Car Connectivity Consortium

MirrorLink®

IEEE 802.11 CCC Information Element

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1 VERSION HISTORY

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1 **LIST OF TABLES**

1 TERMS AND ABBREVIATIONS

2 IE   Information Element

3 IEEE   Institute of Electrical and Electronics Engineers

4 Miracast Commercial denomination of WDF

5 ML   MirrorLink

6 OUI   Organizationally Unique Identifier

7 UPnP   Universal Plug and Play

8 USB   Universal Serial Bus

9 WFD   Wi-Fi Display

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14 UPnP is a registered trademark of UPnP Forum.

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1 ABOUT

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

This specification defines the IEEE 802.11 CCC vendor-specific Information Element.

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

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are following the notation as described in RFC 2119 [2].

- MUST: This word, or the terms "REQUIRED" or "SHALL", mean that the definition is an absolute requirement of the specification.

- MUST NOT: This phrase, or the phrase "SHALL NOT", mean that the definition is an absolute prohibition of the specification.

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

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

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

2 INTRODUCTION

IEEE allows defining vendor-specific Information elements, which are used to carry information not defined in the IEEE standard within a single defined format. The IE (Information Element) is located at the end of management frames, such as the beacon frame defined in 802.11 specification of IEEE [1].

Multiple IEs can be concatenated. Based on the usage of IE, IEEE defines the formats of different kinds of IEs identified by the Element ID.

This document specifies the IEEE 802.11 CCC vendor-specific Information Element.

1 # 3 IEEE 802.11 INFORMATION ELEMENT

2 The IE (Information Element) is located at the end of management frames such as the beacon frame defined
3 in 802.11 specification of IEEE [1]. Multiple IEs can be concatenated. Based on the usage of IE, IEEE defines
4 the formats of different kinds of IEs identified by the Element ID.

5 The IEEE 802.11 Information Element, as given in Table 2.

Field	Size (octet)	Value	Description
Element ID	1	Defined in [1]	Element identifier
Length	1	Variable	Length of sum of following elements
Information	Variable		Information (IE specific)

6   Table 1: IEEE 802.11 Information Element Format

7 IEEE allows the definition of vendor-specific information elements, identified by the Element ID of 0xDD.

1 **4 CCC INFORMATION ELEMENT**

2 The format of the CCC Information Element is given in Table 2.

Field	Size (octet)	Value	Description
Element ID	1	0xDD	802.11 Vendor specific usage
Length	1	Variable	The length of sum of following elements
OUI (Organizationally Unique Identifier)	3	04-DF-69	CCC specific OUI assigned by IEEE
OUI Type	1		OUI type
Subelements	Variable		One or more subelements can follow

3   Table 2: MirrorLink Information Element Format

4 The Organizationally Unique Identifier (OUI) of the CCC Information Element MUST be 0x04DF69.
5 Allowed OUI Type values are given in Table 3.

OUI Type (Decimal)	Note
0-9	Reserved
10	MirrorLink 1.2
11-255	Reserved

6   Table 3: OUI Types

7 **4.1 MirrorLink Subelements**

8 The MirrorLink Subelement format is given in Table 4.

Field	Size (octet)	Value	Description
Subelement ID	1		Identifier which represents the type of subelement.(See Table 5)
Length	1	Variable	The length of sum of following elements
Subelement body field	variable		The value of subelement.

9   Table 4: MirrorLink Subelement Format

10 The Subelement ID MUST have a value which represents the type of the Subelement. Allowed values are
11 defined in Table 5.

Subelement ID (Decimal)	Note
0	MirrorLink UPnP device information
1	Internet Accessibility
2-255	Reserved

12   Table 5: Subelement Identifier

13 *4.1.1 MirrorLink UPnP Device Information Subelement*

14 The MirrorLink Device Information subelement is given in Table 6. The Subelement ID field MUST have a
15 value of 0x00.

Field	Size (octet)	Value	Description
Subelement ID	1	0x00	Identifier which indicates subelement type of UPnP device information of MirrorLink device.

Field	Size (octet)	Value	Description
Length	1	4	The length of sum of following elements
MirrorLink UPnP Device Information	4		The value of MirrorLink UPnP Device Information.(See Table 7)

1   Table 6: MirrorLink UPnP Device Information Subelement

2   The format of the MirrorLink UPnP Device Information field is given in Table 7.

Bits	Name	Interpretation
2:0	UPnP Device Type	0x0 : UPnP TmServerDevice:1 Server 0x1 : UPnP TmServerDevice:1 Control Point 0x2 – 0x7: Reserved
3	TmApplicationServer:1 Service	0b0 : Not supported 0b1 : Supported
4	TmClientProfile:1 Service	0b0 : TmClientProfile not supported 0b1 : TmClientProfile supported
5	TmNotificationServer:1 Service	0b0 : TmNotificationServer not supported 0b1 : TmNotificationServer supported
15:6	Reserved	Reserved for additional services
31:16	Port number	Port number, used to make URL for UPnP device description fetching

3   Table 7: MirrorLink UPnP Device Information Format

4   The UPnP Device Information subelement MUST be included within the CCC Information Element, if the
5   MirrorLink device is providing any MirrorLink functionality over Wi-Fi.

6   ### 4.1.2 Internet Accessibility Subelement

7   The Internet Accessibility subelement is given in Table 6. The Subelement ID field MUST have a value of
8   0x01.

Field	Size (octet)	Value	Description
Subelement ID	1	0x01	Identifier which indicates subelement type of Internet Accessibility.
Length	1	2	Length of sum of following elements
Internet Accessibility	2		Value of Internet Accessibility (See Table 9)

9   Table 8: Internet Accessibility Subelement

10   The format of the Internet Accessibility Information field is given in Table 7.

Bits	Name	Interpretation
1:0	MirrorLink Type	0b00: MirrorLink Server 0b01; MirrorLink Client with support for single ML Server 0b10: Reserved 0b11: MirrorLink Client with support for multiple ML Servers
2	Internet Access Support	0b0: Not supported 0b1: Supported
3	Internet Access Required	0b0: Not required 0b1: Required
7:4	Reserved	
15:8	MirrorLink Client Preference	MirrorLink Client's preference in case where GO role conflict happens;

Bits	Name	Interpretation
		• 0x00: No conflict or not a MirrorLink Client • 0x01: Internet Access Required • 0x02: Multiple MirrorLink Server Support

1   Table 9: Internet Accessibility Information Format

2   The Internet Accessibility Information subelement MAY be included within the CCC Information Element,
3   if the MirrorLink device is providing MirrroLink functionality over Wi-Fi. In case the Internet Accessibility
4   Information subelement is missing from the CCC Information Element, the receiving MirrorLink device
5   SHOULD implement a behavior as if the following default values had been received:

6   • ML Type: 0b00 or 0b01 (dependent on MirrorLink device type)
7   • Internet Access Support: 0b0 (Not supported)
8   • Internet Access Required: 0b0 (Not required)
9   • ML Client Preference: 0b00 (No conflict or not a MirrorLink Client)

5 REFERENCES

[1] IEEE Std. 801.11-2012, "Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications", March 29, 2012.

[2] IETF, RFC 2119, Keys words for use in RFCs to Indicate Requirement Levels, March 1997. 21 http://www.ietf.org/rfc/rfc2119.