Car Connectivity Consortium
MirrorLink®

UPnP Server Device

Version 1.2.3
(CCC-TS-062)

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1 **Contents**

1 # **List of Tables**

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1. Overview and Scope

2   This device template is compliant with the Universal Plug and Play Architecture, Version 1.0 [1].

3   This document defines the device

4   urn:schemas-upnp-org:device:*TmServerDevice:1*.

5   This device can be a UPnP root device or embedded within a different device.

6   The *TmServerDevice* encapsulates all services for the MirrorLink UPnP Server Device Control Protocol
7   (DCP).

8   Requirements within this specification are valid for MirrorLink 1.1 and MirrorLink 1.2 versions, unless
9   otherwise noted.

10   • Requirements, valid for MirrorLink 1.1 only, are highlight like this.
11   • Requirements, valid for MirrorLink 1.2 only, are highlight like this.

12   The specification lists a series of requirements, either explicitly or within the text, which are mandatory
13   elements for compliant solutions. Recommendations are given, to ensure optimal usage and to provide
14   suitable performance. All recommendations are optional.

15   The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD",
16   "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are following the
17   notation as described in RFC 2119 [1].

18   • MUST: This word, or the terms "REQUIRED" or "SHALL", means that the definition is an absolute
19   requirement of the specification.

20   • MUST NOT: This phrase, or the phrase "SHALL NOT", means that the definition is an absolute
21   prohibition of the specification.

22   • SHOULD: This word, or the adjective "RECOMMENDED", means that there may exist valid
23   reasons in particular circumstances to ignore a particular item, but the full implications must be
24   understood and carefully weighed before choosing a different course.

25   • SHOULD NOT: This phrase, or the phrase "NOT RECOMMENDED" means that there may exist
26   valid reasons in particular circumstances when the particular behavior is acceptable or even useful,
27   but the full implications should be understood and the case carefully weighed before implementing
28   any behavior described with this label.

29   • MAY: This word, or the adjective "OPTIONAL", means that an item is truly optional. One vendor
30   may choose to include the item because a particular marketplace requires it or because the vendor
31   feels that it enhances the product while another vendor may omit the same item. An implementation
32   which does not include a particular option MUST be prepared to interoperate with another
33   implementation which does include the option, though perhaps with reduced functionality. In the
34   same vein an implementation which does include a particular option MUST be prepared to
35   interoperate with another implementation which does not include the option (except, of course, for
36   the feature the option provides.)

37

2. Device Definitions

2.1. Device Type

The following device type identifies a device that is compliant with this template:

urn:**schemas-upnp-org:device**:*TmServerDevice:1*

We herein refer to this device in this document as *TmServerDevice*.

2.2. Device Model

The following table briefly describes the services used in *TmServerDevice*.

Table 1: TmServerDevice Service Descriptions

Service Name	Service Description
TmApplicationServer	Allows for discovery and remote control of applications.
TmClientProfile	Allows MirrorLink UPnP Control Point to specify its preferences, settings and capabilities.
TmNotificationServer	Allows MirrorLink UPnP Server to send notification events

Products that expose devices of the type **urn:schemas-upnp-org:device:***TmServerDevice:1* MUST implement minimum version numbers of all required embedded devices and services specified in the table below.

Table 2: Device Requirements for TmServerDevice

DeviceType	Root	Req. or Opt.[1]	ServiceType	Req. or Opt.[1]	Service ID[2]
TmServerDevice:1	Yes	R	*TmApplicationServer:1*	R	*TmApplicationServer*
			TmClientProfile:1	R	*TmClientProfile*
			TmNotificationServer:1	O	*TmNotificationServer*

[1] R = Required, O = Optional.

[2] Prefixed by urn:**upnp-org**:**serviceId**: .

2.2.1. Relationship Between Services

Figure 1 shows the logical structure of the device and the encapsulated services which provide MirrorLink capabilities.

The TmClientProfile service provides a way for the MirrorLink UPnP Control Point to notify the MirrorLink Server device about its preferences, capabilities and desired settings (i.e. client profile). This information can then be utilized by other services hosted by the MirrorLink Server device such as the TmApplicationServer service.

The TmApplicationServer service provides a way for the MirrorLink UPnP Control Point to remotely control and access applications on the MirrorLink Server device.

The TmNotificationServer service provides a way for the MirrorLink UPnP Server to notify the MirrorLink UPnP Control Point on application notification events.
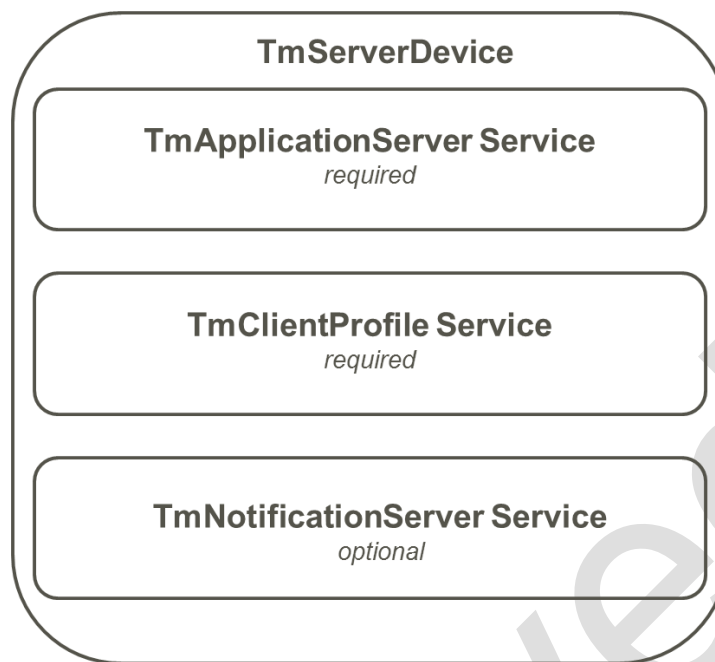
Figure 1: Relationship between TmServerDevice and services

2.3. Theory of Operation

TmServerDevice provides mechanisms which enable MirrorLink UPnP Control Points to discover and access MirrorLink services.

Table 3 lists the attributes which are part of the TmServerDevice and specified as extensions to the standard UPnP Device XML schema.

Table 3: Extended Attributes for TmServerDevice

Element	Description	Parent	Availability
X_mirrorLink Version	MirrorLink Server Version Note: If the version information is missing, the MirrorLink Client MUST assume a version 1.0 MirrorLink Server.	device	Mandatory
majorVersion	MirrorLink Server Major Version A_ARG_TYPE_Int	X_mirrorLink Version	Mandatory
minorVersion	MirrorLink Server Minor Version A_ARG_TYPE_Int	X_mirrorLink Version	Mandatory
X_connectivity	Connectivity settings	device	Optional
bluetooth	Bluetooth settings of device	X_connectivity	Optional
bdAddr	Bluetooth MAC address (BD_ADDR). Indicates device support for Bluetooth on the device. (A UTF-8 encoded string representing an unsigned 48-bit integer in hexadecimal format (without any '0x' prefix).)	bluetooth	Mandatory
startConnection	A_ARG_TYPE_Bool	bluetooth	Optional

Element	Description	Parent	Availability
	Bluetooth Connection will be initiated from device. **Default**: `true`		
wifi	WiFi settings of the device	X_connectivity	Optional
macAddr	WiFi MAC address (A UTF-8 encoded string representing an unsigned 48-bit integer in hexadecimal format (without any "`0x`" prefix, and without any grouping using "`:`", "`.`" or "`-`")	wifi	Mandatory
ssid	Service Set Identifier (SSID), Base64 encoded (A_ARG_TYPE_String)	wifi	Optional
roles	Comma separated list of supported roles. Allowed values are • `AP` (Access Point role) • `Client` (Client role) • `P2P` (Infrastructure-less) (A_ARG_TYPE_String) **Default**: `AP,Client,P2P`	wifi	Optional
protectionList	List of WiFi access protection	wifi	Optional
protection*	Access protection	protectionList	Optional
protocol	Security protocol used to protect WiFi access. Allowed values are • `WEP` • `WPA` • `WPA2` • `WPS` Note: WEP/WPA is listed for legacy reasons, and SHOULD NOT be used (A_ARG_TYPE_String)	protection	Mandatory
passkey	Passkey/Shared key, Base64 encoded MUST be left empty, if transmitted over an unprotected or shared transport channel (e.g. WiFi) (A_ARG_TYPE_String)	protection	Mandatory
X_deviceKeys	Defines device specific physical hard keys which MAY be replicated on the client side	device	Optional
key*	Defines a device specific key	X_deviceKeys	Optional
name	Short name of the key; to be used, if icon is not available or shown (A_ARG_TYPE_String)	key	Mandatory
mandatory	Flag, whether the key is mandatory to ensure minimum functionality of the device Deprecated; MirrorLink Client MUST use default value. (A_ARG_TYPE_Bool) **Default**: `false`	key	Optional
symbolValue	Key's symbol hexadecimal value	key	Mandatory

Element	Description	Parent	Availability
	(A UTF-8 encoded string representing an unsigned 32-bit integer in hexadecimal format (with '0x' prefix).)		
icon*	Describes an icon representing the key	key	Optional
mimetype	Type of icon image	icon	Mandatory
width	Width of icon (A_ARG_TYPE_INT)	icon	Mandatory
height	Height of icon (A_ARG_TYPE_INT)	icon	Mandatory
depth	Color depth of icon (A_ARG_TYPE_INT)	icon	Mandatory
url	Url to icon (A_ARG_TYPE_URI)	icon	Mandatory
X_Signature	XML signature over entire contents of the root element. This is done as specified in [4]. The key used in calculating the signature MUST be the private part of the application-specific key which public part was bound to the attestation of UPnP-Server component. (The public part can be used to verify the signature.) The Reference element of the XML signature MUST be empty. The SignatureMethod MUST be RSA with SHA1. The KeyInfo element MAY be omitted. The mechanism for generation, exchange and maintenance of keys is out of scope for this specification.	device	Mandatory
X_presentations	Presentation protocols supported from the MirrorLink Server. (MirrorLink 1.2)	device	Optional
presentation	Comma-separated list of presentation protocols supported from the MirrorLink Server. • hsml • wfd • vncu • vncw • html (A_ARG_TYPE_String) **Default**: "vncu"	X_presentations	Mandatory
X_localization	Provide information about the localization support from the MirrorLink Server.	device	Optional
characterSet	Comma-separated list of entry points into the UniCode Character Code Charts, which are supported from the MirrorLink Server device. (UTF-8 encoded string; each entry point is given in hexadecimal format (with "0x" prefix).	X_localization	Mandatory

1   The elements marked with an (*) can have multiple instances.

1   The MirrorLink Client SHOULD validate the XML signature, after having received the UPnP session key as
2   part of the Device Attestation Protocol.

3   Keys listed in the X_deviceKeys section, MAY include X11 keys as well as ITU, knob, device, multimedia
4   and function keys as defined in [3]. Keys listed MAY include keys not specified in [2]. All keys listed MUST
5   be accessible at all times on the MirrorLink Server device, either as hard (i.e. physical) or as soft buttons.

6   If the MirrorLink Server has a Bluetooth module, the MirrorLink Server MUST provide a Bluetooth MAC
7   address (bdAddr), even if that module is not used within a potential MirrorLink connection.

8   The MirrorLink Server SHOULD provide information about its localization support with respect to the
9   support of foreign language character sets. In case the information is provided, the MirrorLink Server MUST
10   include all supported character sets, as defined by the UniCode Character Code Chart given by the provided
11   entry point, specified in [5][1]. A MirrorLink Server MUST support all characters from a listed Code Chart. A
12   MirrorLink Server MUST support at least Basic Latin (ASCII), which is defined by the Character Code Chart
13   entry 0x0000.

14   XSD format descriptions are given in Appendix A.

15   2.3.1. XML Signature Minimum Set

16   The MirrorLink Server MUST sign the Device XML.

17   Signatures MUST follow W3C's recommendation on XML signing, as specified in [4]. The W3C
18   recommendation contains many optional elements for handling the different aspects of the XML signing. In
19   order to reduce the complexity, the following requirements MUST be followed for MirrorLink Server and
20   Client devices.

21   •   The **Reference URI** MUST be empty.

22   •   MirrorLink Server MUST NOT use XPath or XSLT **XML transformations**

23   •   The MirrorLink Server MUST use **Canonical method** XML version 1.0 (`xml-c14n` or `xml-`
24   `exc-c14n`) or 1.1 (`xml-c14n11`); Canonical XML version 2.0 or later MUST NOT be used.

25   •   The MirrorLink Server MUST use SHA-1 **digest method**; other digest methods MUST NOT be
26   used.

27   •   The MirrorLink Server MUST use RSA-SHA1 **signature method**; other signature methods, like
28   HMAC-SHA1 or DSA-SHA1, MUST NOT be used

29   •   The MirrorLink Client MUST NOT use the **KeyInfo** element to identify a public key to verify the
30   signature; it MUST use the `applicationPublicKey` element obtained from the DAP
31   `attestationResponse`, for the `TerminalMode:UPnP-Server` component instead.

32

---

[1] The Unicode code charts define a range for the respective code. The entry point is defined as the first value within that given range. E.g. Basic Latin (ASCII) has a range of 0x0000 - 0x007F. Therefore its entry point is 0x0000.

3. XML Device Description

When processing XML, MirrorLink Clients MUST ignore any unknown elements and their sub elements or content and any unknown attributes and their values. MirrorLink Clients MUST NOT expect any particular order of XML elements located at the same level of the XML tree, unless specifically mandated (e.g. via xs:sequence). MirrorLink Client MUST understand xml namespace as specified in W3C "Namespaces in XML 1.0".

The MirrorLink Server MUST provide a well-formed XML and a correct parent children relationship of xml elements and correct xml namespaces URI for each element. If the MirrorLink Server provides MirrorLink extension elements (X_...) then those elements SHOULD be valid according their XSD provided in Appendix A. If the MirrorLink Server declares conformance to UPnP DA 1.1 in the specVersion element then it MUST provide XML Device Description that is valid according to XSD presented in Appendix A. Otherwise the MirrorLink Server SHOULD provide XML Device Description that is valid according to XSD presented in Appendix A.

The MirrorLink Client SHOULD be as permissive as possible when consuming XML.

As a general recommendation for better interoperability, the MirrorLink Servers SHOULD use the order of XML elements presented in the listing below, and declare XML namespaces as default to allow interoperability with Clients without XML namespaces support. MirrorLink Servers SHOULD add any element unspecified below after the specified ones and put it in a namespace that isn't specified below. MirrorLink Clients SHOULD be able to handle elements in wrong or any xml namespace if the element wasn't found in the correct one.

```xml
<?xml version="1.0"?>
<root xmlns="urn:schemas-upnp-org:device-1-0">
    <specVersion>
        <major>1</major>
        <minor>0</minor>
    </specVersion>
    <URLBase>base URL for all relative URLs</URLBase>
    <device>
        <deviceType>
            urn:schemas-upnp-org:device:TmServerDevice:1
        </deviceType>
        <friendlyName>short user-friendly title</friendlyName>
        <manufacturer>manufacturer name</manufacturer>
        <manufacturerURL>URL to manufacturer site</manufacturerURL>
        <modelDescription>long user-friendly title</modelDescription>
        <modelName>model name</modelName>
        <modelNumber>model number</modelNumber>
        <modelURL>URL to model site</modelURL>
        <serialNumber>manufacturer's serial number</serialNumber>
        <UDN>uuid:UUID</UDN>
        <UPC>Universal Product Code</UPC>
        <iconList>
            <icon>
                <mimetype>image/format</mimetype>
                <width>horizontal pixels</width>
                <height>vertical pixels</height>
                <depth>color depth</depth>
                <url>URL to icon</url>
            </icon>
        </iconList>
        <serviceList>
            <service>
                <serviceType>
```

```
1                    urn:schemas-upnp-org:service:TmApplicationServer:1
2               </serviceType>
3               <serviceId>
4                  urn:upnp-org:serviceId:TmApplicationServer1
5               </serviceId>
6               <SCPDURL>URL to service description</SCPDURL>
7               <controlURL>URL for control</controlURL>
8               <eventSubURL>URL for eventing</eventSubURL>
9            </service>
10           <service>
11              <serviceType>
12                 urn:schemas-upnp-org:service:TmClientProfile:1
13              </serviceType>
14              <serviceId>
15                 urn:upnp-org:serviceId:TmClientProfile1
16              </serviceId>
17              <SCPDURL>URL to service description</SCPDURL>
18              <controlURL>URL for control</controlURL>
19              <eventSubURL>URL for eventing</eventSubURL>
20           </service>
21           <service>
22              <serviceType>
23                 urn:schemas-upnp-org:service:TmNotificationServer:1
24              </serviceType>
25              <serviceId>
26                 urn:upnp-org:serviceId:TmNotificationServer1
27              </serviceId>
28              <SCPDURL>URL to service description</SCPDURL>
29              <controlURL>URL for control</controlURL>
30              <eventSubURL>URL for eventing</eventSubURL>
31           </service>
32        </serviceList>
33        <presentationURL>URL for presentation</presentationURL>
34        <X_connectivity xmlns="urn:schemas-carconnectivity-org:ml-1-0">
35           <bluetooth>
36              <bdAddr>
37                 Bluetooth MAC address of server device as a string
38                 representing a 48 bit number in hexadecimal format
39                 (without any 0x prefix).
40                 If this value is populated then it means that the
41                 device supports Bluetooth communication
42              </bdAddr>
43              <startConnection>
44                 Indicates that server device is able to initiate
45                 Bluetooth connection to client
46              </startConnection>
47           </bluetooth>
48           <wifi>
49              <macAddr>EF3456347AB7</macAddr>
50              <ssid>MirrorLinkServer_SSID_Example</ssid>
51              <protectionList>
52                 <protection>
53                    <protocol>WPA</protocol>
54                    <passkey>ALDFKJESKJFEILKSDFJE</passkey>
55                 </protection>
56              </protectionList>
57           </wifi>
58        </X_connectivity>
```

```
1          <X_deviceKeys xmlns="urn:schemas-carconnectivity-org:ml-1-0">
2             <key>
3                <name>Home</name>
4                <mandatory>true</mandatory>
5                <symbolValue>0x3000020D</symbolValue>
6                <icon>
7                   <mimetype>image/png</mimetype>
8                   <width>10</width>
9                   <height>10</height>
10                  <depth>16</depth>
11                  <url>homeIcon.png</url>
12               </icon>
13            </key>
14            <key>
15               <name>Call</name>
16               <symbolValue>0x30000200</symbolValue>
17               <icon>
18                  <mimetype>image/png</mimetype>
19                  <width>10</width>
20                  <height>10</height>
21                  <depth>16</depth>
22                  <url>callIcon.png</url>
23               </icon>
24            </key>
25         </X_deviceKeys>
26         <X_mirrorLinkVersion
27         xmlns="urn:schemas-carconnectivity-org:ml-1-1">
28            <majorVersion>1</majorVersion>
29            <minorVersion>1</minorVersion>
30         </X_mirrorLinkVersion>
31         <X_Signature xmlns="urn:schemas-carconnectivity-org:ml-1-1">
32            <Signature Id="deviceSignature"
33            xmlns="http://www.w3.org/2000/09/xmldsig#">
34               <SignedInfo>
35                  <CanonicalizationMethod
36                  Algorithm="http://www.w3.org/2006/12/xml-c14n11"/>
37                  <SignatureMethod Algorithm=
38                  "http://www.w3.org/2000/09/xmldsig#rsa-sha1"/>
39                  <Reference URI="">
40                     <Transforms>
41                        <Transform Algorithm=
42                        "http://www.w3.org/2006/12/xml-c14n11"/>
43                        <Transform Algorithm=
44                        "http://www.w3.org/2000/09/
45                        xmldsig#enveloped-signature"/>
46                     </Transforms>
47                     <DigestMethod Algorithm=
48                     "http://www.w3.org/2000/09/xmldsig#sha1"/>
49                     <DigestValue>
50                        dGhpcyBpcyBub3QgYSB
51                        zaWduYXR1cmUK...
52                     </DigestValue>
53                  </Reference>
54               </SignedInfo>
55               <SignatureValue>...</SignatureValue>
56            </Signature>
57         </X_Signature>
58      <X_presentations xmlns="urn:schemas-carconnectivity-org:ml-1-2">
```

```
1            <presentation>
2                vncu,hsml,wfd
3            </presentation>
4        </X_presentations>
5    </device>
6 </root>
7
```

4.   Test

No semantic tests are defined for this device.

5.   References

[1]   UPnP Forum, "UPnP Device Architecture 1.0", 24 April 2008, http://www.upnp.org

[2]   IETF, RFC 2119, "Keys words for use in RFCs to Indicate Requirement Levels", March 1997.
http://www.ietf.org/rfc/rfc2119.txt

[3]   Car Connectivity Consortium, "MirrorLink – VNC based Display and Control", Version 1.1, 2012.
CCC-TS-010.

[4]   W3C, "XML Signature Syntax and Processing (Second Edition)", W3C Recommendation, 10 June
2008. http://www.w3.org/TR/xmldsig-core/

[5]   Unicode Consortium, "Unicode 7.0 Character Code Charts", http://www.unicode.org/charts/

1 Appendix A – XSD Schema

2 Appendix A.1 – XSD Schema for UDA 1.1

```
3   <?xml version="1.0" encoding="UTF-8"?>
4   <xsd:schema targetNamespace="urn:schemas-upnp-org:device-1-0"
5    xmlns="urn:schemas-upnp-org:device-1-0"
6    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
7    xmlns:ml1-0="urn:schemas-carconnectivity-org:ml-1-0"
8    xmlns:ml1-1="urn:schemas-carconnectivity-org:ml-1-1"
9    xmlns:ml1-1="urn:schemas-carconnectivity-org:ml-1-2"
10   elementFormDefault="qualified">
11   <xsd:import schemaLocation="ml1-0.xsd"
12    namespace="urn:schemas-carconnectivity-org:ml-1-0"/>
13   <xsd:import schemaLocation="ml1-1.xsd"
14    namespace="urn:schemas-carconnectivity-org:ml-1-1"/>
15   <xsd:import schemaLocation="ml1-2.xsd"
16    namespace="urn:schemas-carconnectivity-org:ml-1-2"/>
17   <xsd:element name="root" type="rootType" />
18   <xsd:complexType name="deviceType">
19    <xsd:sequence>
20     <xsd:element name="deviceType">
21      <xsd:complexType>
22       <xsd:simpleContent>
23        <xsd:extension base="xsd:anyURI">
24         <xsd:anyAttribute namespace="##other" processContents="lax" />
25        </xsd:extension>
26       </xsd:simpleContent>
27      </xsd:complexType>
28     </xsd:element>
29     <xsd:element name="friendlyName">
30      <xsd:complexType>
31       <xsd:simpleContent>
32        <xsd:extension base="xsd:string">
33         <xsd:anyAttribute namespace="##other" processContents="lax" />
34        </xsd:extension>
35       </xsd:simpleContent>
36      </xsd:complexType>
37     </xsd:element>
38     <xsd:element name="manufacturer">
39      <xsd:complexType>
40       <xsd:simpleContent>
41        <xsd:extension base="xsd:string">
42         <xsd:anyAttribute namespace="##other" processContents="lax" />
43        </xsd:extension>
44       </xsd:simpleContent>
45      </xsd:complexType>
46     </xsd:element>
47     <xsd:element name="manufacturerURL" minOccurs="0">
48      <xsd:complexType>
49       <xsd:simpleContent>
50        <xsd:extension base="xsd:anyURI">
51         <xsd:anyAttribute namespace="##other" processContents="lax" />
52        </xsd:extension>
53       </xsd:simpleContent>
54      </xsd:complexType>
55     </xsd:element>
```

```
1      <xsd:element name="modelDescription" minOccurs="0">
2       <xsd:complexType>
3        <xsd:simpleContent>
4         <xsd:extension base="xsd:string">
5          <xsd:anyAttribute namespace="##other" processContents="lax" />
6         </xsd:extension>
7        </xsd:simpleContent>
8       </xsd:complexType>
9      </xsd:element>
10     <xsd:element name="modelName">
11      <xsd:complexType>
12       <xsd:simpleContent>
13        <xsd:extension base="xsd:string">
14         <xsd:anyAttribute namespace="##other" processContents="lax" />
15        </xsd:extension>
16       </xsd:simpleContent>
17      </xsd:complexType>
18     </xsd:element>
19     <xsd:element name="modelNumber" minOccurs="0">
20      <xsd:complexType>
21       <xsd:simpleContent>
22        <xsd:extension base="xsd:string">
23         <xsd:anyAttribute namespace="##other" processContents="lax" />
24        </xsd:extension>
25       </xsd:simpleContent>
26      </xsd:complexType>
27     </xsd:element>
28     <xsd:element name="modelURL" minOccurs="0">
29      <xsd:complexType>
30       <xsd:simpleContent>
31        <xsd:extension base="xsd:anyURI">
32         <xsd:anyAttribute namespace="##other" processContents="lax" />
33        </xsd:extension>
34       </xsd:simpleContent>
35      </xsd:complexType>
36     </xsd:element>
37     <xsd:element name="serialNumber" minOccurs="0">
38      <xsd:complexType>
39       <xsd:simpleContent>
40        <xsd:extension base="xsd:string">
41         <xsd:anyAttribute namespace="##other" processContents="lax" />
42        </xsd:extension>
43       </xsd:simpleContent>
44      </xsd:complexType>
45     </xsd:element>
46     <xsd:element name="UDN">
47      <xsd:complexType>
48       <xsd:simpleContent>
49        <xsd:extension base="xsd:anyURI">
50         <xsd:anyAttribute namespace="##other" processContents="lax" />
51        </xsd:extension>
52       </xsd:simpleContent>
53      </xsd:complexType>
54     </xsd:element>
55     <xsd:element name="UPC" minOccurs="0">
56      <xsd:complexType>
57       <xsd:simpleContent>
58        <xsd:extension base="xsd:string">
```

```
1              <xsd:anyAttribute namespace="##other" processContents="lax" />
2            </xsd:extension>
3          </xsd:simpleContent>
4        </xsd:complexType>
5      </xsd:element>
6      <xsd:element name="iconList" minOccurs="0">
7       <xsd:complexType>
8        <xsd:sequence>
9         <xsd:element name="icon" maxOccurs="unbounded">
10         <xsd:complexType>
11          <xsd:sequence>
12           <xsd:element name="mimetype">
13            <xsd:complexType>
14             <xsd:simpleContent>
15              <xsd:extension base="xsd:string">
16               <xsd:anyAttribute namespace="##other"
17                processContents="lax" />
18              </xsd:extension>
19             </xsd:simpleContent>
20            </xsd:complexType>
21           </xsd:element>
22           <xsd:element name="width">
23            <xsd:complexType>
24             <xsd:simpleContent>
25              <xsd:extension base="xsd:int">
26               <xsd:anyAttribute namespace="##other"
27                processContents="lax" />
28              </xsd:extension>
29             </xsd:simpleContent>
30            </xsd:complexType>
31           </xsd:element>
32           <xsd:element name="height">
33            <xsd:complexType>
34             <xsd:simpleContent>
35              <xsd:extension base="xsd:int">
36               <xsd:anyAttribute namespace="##other"
37                processContents="lax" />
38              </xsd:extension>
39             </xsd:simpleContent>
40            </xsd:complexType>
41           </xsd:element>
42           <xsd:element name="depth">
43            <xsd:complexType>
44             <xsd:simpleContent>
45              <xsd:extension base="xsd:int">
46               <xsd:anyAttribute namespace="##other"
47                processContents="lax" />
48              </xsd:extension>
49             </xsd:simpleContent>
50            </xsd:complexType>
51           </xsd:element>
52           <xsd:element name="url">
53            <xsd:complexType>
54             <xsd:simpleContent>
55              <xsd:extension base="xsd:anyURI">
56               <xsd:anyAttribute namespace="##other"
57                processContents="lax" />
58              </xsd:extension>
```

```
1          </xsd:simpleContent>
2         </xsd:complexType>
3        </xsd:element>
4        <xsd:any namespace="##other" minOccurs="0"
5         maxOccurs="unbounded" processContents="lax" />
6       </xsd:sequence>
7       <xsd:anyAttribute namespace="##other" processContents="lax" />
8      </xsd:complexType>
9     </xsd:element>
10     <xsd:any namespace="##other" minOccurs="0" maxOccurs="unbounded"
11      processContents="lax" />
12    </xsd:sequence>
13    <xsd:anyAttribute namespace="##other" processContents="lax" />
14   </xsd:complexType>
15  </xsd:element>
16  <xsd:element name="serviceList">
17   <xsd:complexType>
18    <xsd:sequence>
19     <xsd:element name="service" maxOccurs="unbounded">
20      <xsd:complexType>
21       <xsd:sequence>
22        <xsd:element name="serviceType">
23         <xsd:complexType>
24          <xsd:simpleContent>
25           <xsd:extension base="xsd:anyURI">
26            <xsd:anyAttribute namespace="##other"
27             processContents="lax" />
28           </xsd:extension>
29          </xsd:simpleContent>
30         </xsd:complexType>
31        </xsd:element>
32        <xsd:element name="serviceId">
33         <xsd:complexType>
34          <xsd:simpleContent>
35           <xsd:extension base="xsd:anyURI">
36            <xsd:anyAttribute namespace="##other"
37             processContents="lax" />
38           </xsd:extension>
39          </xsd:simpleContent>
40         </xsd:complexType>
41        </xsd:element>
42        <xsd:element name="SCPDURL">
43         <xsd:complexType>
44          <xsd:simpleContent>
45           <xsd:extension base="xsd:anyURI">
46            <xsd:anyAttribute namespace="##other"
47             processContents="lax" />
48           </xsd:extension>
49          </xsd:simpleContent>
50         </xsd:complexType>
51        </xsd:element>
52        <xsd:element name="controlURL">
53         <xsd:complexType>
54          <xsd:simpleContent>
55           <xsd:extension base="xsd:anyURI">
56            <xsd:anyAttribute namespace="##other"
57             processContents="lax" />
58           </xsd:extension>
```

```
1             </xsd:simpleContent>
2            </xsd:complexType>
3           </xsd:element>
4           <xsd:element name="eventSubURL">
5            <xsd:complexType>
6             <xsd:simpleContent>
7              <xsd:extension base="xsd:anyURI">
8               <xsd:anyAttribute namespace="##other"
9                processContents="lax" />
10             </xsd:extension>
11            </xsd:simpleContent>
12           </xsd:complexType>
13          </xsd:element>
14          <xsd:any namespace="##other" minOccurs="0"
15           maxOccurs="unbounded" processContents="lax" />
16         </xsd:sequence>
17         <xsd:anyAttribute namespace="##other" processContents="lax" />
18        </xsd:complexType>
19       </xsd:element>
20       <xsd:any namespace="##other" minOccurs="0" maxOccurs="unbounded"
21        processContents="lax" />
22      </xsd:sequence>
23      <xsd:anyAttribute namespace="##other" processContents="lax" />
24     </xsd:complexType>
25    </xsd:element>
26    <xsd:element name="deviceList" type="deviceListType" minOccurs="0" />
27    <xsd:element name="presentationURL" minOccurs="0">
28     <xsd:complexType>
29      <xsd:simpleContent>
30       <xsd:extension base="xsd:anyURI">
31        <xsd:anyAttribute namespace="##other" processContents="lax" />
32       </xsd:extension>
33      </xsd:simpleContent>
34     </xsd:complexType>
35    </xsd:element>
36    <xsd:any namespace="##other" minOccurs="0" maxOccurs="unbounded"
37    processContents="lax" />
38    <xsd:element minOccurs="0" ref="ml1-0:X_connectivity"/>
39    <xsd:element minOccurs="0" ref="ml1-0:X_deviceKeys"/>
40    <xsd:element minOccurs="0" ref="ml1-1:X_mirrorLinkVersion"/>
41    <xsd:element minOccurs="1" ref="ml1-1:X_Signature"/>
42    <xsd:element minOccurs="0" ref="ml1-2:X_presentations"/>
43    <xsd:element minOccurs="0" ref="ml1-2:X_localization"/>
44    <xsd:any namespace="##other" minOccurs="0" maxOccurs="unbounded"
45     processContents="lax" />
46   </xsd:sequence>
47   <xsd:anyAttribute namespace="##other" processContents="lax" />
48  </xsd:complexType>
49  <xsd:complexType name="deviceListType">
50   <xsd:sequence>
51    <xsd:element name="device" type="deviceType" maxOccurs="unbounded" />
52    <xsd:any namespace="##other" minOccurs="0" maxOccurs="unbounded"
53     processContents="lax" />
54   </xsd:sequence>
55   <xsd:anyAttribute namespace="##other" processContents="lax" />
56  </xsd:complexType>
57  <xsd:complexType name="rootType">
58   <xsd:sequence>
```

```
1       <xsd:element name="specVersion">
2        <xsd:complexType>
3         <xsd:sequence>
4          <xsd:element name="major">
5           <xsd:complexType>
6            <xsd:simpleContent>
7             <xsd:extension base="xsd:int">
8              <xsd:anyAttribute namespace="##other" processContents="lax" />
9             </xsd:extension>
10           </xsd:simpleContent>
11          </xsd:complexType>
12         </xsd:element>
13         <xsd:element name="minor">
14          <xsd:complexType>
15           <xsd:simpleContent>
16            <xsd:extension base="xsd:int">
17             <xsd:anyAttribute namespace="##other" processContents="lax" />
18            </xsd:extension>
19           </xsd:simpleContent>
20          </xsd:complexType>
21         </xsd:element>
22         <xsd:any namespace="##other" minOccurs="0" maxOccurs="unbounded"
23          processContents="lax" />
24        </xsd:sequence>
25        <xsd:anyAttribute namespace="##other" processContents="lax" />
26       </xsd:complexType>
27      </xsd:element>
28      <xsd:element name="URLBase" minOccurs="0">
29       <xsd:complexType>
30        <xsd:simpleContent>
31         <xsd:extension base="xsd:anyURI">
32          <xsd:anyAttribute namespace="##other" processContents="lax" />
33         </xsd:extension>
34        </xsd:simpleContent>
35       </xsd:complexType>
36      </xsd:element>
37      <xsd:element name="device" type="deviceType" />
38      <xsd:any namespace="##other" minOccurs="0" maxOccurs="unbounded"
39       processContents="lax" />
40     </xsd:sequence>
41     <xsd:attribute name="configId" type="xsd:int" />
42     <xsd:anyAttribute namespace="##other" processContents="lax" />
43    </xsd:complexType>
44   </xsd:schema>
45
```

46 Appendix A.2 – ml1-0.xsd

```
47   <?xml version="1.0" encoding="UTF-8"?>
48   <xs:schema xmlns="urn:schemas-carconnectivity-org:ml-1-0"
49   xmlns:xs="http://www.w3.org/2001/XMLSchema"
50   targetNamespace="urn:schemas-carconnectivity-org:ml-1-0"
51   elementFormDefault="qualified">
52   <xs:element name="X_connectivity">
53    <xs:complexType>
54     <xs:sequence>
55      <xs:element name="bluetooth" minOccurs="0">
56       <xs:complexType>
```

```
1      <xs:sequence>
2       <xs:element name="bdAddr" type="xs:string" minOccurs="1"/>
3       <xs:element name="startConnection" type="xs:boolean"
4        minOccurs="0" default="true"/>
5       <xs:any namespace="##any" minOccurs="0"
6        maxOccurs="unbounded" processContents="lax"/>
7      </xs:sequence>
8      <xs:anyAttribute namespace="##any" processContents="lax"/>
9     </xs:complexType>
10    </xs:element>
11    <xs:element name="wifi" minOccurs="0">
12     <xs:complexType>
13      <xs:sequence>
14       <xs:element name="macAddr" type="xs:string" minOccurs="1"/>
15       <xs:element name="ssid" type="xs:string" minOccurs="0"/>
16       <xs:element name="roles" type="xs:string" minOccurs="0"
17        default="AP,Client,P2P"/>
18       <xs:element name="protectionList" minOccurs="0">
19        <xs:complexType>
20         <xs:sequence>
21          <xs:element name="protection" minOccurs="0"
22           maxOccurs="unbounded">
23          <xs:complexType>
24           <xs:sequence>
25            <xs:element name="protocol" minOccurs="1">
26             <xs:simpleType>
27              <xs:restriction base="xs:string">
28               <xs:enumeration value="WEP"/>
29               <xs:enumeration value="WPA"/>
30               <xs:enumeration value="WPA2"/>
31               <xs:enumeration value="WPS"/>
32              </xs:restriction>
33             </xs:simpleType>
34            </xs:element>
35            <xs:element name="passkey" type="xs:string"
36             minOccurs="1"/>
37            <xs:any namespace="##any" minOccurs="0"
38             maxOccurs="unbounded" processContents="lax"/>
39           </xs:sequence>
40           <xs:anyAttribute namespace="##any" processContents="lax"/>
41          </xs:complexType>
42         </xs:element>
43         <xs:any namespace="##any" minOccurs="0"
44          maxOccurs="unbounded" processContents="lax"/>
45        </xs:sequence>
46        <xs:anyAttribute namespace="##any" processContents="lax"/>
47       </xs:complexType>
48      </xs:element>
49      <xs:any namespace="##any" minOccurs="0"
50       maxOccurs="unbounded" processContents="lax"/>
51     </xs:sequence>
52     <xs:anyAttribute namespace="##any" processContents="lax"/>
53    </xs:complexType>
54   </xs:element>
55   <xs:any namespace="##any" minOccurs="0" maxOccurs="unbounded"
56    processContents="lax"/>
57  </xs:sequence>
58  <xs:anyAttribute namespace="##any" processContents="lax"/>
```

```
1    </xs:complexType>
2   </xs:element>
3   <xs:element name="X_deviceKeys">
4    <xs:complexType>
5     <xs:sequence>
6      <xs:element name="key" minOccurs="0" maxOccurs="unbounded">
7       <xs:complexType>
8        <xs:sequence>
9         <xs:element name="name" type="xs:string" minOccurs="1"/>
10        <xs:element name="mandatory" type="xs:boolean"
11         minOccurs="0" default="false"/>
12        <xs:element name="symbolValue" type="xs:string"
13         minOccurs="1"/>
14        <xs:element name="icon" maxOccurs="unbounded">
15         <xs:complexType>
16          <xs:sequence>
17           <xs:element name="mimetype" type="xs:string" minOccurs="1"/>
18           <xs:element name="width" type="xs:positiveInteger"
19            minOccurs="1"/>
20           <xs:element name="height" type="xs:positiveInteger"
21            minOccurs="1"/>
22           <xs:element name="depth" type="xs:positiveInteger"
23            minOccurs="1"/>
24           <xs:element name="url" type="xs:string" minOccurs="1"/>
25           <xs:any namespace="##any" minOccurs="0" maxOccurs="unbounded"
26            processContents="lax"/>
27          </xs:sequence>
28          <xs:anyAttribute namespace="##any" processContents="lax"/>
29         </xs:complexType>
30        </xs:element>
31        <xs:any namespace="##any" minOccurs="0"
32         maxOccurs="unbounded" processContents="lax"/>
33       </xs:sequence>
34       <xs:anyAttribute namespace="##any" processContents="lax"/>
35      </xs:complexType>
36     </xs:element>
37     <xs:any namespace="##any" minOccurs="0"
38      maxOccurs="unbounded" processContents="lax"/>
39    </xs:sequence>
40    <xs:anyAttribute namespace="##any" processContents="lax"/>
41   </xs:complexType>
42  </xs:element>
43  </xs:schema>
44
```

45 Appendix A.3 – ml1-1.xsd

```
46  <?xml version="1.0" encoding="UTF-8"?>
47  <xs:schema xmlns="urn:schemas-carconnectivity-org:ml-1-1"
48  xmlns:xs="http://www.w3.org/2001/XMLSchema"
49  targetNamespace="urn:schemas-carconnectivity-org:ml-1-1"
50  elementFormDefault="qualified"
51  xmlns:ds="http://www.w3.org/2000/09/xmldsig#">
52  <xs:import schemaLocation="xmldsig-core-schema.xsd"
53   namespace="http://www.w3.org/2000/09/xmldsig#"/>
54  <xs:element name="X_mirrorLinkVersion">
55   <xs:complexType>
56    <xs:sequence>
```

```
1    <xs:element name="majorVersion" type="xs:nonNegativeInteger"/>
2    <xs:element name="minorVersion" type="xs:nonNegativeInteger"/>
3    <xs:any namespace="##any" minOccurs="0" maxOccurs="unbounded"
4     processContents="lax"/>
5   </xs:sequence>
6   </xs:complexType>
7  </xs:element>
8  <xs:element name="X_Signature" minOccurs="1">
9   <xs:complexType>
10   <xs:sequence>
11    <xs:element ref="ds:Signature" minOccurs="1"/>
12    <xs:any namespace="##any" minOccurs="0"
13     maxOccurs="unbounded" processContents="lax"/>
14   </xs:sequence>
15   <xs:anyAttribute namespace="##any" processContents="lax"/>
16   </xs:complexType>
17  </xs:element>
18  </xs:schema>
19
```

Appendix A.3 – ml1-2.xsd (MirrorLink 1.2)

```
21  <?xml version="1.0" encoding="UTF-8"?>
22  <xs:schema xmlns="urn:schemas-carconnectivity-org:ml-1-2"
23  xmlns:xs="http://www.w3.org/2001/XMLSchema"
24  targetNamespace="urn:schemas-carconnectivity-org:ml-1-2"
25  elementFormDefault="qualified">
26  <xs:element name="X_presentations">
27   <xs:complexType>
28    <xs:sequence>
29     <xs:element name="presentation" type="xs:string" default="vncu"
30      minOccurs="1"/>
31     <xs:any namespace="##any" minOccurs="0" maxOccurs="unbounded"
32      processContents="lax"/>
33    </xs:sequence>
34    <xs:anyAttribute namespace="##any" processContents="lax"/>
35   </xs:complexType>
36  </xs:element>
37  <xs:element name="X_localization" minOccurs="0">
38   <xs:complexType>
39    <xs:sequence>
40     <xs:element name="characterSet" type="xs:string" minOccurs="1"/>
41     <xs:any namespace="##any" minOccurs="0" maxOccurs="unbounded"
42      processContents="lax"/>
43    </xs:sequence>
44    <xs:anyAttribute namespace="##any" processContents="lax"/>
45   </xs:complexType>
46  </xs:element>
47  </xs:schema>
48
```