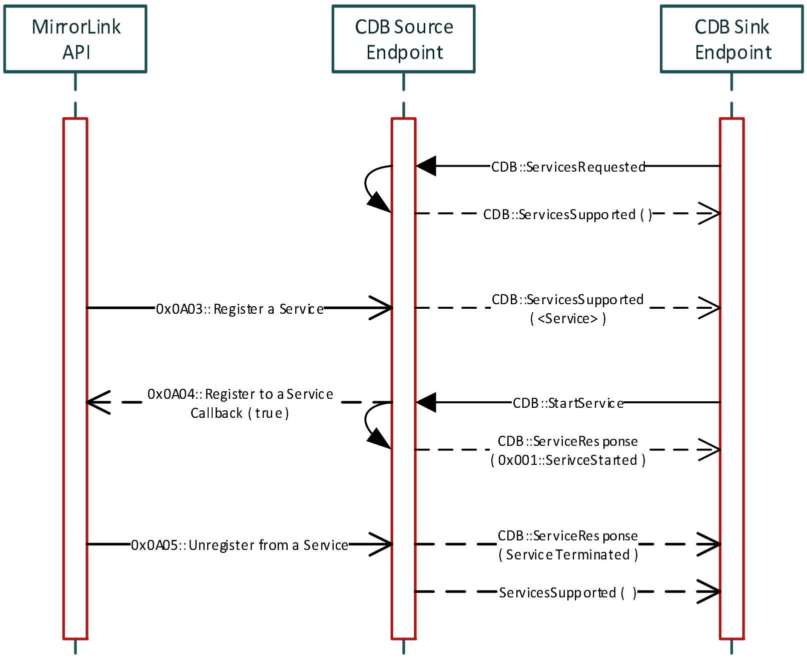
MirrorLink API
CDB Source Endpoint
CDB Sink Endpoint
CDB::ServicesRequested
CDB::ServicesSupported ( )
0x0A03:: Register a Service
CDB::ServicesSupported (<Service>)
0x0A04:: Register to a Service Callback (true)
CDB::StartService
CDB::ServiceResponse (0x001::SerivceStarted)
0x0A05:: Unregister from a Service
CDB::ServiceResponse (Service Terminated)
ServicesSupported ( )

Figure 2: Unregister from a Service Message Flow

6.12.7 0x0A06 - Subscribe to an Object

Description: Subscribe a Service Object; requires an established CDB connection; asynchronous response is provided by the callback specified in clause 6.12.8

Obligation: Conditional - Data Services Module available

API Level: 1+

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Service ID	Service identifier	uint16	Write
Object ID	Hash value of the object	uint32	Write

6.12.8 0x0A07 - Subscribe to an Object Callback

Description: Subscription complete; asynchronous response to the function specified in clause 6.12.7. Any update to the value of the data object will be provided via the Received Object Callback, specified in clause 6.12.13

Obligation: Conditional - Data Services Module available

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Service ID	Service identifier.	uint16	Read
Object ID	Hash value of the object.	uint32	Read
Success	Flag, to indicate whether the action is successful.	bool	Read
Subscription type	Subscription type: 0x00: Regular interval. 0x01: On Change. 0x02: Automatic.	uint8	Read
Interval	Regular time interval in ms, in which updates are sent. shall be 0 for subscription types 0x01 (on change) and 0x02 (Automatic).	uint32	Read

6.12.9 0x0A08 - Unsubscribe from an Object

Description: Unsubscribe from a Service Object

Obligation: Conditional - Data Services Module available

API Level: 1+

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Service ID	Service identifier	uint16	Write
Object ID	Hash value of the object	uint32	Write

6.12.10 0x0A09 - Set an Object

Description: Set a Service Object; requires an established CDB connection and registered service; asynchronous response is provided by the callback specified in clause 6.12.11

In case the application is acting as a sink and has Read & non-Configuration Write Access to a Service, a write to any configuration object will always return an error. Other write to non-configuration objects will always keep the last written value, i.e. the last write wins in case of concurrent writes

In case the application is acting as a source, the server shall use the last updated version of the object when providing object values to the client, according to the client request type (i.e. GET or SUBSCRIBE)

If multiple applications contribute updates to an object, the server should that the last one wins when providing the updated object to the MirrorLink Client

Until an application has provided the first update to an object, the server shall respond to the client request using the `0x10000006` error code (Not available - the requested data is currently unavailable). In case the object becomes not available again, the MirrorLink application shall set the Object Value pointer to NULL

The server shall return the object to its initial unknown state when no value is provided for the object in this method

Obligation: Conditional - Data Services Module available

API Level: 1+

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Service ID	Service identifier	uint16	Write
Object ID	Hash value of the object	uint32	Write
Object Value	Pointer to the object's value	void*	Write

6.12.11 0x0A0A - Set Object Callback

Description: Set a Service object completed; requires established CDB connection, asynchronous response to the function specified in clause 6.12.10

Obligation: Conditional - Data Services Module available

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Service ID	Service identifier	uint16	Read
Object ID	Hash value of the object	uint32	Read
Success	Flag, to indicate whether the action is successful	bool	Read

6.12.12 0x0A0B - Get an Object

Description: Get a Service Object; requires established CDB connection and registered service; asynchronous response is provided by the callback specified in clause 6.12.13

Obligation: Conditional - Data Services Module available

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Service ID	Service identifier	uint16	Write
Object ID	Hash value of the object	uint32	Write
Object Value	Pointer to the object's value	void*	Read

6.12.13 0x0A0C - Received Object Callback

Description: New data object available; requires established CDB connection, registered service and an object subscription

For applications, having registered as a sink, asynchronous response to the functions specified in clause 6.12.12. This callback will be used from the MirrorLink Server to provide new data value for objects to which the application has subscribed using clause 6.12.7

For applications, having registered as a source, this callback informs the application that a sink running on the client has requested to write to an object. An application shall respond to the received object callback via the *SetDataObjectResponse* (0x0A0E) function, defined in clause 6.12.15

In API Level 1, this callback is only available for applications registered as a sink

Obligation: Conditional - Data Services Module available

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Service ID	Service identifier	uint16	Read
Object ID	Hash value of the object	uint32	Read
Success	Flag, to indicate whether the action is successful	bool	Read
Object Value	Pointer to the object's value	void*	Read

6.12.14 0x0A0D - Request to Update an Object Callback

Description: Indicates that the MirrorLink Client wants to receive the current values for an object from the application having registered to the service as a source; requires an established CDB connection and registered service:

- A MirrorLink Client GET request may translate into an occurrence of this callback, with the *updateOnChange* parameter set to `false`, unless there exists a subscription for this object already. If received from the MirrorLink application, it shall provide the current version of the Object using clause 6.12.10 *Set an Object* method.
- A MirrorLink Client SUBSCRIBE request shall translate into a single occurrence of this callback, with the *updateOnChange* parameter set to `true`. The MirrorLink application shall start providing updated version of the Object using clause 6.12.10 *Set an Object* method.
- A MirrorLink Client CANCEL request shall translate into an occurrence of this callback with the *updateOnChange* parameter set to `false`. The MirrorLink application should stop providing updated versions of the Object using clause 6.12.10 *Set an Object* method.

The MirrorLink Server shall use the last updated version of the object when providing object values to the MirrorLink Client, according to the MirrorLink Client request type (i.e. GET or SUBSCRIBE)

Until an application has provided the first update to an object, the server shall respond to the client request using the `0x10000006` error code (Not available - The requested data is currently unavailable)

The server shall return the object to its initial unknown state when no applications have registered to the service

Obligation: Conditional - Data Services Module available

API Level: 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Service ID	Service identifier	uint16	Read
Object ID	Hash value of the object	uint32	Read
Object Value	Pointer to the object's value	void*	Read

Feature Name	Description	Type	Direction
UpdateOnChange	Update on change. True if the application is meant to provide an updated value every time the state of the object changed, without having the callback being triggered	bool	Read

Figure 3 shows example subscription and un-subscription for on-change.

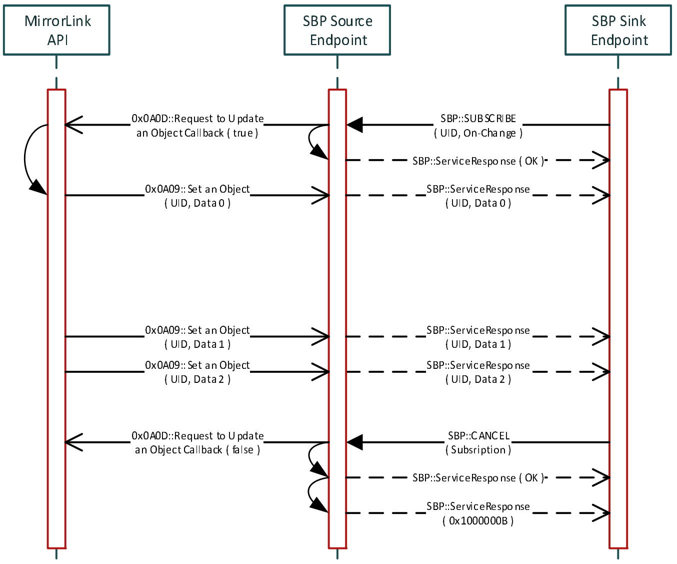
MirrorLink API
SBP Source Endpoint
SBP Sink Endpoint
0x0A0D::Request to Update an Object Callback (true)
SBP::SUBSCRIBE (UID, On-Change)
SBP::ServiceResponse (OK)
0x0A09:: Set an Object (UID, Data 0)
SBP::ServiceResponse (UID, Data 0)
0x0A09:: Set an Object (UID, Data 1)
SBP::ServiceResponse (UID, Data 1)
0x0A09:: Set an Object (UID, Data 2)
SBP::ServiceResponse (UID, Data 2)
0x0A0D::Request to Update an Object Callback (false)
SBP::CANCEL (Subsription)
SBP::ServiceResponse (OK)
SBP::ServiceResponse (0x1000000B)

Figure 3: SBP Message Exchange for On-Change Subscription

Figure 4 shows example subscription and un-subscription for regular interval.

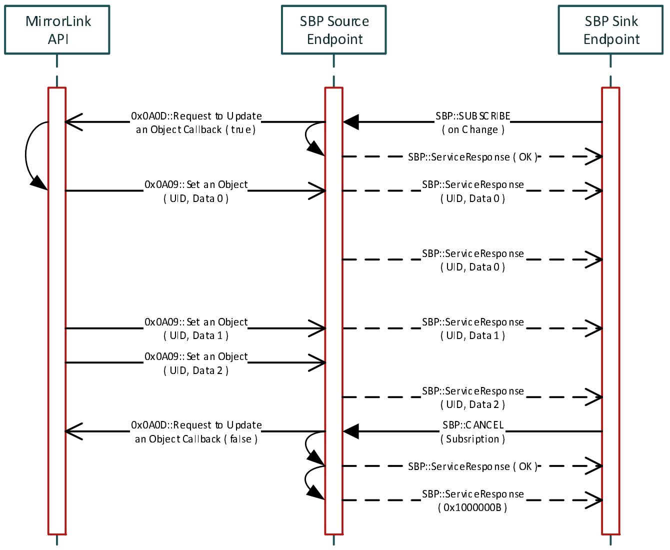
MirrorLink API
SBP Source Endpoint
SBP Sink Endpoint
0x0A0D::Request to Update an Object Callback (true)
SBP::SUBSCRIBE (on Change)
SBP::ServiceResponse (OK)
0x0A09:: Set an Object (UID, Data 0)
SBP::ServiceResponse (UID, Data 0)
SBP::ServiceResponse (UID, Data 0)
0x0A09:: Set an Object (UID, Data 1)
SBP::ServiceResponse (UID, Data 1)
0x0A09:: Set an Object (UID, Data 2)
SBP::ServiceResponse (UID, Data 2)
0x0A0D::Request to Update an Object Callback (false)
SBP::CANCEL (Subsription)
SBP::ServiceResponse (OK)
SBP::ServiceResponse (0x1000000B)

Figure 4: SBP Message Exchange for Interval Subscription

Figure 5 shows example message exchange, in case a GET request received during an (on-Change) subscription.

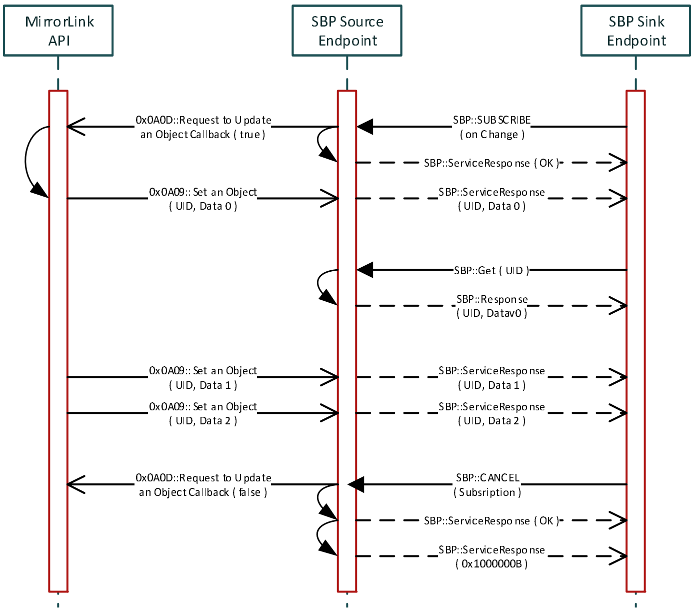
MirrorLink API
SBP Source Endpoint
SBP Sink Endpoint
0x0A0D::Request to Update an Object Callback (true)
SBP::SUBSCRIBE (on Change)
SBP::ServiceResponse (OK)
0x0A09:: Set an Object (UID, Data 0)
SBP::ServiceResponse (UID, Data 0)
SBP::Get (UID)
SBP::Response (UID, Datav0)
0x0A09:: Set an Object (UID, Data 1)
SBP::ServiceResponse (UID, Data 1)
0x0A09:: Set an Object (UID, Data 2)
SBP::ServiceResponse (UID, Data 2)
0x0A0D::Request to Update an Object Callback (false)
SBP::CANCEL (Subsription)
SBP::ServiceResponse (OK)
SBP::ServiceResponse (0x1000000B)

Figure 5: SBP Message Exchange for Get access during an active Subscription

Details of the SBP are specified in [7].

6.12.15 0x0A0E - Set Data Object Response

Description: Asynchronous response to the function specified in clause 6.12.13 (0x0A0C).

When an application, having registered as a source, receives a request to set an object from the data sink, via the callback specified in clause 6.12.13, it shall report the result of the action using this API call.

Generic response values, as specified in [7], are:

- 0x00000000 (Ok - No error).
- 0x10000001 (Unknown UID - Unrecognized object UID).
- 0x10000002 (Not supported - Feature not supported).
- 0x10000005 (Missing data - Mandatory member variable is missing).
- 0x1000000C (Write not allowed - The object does not allow writing).
- 0x1000000E (Not available - The data is currently unavailable for writing).

Additional response values are Service Specific.

Application should respond within 3 min. In case the application fails to respond the MirrorLink Server should respond with 0x1000000E (Not available - The data is currently unavailable for writing). A service specification may define specific timeout values.

The MirrorLink Server shall use SBP *Response-Continue* mechanism as defined in [7], to provide a timely response to the data sink, while waiting for the application to respond.

Obligation: Conditional - Data Services Module available

API Level: 2

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Service ID	Service identifier	uint16	Write
Object ID	Hash value of the object	uint32	Write
Response	Response value for the Set Object operation	uint32	Write

6.13 0x0Bxx - Notifications

6.13.1 0x0B01 - Notifications Supported

Description: Indicate support for UPnP notifications [10] from the application; the MirrorLink Server will issue a *NotiAppListUpdate* event, to inform the MirrorLink Client that the notification support for this application has changed. Unless otherwise set by the application, the MirrorLink Server shall assume that the application will not support notifications

Obligation: Conditional - Notifications Module available

API Level: 1+

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Notifications supported	Flag indicating notification support from the application	bool	Write

6.13.2 0x0B02 - Notifications Enabled

Description: Checks whether notifications are enabled for the application; any later change to the provided information shall be notified via the callback function defined in clause 6.13.3

Obligation: Conditional - Notifications Module available

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Notifications enabled	Flag indicating that notifications are enabled from MirrorLink Server and Client for the application **Default**: False	bool	Read

6.13.3 0x0B03 - Notifications Enabled Callback

Description: Notification enablement has changed

Obligation: Conditional - Notifications Module available

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Notifications enabled	Flag indicating that notifications are enabled from MirrorLink Server and Client for the application **Default**: False	bool	Read

6.13.4 0x0B04 - Notification Configuration

Description: Get configuration information for the notification service; any later change to the provided information shall be notified via the callback function defined in clause 6.13.5

Obligation: Conditional - Notifications Module available

API Level: 1+

Type: Get

Feature List:

Feature Name	Description	Type	Direction
Notification UI Support	Flag, whether the MirrorLink client supports its own notification UI	bool	Read
Max Actions	Maximum number of actions	uint8	Read
Max Action Name Length	Maximum number of characters of the Action Name	uint8	Read
Max Notification Title Length	Maximum number of characters of the notification title	uint16	Read
Max Body Length	Maximum number of characters of the notification body	uint16	Read
Languages	Comma separated list of languages supported by voice interactions, both for text to speech and recognition. Languages are identified according to ISO 639-1 [12]	string	Read
Supported Actions	List of action types supported by voice interactions	string[]	Read

6.13.5 0x0B05 - Notification Configuration Callback

Description: Notification Configuration information has changed

Obligation: Conditional - Notifications Module available

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
Notification UI Support	Flag, whether the MirrorLink client supports its own notification UI	bool	Read
Max Actions	Maximum number of actions	uint8	Read
Max Action Name Length	Maximum number of characters of the Action Name	uint8	Read
Max Notification Title Length	Maximum number of characters of the notification title	uint16	Read
Max Body Length	Maximum number of characters of the notification body	uint16	Read

Feature Name	Description	Type	Direction
Languages	Comma separated list of languages supported by voice interactions, both for text to speech and recognition. Languages are identified according to ISO 639-1 [12]	string	Read
Supported Actions	List of action types supported by voice interactions	string[]	Read

6.13.6 0x0B06 - Send Notification for client-based Notification UI

Description: Send a notification from the application; this notification replaces any pending notification sent by the same application. If the replaced notification is still valid, after the new notification has been handled, the application will need to resend it

The application will receive the action callback 0x0B09, containing the selected action. In case the notification has been ignored, the corresponding *actionID* is set to zero

Obligation: Conditional - Notifications Module available

API Level: 1+

Type: Set

Feature List:

Feature Name	Description	Type	Direction
notiTitle	Title of the notification event.	string8	Write
notiBody	Body of the notification event.	string8	Write
iconUrl	Url to icon belonging to the notification. Icon shall be of mimetype "image/png" with a color depth of 24. *iconUrl* can make use of the data URI scheme [3] to provide immediate access to the icon data.	url	Write
actionList	List of actions belonging to the notification.	Action[]	Write
notificationID	Returns the notification identifier; a Zero value will be returned, if the action was not successful.	uint32	Read

6.13.7 0x0B07 - Send Notification for VNC-based Notification UI

Description: Send a notification from the application; this notification replaces any pending notification sent by the same application. If the replaced notification is still valid, after the new notification has been handled, the application will need to resend it

The application will be brought into foreground in case the notification is accepted. Otherwise, the application will receive the action callback 0x0B09 within an *actionID* set to zero

Obligation: Conditional - Notifications Module available

API Level: 1+

Type: Set

Feature List:

Feature Name	Description	Type	Direction
notificationID	Returns the notification identifier; a Zero value will be returned, if the action was not successful	uint32	Read

6.13.8 0x0B08 - Cancel Notification

Description: Cancel a notification from the application

Obligation: Conditional - Notifications Module available

API Level: 1+

Type: Set

Feature List:

Feature Name	Description	Type	Direction
notification ID	Identifier of the notification, which needs to get cancelled	uint32	Write

6.13.9 0x0B09 - Receive Action Callback

Description: Receive action from the MirrorLink Client for a notification

Obligation: Conditional - Notifications Module available

API Level: 1+

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
notification ID	Identifier of the notification.	uint32	Read
actionID	Action identifier.	uint32	Read
actionExtra	API Level 2 only: Extraneous set of parameters passed back to the application as the result of the action. Use in conjunction with: • ACTION_RESPONSE_FREE_FORM_SPEECH and • ACTION_RESPONSE_FREE_FORM_AUDIO.	Platform-specific	Read

6.13.10 0x0B0A - Send Notification for Voice-based Notification UI

Description: Voice a notification from the application; this notification replaces any pending notification sent by the same application. If the replaced notification is still valid, after the new notification has been handled, the application will need to resend it. Results are submitted using the Receive Action Callback, specified in clause 6.13.9

The *ActionList* provided for Voice-based Notification shall only make use of the subset of Action Type as defined in clause 7.7 Action Types supported for Voice Based Notifications

Obligation: Conditional - TTS Engine available, Voice Recognition Engine Available

API Level: 2

Type: Set

Feature List:

Feature Name	Description	Type	Direction
NotiPrompt	Voice Prompt of the notification event	string8	Write
LanguageCode	Language Code (according to ISO 639-1 [12])	string8	Write
ActionList	List of actions belonging to the notification.	Action[]	Write

Feature Name	Description	Type	Direction
notificationID	Returns the notification identifier; a Zero value will be returned, if the action was not successful.	uint32	Read

6.13.11 0x0B0B - Initiate Voice-based Interaction

Description: Initiate Push-To-Talk from the application; this method allows an application to trigger a prompt-less voice interaction within the MirrorLink session

The standard set of actions supported by MirrorLink is used, as if the session was triggered from the MirrorLink client, and can result in other applications being launched in response if they have published support for the corresponding action using the Actions module. The only difference with an external push to talk trigger is that the calling application has priority over all other applications having published similar actions

The resulting action shall be triggered using the Action Invoked Callback defined in clause 6.14.8

The MirrorLink Server shall use the same process in response to a Push To Talk request from the MirrorLink client, but without prioritizing any particular application

Obligation: Conditional - TTS Engine available, Voice Recognition Engine Available

API Level: 2

Type: Set

Feature List:

Feature Name	Description	Type	Direction
LanguageCode	Language Code (according to ISO 639-1 [12]).	string8	Write
notificationID	Returns the notification identifier; a Zero value will be returned, if the action was not successful.	uint32	Read

6.13.12 0x0B0C - Notification Failed Callback

Description: Notification, initiated with 0x0B06, 0xB07, 0x0B0A or 0x0B0B failed. No Action Invoked Callback will be triggered

Obligation: Mandatory

Type: Callback

API Level: 2

Feature List:

Feature Name	Description	Type	Direction
notification ID	Identifier of the notification that failed	uint32	Read

6.14 0x0Cxx - Actions

6.14.1 General

This module provides Applications with the means to share actions either with other applications (for example a contact application might want to use the 'navigate to' action of a navigation application, within MirrorLink) or with the MirrorLink Server and Client themselves (for inclusion of shortcuts in the application listing or as the result of a user triggered voice interaction for example).

Actions registered with an action type of 'Variant' shall be included as new entries with their own *AppID* in the UPnP Application Listing [4] using the action provided name, action provided icon, their variant property set to the unique *AppID* of the owner application and have their *resourceStatus* following those of the owner application. If no icon is provided, then the *AppList* shall point to the same icon URL as the owner application.

The *AppCertificateURL* of actions originating entries in the *AppList* shall point to the same URL as the owner application.

When launching an application action of type 'Variant', the MirrorLink Server shall supply the launch point with the details of the action being triggered.

Application actions share the same certification status as their parent applications, and can be created/updated and deleted at any time by an application. If this happens during a MirrorLink session and the modified actions are potentially affecting the UPnP Application Listing [4], A MirrorLink server shall inform a connected MirrorLink client of changes using the UPnP AppListUpdate evented variable [4].

Only applications whose certificate includes `"com.mirrorlink.commonapi.actions"` in their `<serviceList/>` are eligible to publish actions using this module.

Any applications can query the list of certified actions and invoke any action.

6.14.2 0x0C01 - Create Application Actions

Description: Informs the MirrorLink server about new actions supported by the application.

If called within a MirrorLink session, a MirrorLink Server shall inform a connected MirrorLink client of changes affecting the UPnP *AppList* [4] using the UPnP *AppListUpdate* evented variable [4]

Obligation: Mandatory

API Level: 2

Type: Set

Feature List:

Feature Name	Description	Type	Direction
Actions	A list of new actions supported by the application.	Action[]	Write
Success	True if all shortcuts where added successfully.	bool	Read

6.14.3 0x0C02 - Update Application Actions

Description: Informs the MirrorLink server about an update to an existing action registered by the application

If called within a MirrorLink session, a MirrorLink Server shall inform a connected MirrorLink client of changes affecting the UPnP *AppList* [4] using the UPnP *AppListUpdate* evented variable [4]

Obligation: Mandatory

API Level: 2

Type: Set

Feature List:

Feature Name	Description	Type	Direction
actions	A list of existing actions supported by the application that require an update.	Action[]	Write
success	True if all shortcuts where updated successfully.	bool	Read

6.14.4 0x0C03 - Retrieve Application Actions

Description: Retrieves all actions known to the MirrorLink Server for the calling application

Obligation: Mandatory

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
actions	A list of all actions supported by the application known to the server device	Action[]	Read

6.14.5 0x0C04 - Delete Application Actions

Description: Deletes known shortcuts for the calling application

If called within a MirrorLink session, a MirrorLink Server shall inform a connected MirrorLink client of changes affecting the UPnP *AppList* [4] using the UPnP *AppListUpdate* evented variable [4]

Obligation: Mandatory

API Level: 2

Type: Set

Feature List:

Feature Name	Description	Type	Direction
actions	A list of all actions to be deleted from the server device maintained list of actions supported by the application. Only the *actionID* is used to identify actions that shall be deleted	Action[]	Read

6.14.6 0x0C05 - Get Certified Actions

Description: Provides the actions identifier for any action registered by an application that can be launched to perform the required action type

The returned actions list shall be consistent with the result/input to UPnP Application Server Service *SetAllowedApplication* [4] if available

The returned actions list shall be consistent with any user facing application listing

Obligation: Conditional - Platform Support Available

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
actionType	The type of action that the calling application wishes to offload to another MirrorLink Certified application	Platform Dependent	Write
includeParkOnly	Flag, indicating, the list of applications available for the action type can include applications that are park only	Bool	Write

Feature Name	Description	Type	Direction
actions	The List of all MirrorLink Certified actions supporting the required action type within the current MirrorLink session. The *actionIDs* of the returned actions are system wide and can be used to invoke the actions, but cannot be used to update/delete actions of any 3rd party application, or the calling application itself	Action[]	Read
favoriteIndex	The index in the action list that is selected by the user as the default target for the action on the platform or -1 if none	Int16	Read

6.14.7 0x0C06 - Invoke Action

Description: Invoke an action registered by an application with the server device, may launch the application if not running already

Obligation: Conditional - Platform Support Available

API Level: 2

Type: Get

Feature List:

Feature Name	Description	Type	Direction
actionID	The system wide actionID of the action the calling application wishes to offload to another MirrorLink Certified application.	uint16	Write
parameters	An action specific parameter or set of parameters to be passed to the application executing the action.	Platform dependent	Write
success	True if the action was invoked successfully (false if the parent application could not be launched for example or refused the action or is not certified for the current context).	bool	Read

6.14.8 0x0C07 - Action Invoked Callback

Description: A MirrorLink Client or MirrorLink Aware application has launched an action previously published by the application

Obligation: Conditional - Platform Support Available

API Level: 2

Type: Callback

Feature List:

Feature Name	Description	Type	Direction
actionID	Identifier of the action as submitted by the application using the Create Action actions.	uint16	Read
Parameters	Parameter or set of Parameters passed by the invoking application.	Platform dependent	Read
isVoiceAction	Flag indicating that the server issued the action following a command voiced by the user.	bool	Read

7 Dictionary of MirrorLink Action Types

7.1 General

The MirrorLink Server shall recognize the following actions.

7.2 Variants

7.2.1 ACTION_VARIANT

Add a variant application launch point to the UPnP application listing [4].

7.3 Alarm and Timer

7.3.1 ACTION_SET_ALARM

Set an alarm for the desired time and date.

7.3.2 ACTION_SET_TIMER

Set a timer to expire after a length of time.

7.3.3 ACTION_DISMISS_ALARM

Dismiss an alarm.

7.3.4 ACTION_SNOOZE_ALARM

Snooze an alarm.

7.4 Telephony and Messaging

7.4.1 ACTION_DIAL

Dial a number.

7.4.2 ACTION_CALL

Call either a number or a contact.

7.4.3 ACTION_TEXT

Text a contact.

7.5 Media Playback

7.5.1 ACTION_PLAY_MEDIA

Play a particular media item.

7.5.2 ACTION_PLAY

Resume/Start playback of the current Media.

7.5.3 ACTION_PAUSE

Pause playback of the current Media.

7.5.4 ACTION_NEXT

Skip to the next track during Media Playback.

7.5.5 ACTION_PREVIOUS

Skip to the previous track during Media Playback.

7.5.6 ACTION_SHUFFLE

Set the current Media Playback mode to shuffle and resume playback.

7.5.7 ACTION_REPEAT

Set the current Media Playback mode to repeat and resume playback.

7.5.8 ACTION_MUTE

Mute the current audio.

7.6 Application Launching

7.6.1 ACTION_OPEN_APPLICATION

Open a MirrorLink Application.

7.7 Response to Voice-Based Notifications

7.7.1 ACTION_RESPONSE_YES

Correspond to a positive answer from the user.

7.7.2 ACTION_RESPONSE_NO

Correspond to a negative answer from the user.

7.7.3 ACTION_RESPONSE_FREE_FORM_SPEECH

Correspond to a free form answer from the user that shall be tokenized by the MirrorLink Server before being passed back to the application.

7.4.4 ACTION_RESPONSE_FREE_FORM_AUDIO

Correspond to a free from answer, limited in length, from the user that shall be passed back to the application in the form of raw PCM data

7.8 Miscellaneous

7.8.1 ACTION_CREATE_NOTE

Create a note.

7.9 MirrorLink Home Screen

7.9.1 ACTION_MIRRORLINK_HOME_SCREEN

Bring up or return to the MirrorLink Home Screen, or if not present, return to the MirrorLink Client using `"Switch to native UI"` context information.

7.9.2 ACTION_MIRRORLINK_APP_LIST

Bring up the Application Listing/Launching functionality of the MirrorLink Home Screen, or if not present, return to the MirrorLink Client using `"Switch to native UI"` context information as specified in [6].

7.9.3 ACTION_MIRRORLINK_MUSIC

Equivalent to launching the preferred media playback functionality of the MirrorLink Server or if not present, equivalent to receiving the *Multimedia_Play* keycode from the MirrorLink Client.

8 Voice Supported Actions Grammar

8.1 General

MirrorLink Voice Supported Actions shall let users quickly complete tasks in MirrorLink application using voice commands. MirrorLink Servers supporting a MirrorLink accessible voice recognition engine shall translate a user's voice requests seamlessly so that they lead directly to the relevant MirrorLink application.

To do so, a MirrorLink Server shall recognize a standard set of spoken action requests and triggers MirrorLink Application using the Action Manager Module. Applications like a Media Player or a Dialer can then receive these actions and perform the requested operation.

Furthermore, as a MirrorLink application starts being handled using voice, there might be times when the application would like to ask the user a follow-up question before performing the requested operation. For example, when a user launches a Media Player application by saying "play some music", the application may want to ask the user "what artist?" Or when a taxi reservation application hears the user says, "book a cab", it might want to ask, "where to?" By working with the Notifications module *SendVoiceNotification* API, an application can ask follow-up questions like these.

Standard MirrorLink Voice Actions should be documented using the [1] JSPEECH Grammar Format published by W3C and the English language as a target. This grammar shall encompass any language supported by the MirrorLink Server Voice Recognizer. MirrorLink Servers should make use of a dedicated MirrorLink Language Model to further improve the quality of the user experience.

Voice recognition and Text to Speech shall be supported for the major languages spoken in each target market of the MirrorLink Server.

8.2 Sample JSPEECH grammar

This clause provides a sample grammar for a subset of actions that are supported for the voice-based interaction.

When multiple recognition patterns (e.g. for localization purposes) are available for an action type, tags shall be used to uniquely identify the action that should result from a successful speech recognition session.

```
#JSGF V1.0;
import <com.vendor.freeformspeech.speech>
grammar com.mirrorlink.commonapi.voiceactions;
public <action_response_yes> = (yes | sure) {action_response_yes};
public <action_response_no> = (no | nope){action_response_no};
public <action_reponse_free_form_speech> = <com.vendor.freeformspeech.speech>
{action_response_free_form_speech};
public <set> = set;
public <snooze> = snooze;
public <launch> = (open | launch);
public <action_set_alarm> = <tbd> {action_set_alarm};
public <action_set_timer> = <tbd>{action_set_time};
public <action_dismiss_alarm> = <tbd> {action_dismiss_alarm};
public <action_snooze_alarm> = <tbd> {action_snooze_alarm};
public <action_dial> = <tbd> {action_dial};
public <action_call> = <tbd> {action_call};
public <action_text> = <tbd>{action_text};
public <action_play_media> = <tbd> {action_play_media};
public <action_play> = <tbd> {action_media_play};
public <action_pause> = <tbd> {action_media_pause};
public <action_next> = <tbd> {action_media_next};
public <action_previous> = <tbd> {action_media_previous};
public <action_shuffle> = <tbd> {action_media_shuffle};
public <action_repeat> = <tbd> {action_repeat};
public <action_mute> = <tbd> {action_mute};
public <action_open_application> = <tbd> {action_open_application};
public <action_create_note> = <tbd>{action_create_note};
```

9 Theory of Operations

9.1 Notifications

9.1.1 Send Client-based Notification

A MirrorLink applications, intending to send a notification to get attention from the consumer, while in case the MirrorLink application is currently not in the foreground on the MirrorLink Client's screen, can send a notification, following message flow in Figure 6.

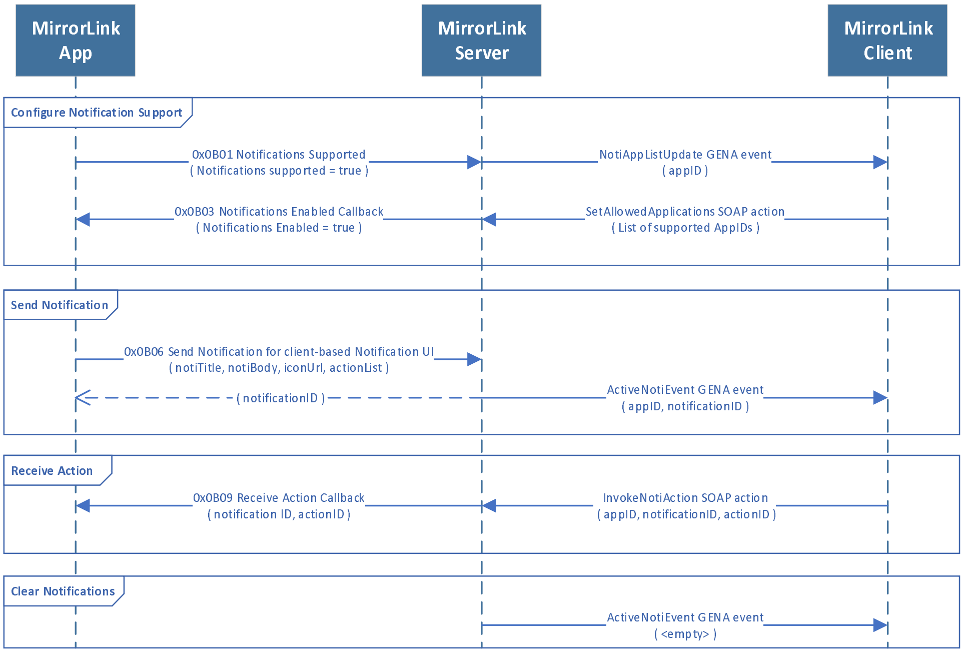
MirrorLink App
MirrorLink Server
MirrorLink Client
Configure Notification Support
0x0B01 Notifications Supported (Notifications supported = true)
NotiAppListUpdate GENA event (appID)
0x0B03 Notifications Enabled Callback (Notifications Enabled = true)
SetAllowedApplications SOAP action (List of supported AppIDs)
Send Notification
0x0B06 Send Notification for client-based Notification UI (notiTitle, notiBody, iconUrl, actionList)
(notificationID)
ActiveNotiEvent GENA event (appID, notificationID)
Receive Action
0x0B09 Receive Action Callback (notification ID, actionID)
InvokeNotiAction SOAP action (appID, notificationID, actionID)
Clear Notifications
ActiveNotiEvent GENA event (<empty>)

Figure 6: Message Flow for Client-Based Notification

9.1.2 Cancel Notification

A MirrorLink application, intending to cancel an outstanding notification, will follow the message flow depicted in Figure 7.

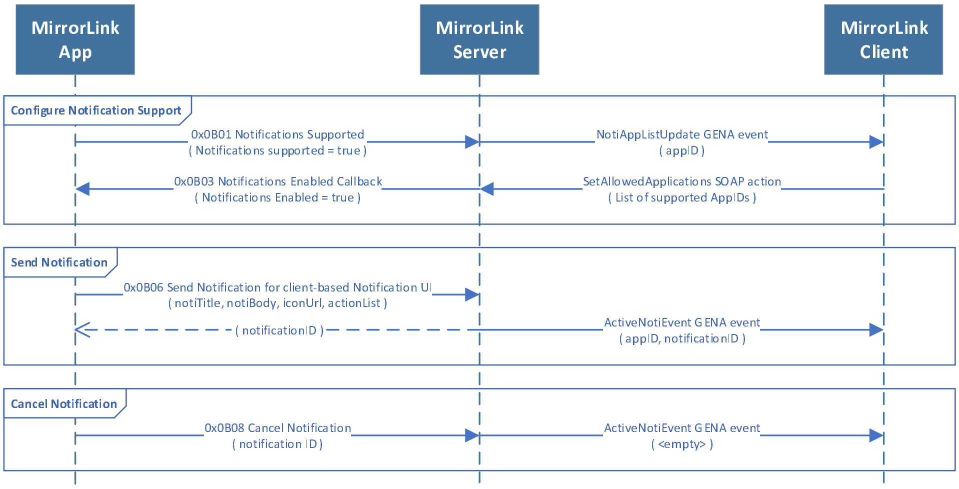
MirrorLink App
MirrorLink Server
MirrorLink Client
Configure Notification Support
0x0B01 Notifications Supported (Notifications supported = true)
NotiAppListUpdate GENA event (appID)
0x0B03 Notifications Enabled Callback (Notifications Enabled = true)
SetAllowedApplications SOAP action (List of supported AppIDs)
Send Notification
0x0B06 Send Notification for client-based Notification UI (notiTitle, notiBody, iconUrl, actionList)
(notificationID)
ActiveNotiEvent GENA event (appID, notificationID)
Cancel Notification
0x0B08 Cancel Notification (notification ID)
ActiveNotiEvent GENA event (<empty>)

Figure 7: Message Flow to Cancel a Notification

9.1.3 Replace Notification

A MirrorLink application, intending to replace an outstanding notification, will follow the message flow depicted in Figure 8.

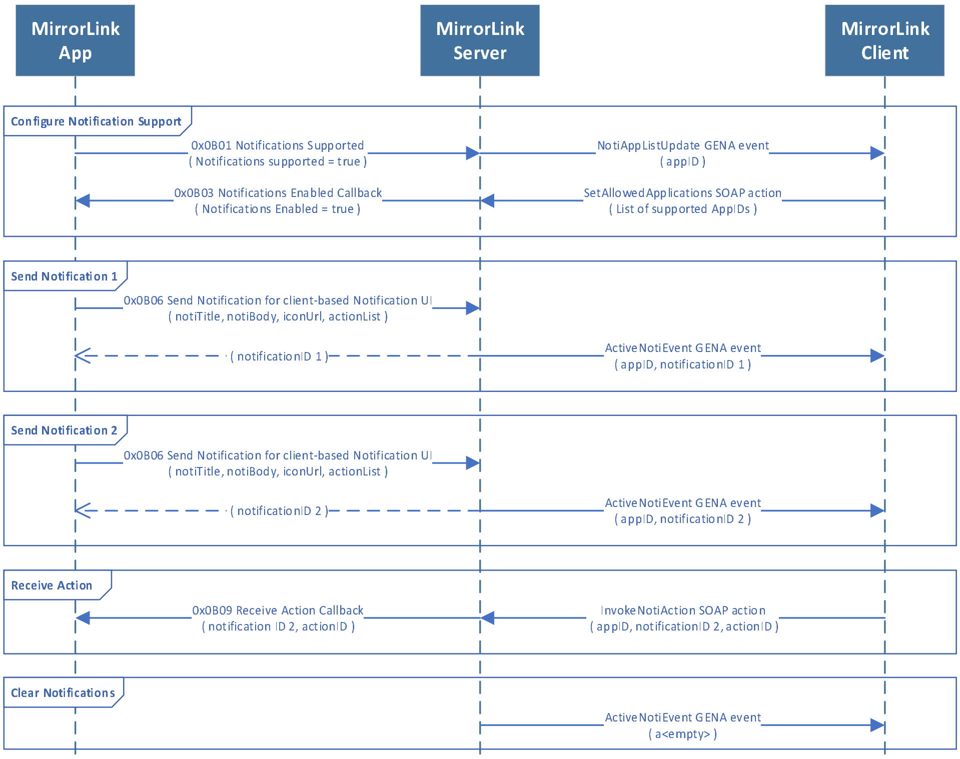
MirrorLink App
MirrorLink Server
MirrorLink Client
Configure Notification Support
0x0B01 Notifications Supported (Notifications supported = true)
NotiAppListUpdate GENA event (appID)
0x0B03 Notifications Enabled Callback (Notifications Enabled = true)
SetAllowedApplications SOAP action (List of supported AppIDs)
Send Notification 1
0x0B06 Send Notification for client-based Notification UI (notiTitle, notiBody, iconUrl, actionList)
(notificationID 1)
ActiveNotiEvent GENA event (appID, notificationID 1)
Send Notification 2
0x0B06 Send Notification for client-based Notification UI (notiTitle, notiBody, iconUrl, actionList)
(notificationID 2)
ActiveNotiEvent GENA event (appID, notificationID 2)
Receive Action
0x0B09 Receive Action Callback (notification ID 2, actionID)
InvokeNotiAction SOAP action (appID, notificationID 2, actionID)
Clear Notifications
ActiveNotiEvent GENA event (a<empty>)

Figure 8: Message Flow to Replace a Notification from the same Application

A MirrorLink application can cancel the old notification, prior sending the new notification. This will cause the MirrorLink Server to cancel the notification with the MirrorLink Client though, which can cause the MirrorLink Client to briefly switch back to its native user interface before processing the new notification.

9.1.4 Process Multiple of Notifications from different Applications

In case notifications are send from multiple applications simultaneously, the MirrorLink will process them one-by-one in a first-come first-serve order, following the message flow depicted in Figure 9. The MirrorLink Server will store received notifications, in case another notification is already pending. The MirrorLink application will not need to resend the notification.

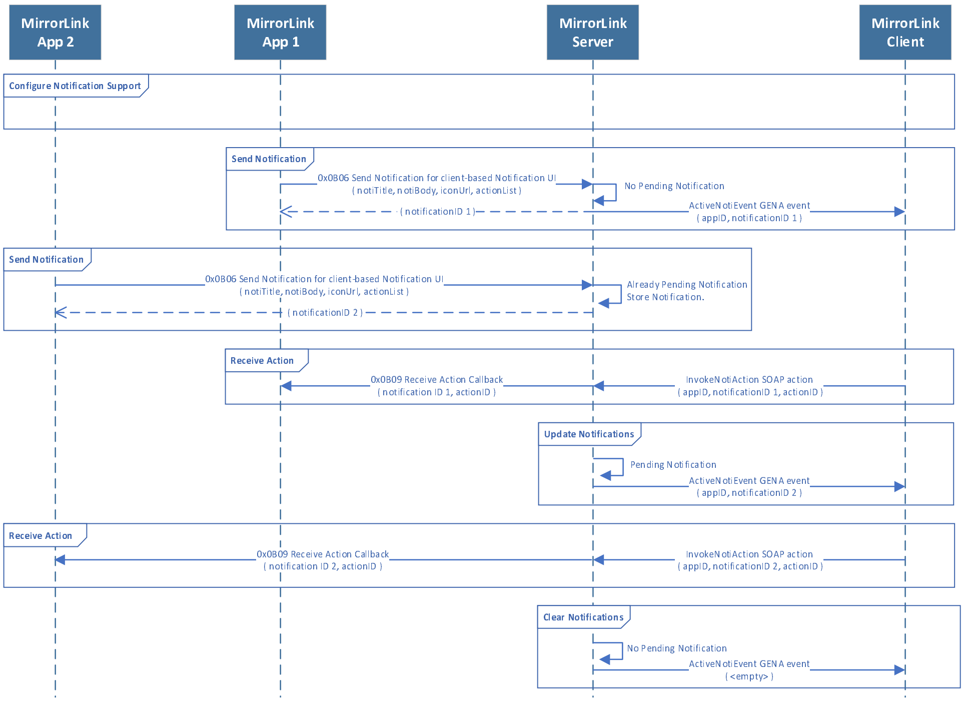
MirrorLink App 2
MirrorLink App 1
MirrorLink Server
MirrorLink Client
Configure Notification Support
Send Notification
0x0B06 Send Notification for client-based Notification UI
(notiTitle, notiBody, iconUrl, actionList)
No Pending Notification
(notificationID 1)
ActiveNotiEvent GENA event
(appID, notificationID 1)
Send Notification
0x0B06 Send Notification for client-based Notification UI
(notiTitle, notiBody, iconUrl, actionList)
Already Pending Notification
Store Notification.
(notificationID 2)
Receive Action
0x0B09 Receive Action Callback
(notification ID 1, actionID)
InvokeNotiAction SOAP action
(appID, notificationID 1, actionID)
Update Notifications
Pending Notification
ActiveNotiEvent GENA event
(appID, notificationID 2)
Receive Action
0x0B09 Receive Action Callback
(notification ID 2, actionID)
InvokeNotiAction SOAP action
(appID, notificationID 2, actionID)
Clear Notifications
No Pending Notification
ActiveNotiEvent GENA event
(<empty>)

Figure 9: Message Flow to Process Multiple Notifications from the different Applications

The MirrorLink application will cancel the notification, using 0x0B08, in case the notification is not valid anymore, e.g. due to a timeout.

Annex A (informative): Authors and Contributors

The following people have contributed to the present document:

Rapporteur:	Dr. Jörg Brakensiek, E-Qualus (for Car Connectivity Consortium LLC)
	Laurent Cremmer, RealVNC Limited
Other contributors:	Murali Soundararajan, Samsung
	Patrick Lünnemann, Carmeq (for Volkswagen AG)

History

Document history		
V1.3.0	October 2017	Publication
V1.3.1	October 2019	Publication