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TECHNICAL SPECIFICATION

**Publicly Available Specification (PAS);
Intelligent Transport Systems (ITS);
MirrorLink®;
Part 20: Internet Accessibility**

CAUTION

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

ETSI

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

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

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

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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 20 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 color display, audio input/output and user input mechanisms.

The present document specifies MirrorLink Device Discovery on Wi-Fi Direct. The procedure is used to provide MirrorLink Server and Client's Internet configuration prior to Wi-Fi P2P group formation.

2   References

2.1   Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

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

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

[1]   Wi-Fi Alliance Technical Committee, P2P Task Group: "Wi-Fi Peer-to-Peer (P2P) Technical Specification", Revision 1.7, July 06, 2016.

NOTE: Available at https://www.wi-fi.org/downloads-registered-guest/Wi-Fi%2BP2P%2BTechnical%2BSpecification%2Bv1.7.pdf/29559.

[2]   ETSI TS 103 544-18 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 18: IEEE 802.11™ Car Connectivity Consortium (CCC) Information Element".

2.2   Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

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

[i.1]   ETSI TS 103 544-1 (V1.3.1): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 1: Connectivity".

3   Definition of terms, symbols and abbreviations

3.1   Terms

Void.

3.2 Symbols

Void.

3.3 Abbreviations

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

AP   Access Point
CCC   Car Connectivity Consortium
DHCP   Dynamic Host Configuration Protocol
DNS   Domain Name System
GC   P2P Group Client
GO   P2P Group Owner
IE   Information Element
IP   Internet Protocol
ML   MirrorLink
P2P   Peer-to-peer
WAN   Wide Area Network

4 Internet Accessibility

4.1 General

Both MirrorLink Server and Client can access the Internet, if all the following three conditions are true:

1) Either MirrorLink Server or Client shall have Internet connectivity with WAN interface.

2) The device that has Internet access shall be capable of sharing its connectivity to the other.

3) The device having Internet connectivity shall become an Access Point.

4.2 Wi-Fi P2P Connection

4.2.1 General

If a MirrorLink Server and Client want Wi-Fi P2P connection, they shall proceed Wi-Fi connection setup as defined on the Wi-Fi P2P specification [1].

If a MirrorLink Client is setup to connect in this mode and the MirrorLink Server is set to operate in the same mode, the two devices find each other over Wi-Fi technology and negotiate the AP and client role in autonomous way by conducting Group Owner negotiation procedure defined in the Wi-Fi P2P specification.

The AP role negotiation is performed as following, as defined in [1]:

1) The Wi-Fi interface is turned on at both MirrorLink Server and Client.

2) If the Wi-Fi mode is set to P2P mode, it proceeds to Wi-Fi Device discovery as defined in [1].

3) During the device discovery, a MirrorLink device shall include CCC IE (Information Element) which is defined in [2].

4) By referring the information included in the Internet Accessibility sub-element in the CCC IE, defined in [2], the MirrorLink Server and the Client exchange Group Owner negotiation messages to negotiate AP role by checking GO Intent Value in the message.

5) A device sends higher GO Intent Value will take Group Ownership and starts AP mode.

4.2.2   MirrorLink Internet Accessibility information Exchange

To inform the configuration information of internet accessibility of both sides, an Internet Accessibility sub-element shall be included into the CCC Information Element, as defined in [2] prior to a group formation.

The Internet Accessibility entry provides the following information:

- MirrorLink Type, i.e. whether the device is a Server or a Client device, and in case of a client device, whether it supports a single or multiple MirrorLink servers.

- Internet Access Support, i.e. whether the device is able to provide internet access for the connected device.

- Internet Access Required, i.e. whether the device requires access to the Internet.

- MirrorLink Client Preference, i.e. in case there is a contradiction, the MirrorLink Clients informs about its preference to resolve it.

4.2.3   Managing Wi-Fi P2P connection using MirrorLink Service Discovery

MirrorLink Server or Client wants to become Group Owner when its configuration or service needs P2P Group Owner role to operate correctly. For example, MirrorLink Client shall become Group Owner to support more than one MirrorLink Servers, while MirrorLink Server shall play Group Owner role to offer Internet connectivity sharing to the other. By setting its Intent Value to 15, MirrorLink Server or Client shall be the P2P Group Owner.

In the case where both the MirrorLink Server and the Client want to become Group Owner and both of them set their Intent Values to 15, the P2P connection fails. To prevent such P2P connection failure, MirrorLink Server and Client shall exchange Internet Accessibility information at Device Discovery procedure prior to a group formation.

Based on MirrorLink Service Configurations of the MirrorLink Server and the Client, the following Group Owner and Group Client role can be distinguished as shown in Table 1.

Table 1: MirrorLink Service Configuration for Group Owner Selection

MirrorLink Service Configuration						Group Ownership Selection			
Internet Access		Internet Access Required		Multiple ML Servers Support	ML Client Preference	GO Role Conflict	Device offering Cross Connection	P2P Role	
ML Server	ML Client	ML Server	ML Client					ML Server	ML Client
Yes	Yes	Yes	Yes	Yes	N/A	No	ML Client	GC	GO
Yes	Yes	Yes	Yes	No	N/A	No	Both	Both	Both
Yes	Yes	Yes	No	Yes	N/A	No	ML Client	GC	GO
Yes	Yes	Yes	No	No	N/A	No	Both	Both	Both
Yes	Yes	No	Yes	Yes	N/A	No	ML Client	GC	GO
Yes	Yes	No	Yes	No	N/A	No	Both	Both	Both
Yes	Yes	No	No	Yes	N/A	No	N/A	GC	GO
Yes	Yes	No	No	No	N/A	No	N/A	Both	Both
Yes	No	Yes	Yes	Yes	Internet Access	Yes	ML Server	GO	GC
Yes	No	Yes	Yes	Yes	Multiple ML Servers	Yes	N/A (Concurrent Operation)	GC	GO
Yes	No	Yes	Yes	No	N/A	No	ML Server	GO	GC
Yes	No	Yes	No	Yes	N/A	No	N/A (Concurrent Operation)	GC	GO
Yes	No	Yes	No	No	N/A	No	N/A	GC	GO
Yes	No	Yes	No	No	N/A	No	ML Server	GO	GC
Yes	No	No	Yes	Yes	Internet Access	Yes	ML Server	GO	GC

MirrorLink Service Configuration						Group Ownership Selection			
Internet Access		Internet Access Required		Multiple ML Servers Support	ML Client Preference	GO Role Conflict	Device offering Cross Connection	P2P Role	
ML Server	ML Client	ML Server	ML Client					ML Server	ML Client
					Multiple ML Servers	Yes	N/A	GC	GO
				No	N/A	No	ML Server	GO	GC
		No	No	Yes	N/A	No	N/A	GC	GO
				No	N/A	No	N/A	GC	GO
							ML Server	GO	GC
No	Yes	Yes	Yes	Yes	N/A	No	ML Client	GC	GO
				No					
		Yes	No	Yes					
				No					
		No	Yes	Yes					
				No					
		No	No	Yes			N/A	GC	GO
				No				Both	Both
No	No	Yes	Yes	Yes	N/A	No	N/A	GC	GO
				No				Both	Both
		Yes	No	Yes				GC	GO
				No				Both	Both
		No	Yes	Yes				GC	GO
				No				Both	Both
		No	No	Yes				GC	GO
				No				Both	Both

NOTE 1: If P2P Device cannot provide Internet Access properties to the other, its Internet Access will be regarded as not available.

NOTE 2: Both mean that Group Owner can be decided on secondary factors. If both device can be GO, then MirrorLink Client is recommended to become GO.

NOTE 3: Concurrent operation mean that the MirrorLink Server uses its own Internet connectivity and does not offer Cross Connection, and the MirrorLink Client cannot access the Internet.

After exchanging MirrorLink Internet Accessibility Service Configuration, MirrorLink Server and Client acknowledge which device will be the P2P Group Owner to operate MirrorLink correctly. MirrorLink Server and Client shall proceed Group Formation Procedure to form P2P group as specified in [1].

During Group Negotiation phase, both the MirrorLink Server and the Client can begin Group Owner Negotiation by sending a GO Negotiation Request frame. The device receiving a GO Negotiation Request frame shall examine the received information and respond with a GO Negotiation Response frame. If the device has to be the Group Owner but its default Intent Value is lower than the Intent Value in the GO Negotiation Request, the device shall set the value higher than the received Intent Value. If the device has to be the Group Client but its default Intent Value is higher than the Intent Value in the GO Negotiation Request, the device shall set the value lower than the received Intent Value.

Figure 1 shows Group Owner Intent Value determination process from the perspective of the P2P Device receiving a GO Negotiation Request frame.

x1 = Group Owner Intent Value of P2P Device 1 initiating the GO Negotiation Request frame

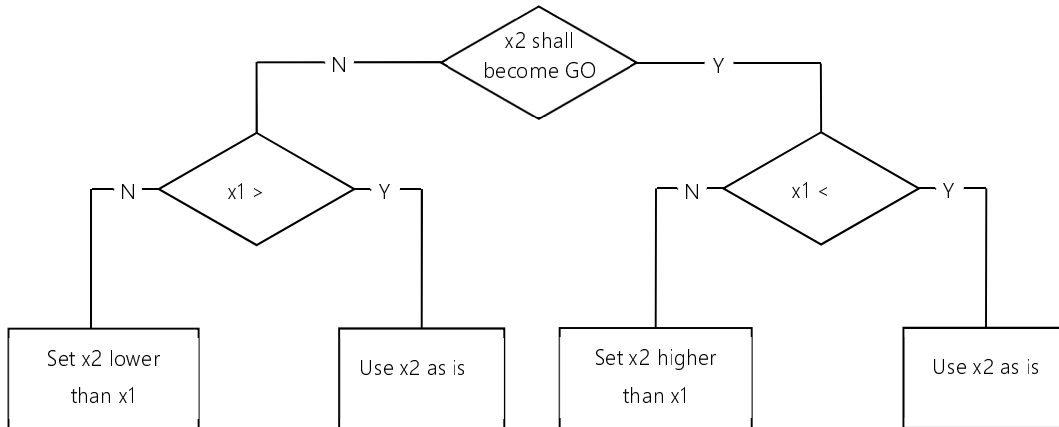x2 = Group Owner Intent Value of P2P Device 2 receiving the GO Negotiation Request frame

Figure 1: Group Owner Intent Value Determination Flowchart

The P2P Device initiating Group Owner Negotiation procedure shall set its GO Intent Value less than 15, if the device is agreed to become Group Client based on MirrorLink Service Configuration exchange. If the P2P Device initiating GO Negotiation procedure is agreed to become Group Owner, the device shall set its GO Intent Value higher than 0.

As defined in [1], The P2P Group Owner shall act as a DHCP server to provide IP addresses to the connected P2P Clients that use IP. The DHCP server, at least, shall support Internet Protocol version 4 (IPv4) and assign IP addresses, subnet mask and default gateway. A P2P Client that uses IP shall be capable of acting as a DHCP Client. If the Group Owner shares Internet connectivity with other devices on the network, the Group Owner shall provide at least one valid DNS address for the Internet access.