



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

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Foreword

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

The present document is part 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).

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1 Scope

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

The 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.

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

- [1] W3C: "JSpeech Grammar Format", available at <https://www.w3.org/TR/jsgf/>.
- [2] ETSI TS 103 544-22 (V1.3.0): "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, <http://tools.ietf.org/html/rfc2397> .

2.2 Informative references

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

- [i.1] ETSI TS 103 544-1 (V1.3.0): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 1: Connectivity".

3 Abbreviations

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

| | |
|------|---|
| ACMS | Application Certification Management System |
| BT | Bluetooth |
| ML | MirrorLink |

| | |
|------|------------------------------------|
| OCSP | Online Certificate Status Protocol |
| RFB | Remote Framebuffer |
| UPnP | Universal Plug and Play |
| USB | Universal Serial Bus |
| VNC | Virtual Network Computing |

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 this 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) |

| Data Type | Description |
|----------------------|---|
| | 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 according IEEE754-1985, single-precision Default: 0.0 |
| double | Data type representing a 64-bit floating point value according IEEE754-1985, double-precision 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: " " |
| <i>typeName</i> [] | Data type representing an array of values of type <i>typeName</i> . Default: Zero-length array |
| <i>structureName</i> | Data type representing the Structure <i>structureName</i> , as specified in Clause Definitions. Default: Default value for each element of the structure |
| <i>void*</i> | Pointer to a data structure Default: " 0x0 " |

The MirrorLink API does not intend to specify, how information provided the MirrorLink has to be used to fulfil driver distraction guidelines. This information is provided from driver distraction guideline documents 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 0xE- 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 0xE- 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 0xE- Structure Action

Table 4: Structure Action

| Feature Name | Description | Type | API Level |
|--------------|---|--------------------|-----------|
| actionID | Action identifier; shall be non-zero. The <i>actionID</i> 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. (ACTION_CREATE_SHORTCUT, ACTION_CALL, ACTION_MAP, ACTION_ROUTE etc.) | Platform dependent | 2+ |

5.4 0xE- 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 - 0x0C06 | 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. I.e. some MirrorLink application may use API level 1, while others use a different API level. The

MirrorLink Sever behaviour, in case an application is using an API level bigger than supported by the MirrorLink Sever, 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 0xF- 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 0xF- 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 0xF- 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 0x- 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 0x- 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 0x- MirrorLink Client Manufacturer and Model Information

Description: Provided MirrorLink client manufacturer and model information, as received through the UPnP Client Profile Service; 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 0x- 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 0x- 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+

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 following driver distraction ruling, as set force for CCC drive-certification | bool | Read |

6.3.6 0x- MirrorLink Client Driver Distraction Information

Description: Provided driver distraction regulation support information of MirrorLink Client, as received through the UPnP Client Profile Service; 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 is 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 0x- 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 0x- MirrorLink Client Character Set Support

Description: Provided MirrorLink Client Character Set information, as received through the UPnP Client Profile Service; 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 0x- 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; 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 MirrorLink 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 clients 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 clients 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; 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 0x- MirrorLink Server Manufacturer and Model Information

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

Obligation: Mandatory

API Level 2

Type: Get

Feature List:

| Feature Name | Description | Type | Direction |
|-------------------|--|---------|-----------|
| Server Identifier | Identifier of the MirrorLink server (UPnP Device UDN) | 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 as a certified application. | bool | Read |

6.4.2 0x- 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 0x- 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 0x- 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 |
| 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 0x- 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.

Determining if each application is in turned advertised as certified to the MirrorLink 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 hold a valid CCC application certificate | Platform dependent | Read |

6.4.6 0x- 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. 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 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 if used by the MirrorLink Client within an established MirrorLink connection.

The returned Application Certification Statuses shall be consistent with any user facing application listing.

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 Certified App | Flag, indicating, whether the MirrorLink server has included the application into its UPnP advertisements as a 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 0x- 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 0x- 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 |
| 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 0x- Get Certified Applications List Changed Callback

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

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 hold a valid CCC application certificate | Platform dependent | read |

6.5 0x03xx - Connection Information

6.5.1 0x- 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 0x- 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 with a non-empty Client Profile string.
- MirrorLink Client sends the first UPnP Application Server service action.

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

- MirrorLink Clients sends a UPnP *SetClientProfile* action 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 0x- 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 |
| 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. | 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 0x- 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 |
| 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 0x- 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 0x- 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 the MirrorLink has to be used to fulfil driver distraction.

6.6.2 0x- 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, 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 |

| Feature Name | Description | Type | Direction |
|------------------------------|--|--------|-----------|
| 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 |
| 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 0x- 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 |

| Feature Name | Description | Type | Direction |
|------------------------------|--|--------|-----------|
| 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 |
| 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 |

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

6.7.3 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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, 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. | 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 0x- 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 0x- 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, 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 |
| Audio Content Category | Array of Application Categories for the Audio Content of the audio stream. | uint32[] | Write |

| Feature Name | Description | Type | Direction |
|-----------------|---|------|-----------|
| | <p>Array shall be sorted in priority order. Top priority is at position [0].</p> <p>Setting the value to a Zero pointer will reset the audio content category to the value provided in the UPnP application advertisement.</p> <p>The following audio content categories are defined:</p> <ul style="list-style-type: none"> • "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; | | |
| Handle Blocking | <p>Flag, whether the application will take care of the blocking, in case the MirrorLink Client blocks the content.</p> <p>MirrorLink certified applications shall handle audio blocking, 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 CCC-TS-056).</p> <p>MirrorLink Servers may ignore the provided value.</p> | 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 0x- 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 [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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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 0x- 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. The APIs cannot be used to implement a data service provided from the MirrorLink Server.

6.12.2 0x0A- 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 0x0A- 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 0x0A- 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

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 each service for which it supports application registering as a source in its `ServicesSupported` CDB response, regardless of MirrorLink applications advertising support for it being available.

The MirrorLink Server shall respond to a StartService request originating from a Sink on the MirrorLink Client with a successful ServiceResponse message even if no Application has called Register to a Service for this particular source yet.

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 <i>asSource</i> is equal to true. Defaults to false for API Level 1. | bool | Write |

6.12.5 0x0A- Register to a Service Callback

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

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 |

6.12.6 0x0A- Unregister from a Service

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

Obligation: Conditional - Data Services Module available

API Level 1+

Type: Set

Feature List:

| Feature Name | Description | Type | Direction |
|--------------|--------------------|--------|-----------|
| Service ID | Service identifier | uint16 | Write |

6.12.7 0x0A- 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 0x0A- 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 0x0A- 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 0x0A- 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).

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. If no application has registered to the service, the server shall respond with 0x1000000E (Not available - The data is currently unavailable for writing).

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 translate into an occurrence of this callback, with the *updateOnChange* parameter set to `false`, unless there exists a subscription for this object already.
- A MirrorLink Client SUBSCRIBE request translate into a single occurrence of this callback, with the *updateOnChange* parameter set to `true`.

- A MirrorLink Client CANCEL request translate into an occurrence of this callback with the *updateOnChange* parameter set to *false*.

If *updateOneChange* is *true*, then the application shall start providing updated version 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 |
| 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 |

6.13 0x0Bxx - Notifications

6.13.1 0x0B- Notifications Supported

Description: Indicate support for UPnP notifications 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 0x0B- 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 0x0B- 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 0x0B- 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 |

| 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. | string | Read |
| Supported Actions | List of action types supported by voice interactions | string[] | Read |

6.13.5 0x0B- 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 |
| 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. | string | Read |
| Supported Actions | List of action types supported by voice interactions | string[] | Read |

6.13.6 0x0B- Send Notification for client-based Notification UI

Description: Send a notification from the application; this notification replaces a previously send notification.

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. <i>iconUrl</i> 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 0x0B- Send Notification for VNC-based Notification UI

Description: Send a notification from the application; this notification replaces a previously send notification.

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 0x0B- 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 0x0B- 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 <ul style="list-style-type: none"> 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 a previously send notification. Result 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 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) | string8 | 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 |

6.13.11 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) | 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 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, A MirrorLink server shall inform a connected MirrorLink client of changes using the UPnP *AppListUpdate* evented variable.

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 0x0C - 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* using the UPnP *AppListUpdate* evented variable.

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 0x0C- 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* using the UPnP *AppListUpdate* evented variable.

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 were updated successfully | bool | Read |

6.14.4 0x0C- 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 0x0C- 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* using the UPnP *AppListUpdate* evented variable.

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 <i>actionID</i> is used to identify actions that shall be deleted | Action[] | Read |

6.14.6 0x0C- 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* 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 |
| actions | The List of all MirrorLink Certified actions supporting the required action type within the current MirrorLink session. The <i>actionIDs</i> 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 3 rd 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 0x0C- 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 0x0C- 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

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

7.6.2 Response to Voice-Based Notifications

7.6.3 ACTION_RESPONSE_YES

Correspond to a positive answer from the user.

7.6.4 ACTION_RESPONSE_NO

Correspond to a negative answer from the user.

7.6.5 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.

7.6.6 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

7.7 Miscellaneous

7.7.1 ACTION_CREATE_NOTE

Create a note.

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> = <tbid> {action_set_alarm};
public <action_set_timer> = <tbid> {action_set_time};
public <action_dismiss_alarm> = <tbid> {action_dismiss_alarm};
public <action_snooze_alarm> = <tbid> {action_snooze_alarm};
public <action_dial> = <tbid> {action_dial};
public <action_call> = <tbid> {action_call};
public <action_text> = <tbid> {action_text};
public <action_play_media> = <tbid> {action_play_media};
public <action_play> = <tbid> {action_media_play};
public <action_pause> = <tbid> {action_media_pause};
public <action_next> = <tbid> {action_media_next};
public <action_previous> = <tbid> {action_media_previous};
public <action_shuffle> = <tbid> {action_media_shuffle};
public <action_repeat> = <tbid> {action_repeat};
public <action_mute> = <tbid> {action_mute};
public <action_open_application> = <tbid> {action_open_application};
public <action_create_note> = <tbid> {action_create_note};
```

Annex A (informative): Authors and Contributors

The following people have contributed to the present document:

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History

| Document history | | |
|-------------------------|--------------|-------------|
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