Car Connectivity Consortium

MirrorLink®

Audio Test Specification

Version 1.1.8
(CCC-TS-013)

VERSION HISTORY

Version	Date	Comment
1.1	31 March 2012	Approved Version
1.1.1	24 September 2012	Approved Errata Version
1.1.2	05 March 2013	Approved Errata Version
1.1.3	18 June 2013	Approved Errata Version
1.1.4	03 October 2013	Approved Errata Version
1.1.5	21 November 2013	Approved Errata Version
1.1.6	18 March 2014	Approved Errata Version
1.1.7	17 June 2014	Approved Errata Version
1.1.8	10 November 2014	Approved Errata Version

LIST OF CONTRIBUTORS

Brakensiek, Jörg (Editor) Microsoft Corporation
Hrabak, Robert General Motors Corporation
Lehner, Martin jambit GmbH

LEGAL NOTICE

TABLE OF CONTENTS

TERMS AND ABBREVIATIONS

A2DP	Bluetooth Advanced Audio Distribution Profile
RTP	Real Time Protocol
VNC	Virtual Networking Computing
UPnP	Universal Plug and Play

1 ABOUT

This document specifies all MirrorLink protocol conformance test cases for the Audio Specification [2].

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[1].

1. MUST: This word, or the terms "REQUIRED" or "SHALL", mean that the definition is an absolute requirement of the specification.
2. MUST NOT: This phrase, or the phrase "SHALL NOT", mean that the definition is an absolute prohibition of the specification.
3. 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.
4. 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.
5. 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 DEFINITIONS

2.1 Execution of Test Cases

Every test case is uniquely identified by an identifier.

- A MirrorLink server MUST pass all test cases, starting with SR.
- A MirrorLink client MUST pass all test cases, starting with CL

Every test case description includes an entry, whether the test cases is considered mandatory or not.

- Test cases marked as MANDATORY, MUST be executed.
- Test cases marked as CONDITIONAL, MUST be executed if the given condition is met.
- Test cases marked as CONDITIONAL, MUST NOT be executed if the given condition is not met.
- Test cases marked as NONE, MUST NOT be executed

2.2 Server Definitions

The following definitions are frequently used in different server and client test cases. Usage is indicated by the given designator name.

2.2.1 RTP Server Connect

This definition contains all necessary steps to launch the RTP server on the MirrorLink server.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	Set Payload Type	Invoke Set Client Profile • Define support for selected payload types	• Client profile indicating support for selected payload types has been registered
3	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes RTP server(s) for selected payload types and audio types
4	Launch RTP Server	Invoke Launch Application for RTP server for selected payload type and audio type.	• Receive URL on Launch Application
5	Connect to RTP server	Open UDP socket Send single UDP bytes to RTP server until at least one RTP packet arrives	• First RTP packet arrives • Packets received from URL identical to the advertised one

Table 1: RTP Server Connect - Definitions

2.2.2 RTP Server Disconnect

This definition contains all necessary steps to terminate the RTP server on the MirrorLink server.

Step	Name	Description	Expected Result
1	Terminate RTP Server	Invoke Terminate Application action for RTP Server Close UDP socket	• RTP server terminated • No Audio packets received
2	UPnP Server Disconnect	See Definitions in [3]	

Table 2: RTP Server Disconnect - Definitions

2.2.3 RTP Client Connect

This definition contains all necessary steps to launch the RTP client on the MirrorLink server.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	Set Payload Type	Invoke Set Client Profile • Define support for selected payload types	• Client profile indicating support for selected payload types has been registered
3	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes RTP client(s) for selected payload types and audio types.
4	Launch RTP Client	Invoke Launch Application for RTP client, supporting selected payload type and audio type.	• Receive URL on Launch Application
5	Connect to RTP client	Open UDP socket Send empty RTP packet	

Table 3: RTP Client Connect - Definitions

2.2.4 RTP Client Disconnect

This definition contains all necessary steps to terminate the RTP server on the MirrorLink server.

Step	Name	Description	Expected Result
1	Terminate RTP Client	Invoke Terminate Application action for RTP Client Close UDP socket	• RTP client terminated • No audio playback
2	UPnP Server Disconnect	See Definitions in [3]	

Table 4: RTP Client Disconnect - Definitions

2.3 Client Definitions

2.3.1 RTP Client Connect

This definition contains all necessary steps to connect to RTP client on the MirrorLink client.

Step	Name	Description	Expected Result
1	UPnP Client Connect	See Definitions in [3]	
2	UPnP Application Listing	Wait for Get Application List action. Provide Application List including RTP server with selected payload type(s) and audio type(s). Do not include BT modules into the App listing;	• Invoke Get Application List action
3	Launch RTP Server	Wait for Launch Application action for the RTP server with selected payload type and audio type. If the RTP client is not launched automatically, the test engineer will start an application providing audio (PIXIT)	• Invoke Launch Application • AppID is matching RTP server • RTP server provides selected payload type(s) and audio type(s)
4	Connect to RTP client	Open UDP socket Send empty RTP packet on single UDP byte	• Receive single UDP bytes, until at least one RTP packet is send.

Table 5: RTP Client Connect - Definitions

2.3.2 RTP Client Disconnect

This definition contains all necessary steps to disconnect from the RTP client on the MirrorLink client.

Step	Name	Description	Expected Result
1	Terminate RTP Server	Terminate RTP Server	• No audio playback
2	UPnP Client Disconnect	See Definitions in [3]	

Table 6: RTP Client Disconnect - Definitions

2.3.3 RTP Server Connect

This definition contains all necessary steps to connect to RTP Server on the MirrorLink client.

Step	Name	Description	Expected Result
1	UPnP Client Connect	See Definitions in [3]	
2	UPnP Client Profile	Set supported RTP payload types.	• Invoke Set Client Profile action with the list of supported RTP payload types. • Note: DUT may skip this step, in case it supports only RTP payload type 99.

Step	Name	Description	Expected Result
3	UPnP Application Listing	Wait for Get Application List action. Provide Application List including RTP client with selected payload type(s) and audio type(s).	• Invoke Get Application List action
4	Launch RTP Client	Wait for Launch Application action for the RTP client with selected payload type and audio type.	• Invoke Launch Application • AppID is matching RTP client • RTP client provides selected payload type(s) and audio type(s).
5	Connect to RTP client	Open UDP socket Prepare for RTP	•

Table 7: RTP Server Connect - Definitions

2.3.4 RTP Server Disconnect

This definition contains all necessary steps to disconnect from the RTP Server on the MirrorLink client.

Step	Name	Description	Expected Result
1	Terminate RTP Client	Terminate RTP Client	• No Audio packets received
2	UPnP Client Disconnect	See Definitions in [3]	

Table 8: RTP Server Disconnect - Definitions

3 SERVER FEATURE TEST CASES

3.1 Audio Link Identification

3.1.1 SR/AUDIO/LINK/IdentifyRtpClientPt0

Requirement: CONDITIONAL

Condition: Support for RTP Client AND

Support for RTP payload type 0

The server's application list is searched for a RTP client announcing the payload type 0 in its format element.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes RTP clients with payload type 0 • RTP client with content category Voice Command In listed first (if available) • RTP clients with all possible content category combinations advertised, individually (PIXIT)
3	UPnP Server Disconnect	See Definitions in [3]	

Table 9: RTP client of payload type 0 is available – Test Steps

3.1.2 SR/AUDIO/LINK/IdentifiyRtpClientPt98

Requirement: CONDITIONAL

Condition: Support for RTP Client AND

Support for RTP payload type 98

The server's application list is searched for a RTP client announcing the payload type 98 in its format element.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes RTP clients with payload type 98 • RTP client with content category Voice Command In listed first (if available) • RTP clients with all possible content category combinations advertised, individually (PIXIT)
3	UPnP Server Disconnect	See Definitions in [3]	

Table 10: RTP client of payload type 98 is available – Test Steps

3.1.3 SR/AUDIO/LINK/IdentifiyRtpClientPt99

Requirement: CONDITIONAL

Condition: Support for RTP Client

The server's application list is searched for a RTP client announcing the payload type 99 in its format element.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes RTP clients with payload type 99 • RTP client with content category Voice Command In listed first (if available) • RTP clients with all possible content category combinations advertised, individually (PIXIT)
3	UPnP Server Disconnect	See Definitions in [3]	

Table 11: RTP client of payload type 99 is available – Test Steps

3.1.4 SR/AUDIO/LINK/IdentifyRtpServerPt0

Requirement: CONDITIONAL

Condition: Support for RTP payload type 0

The server's application list is searched for a RTP server announcing the payload type 0 in its format element.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes RTP servers with payload type 0 • RTP server with content category Media Audio Out listed first (if available) • RTP servers with all possible content category combinations advertised, individually (PIXIT)
3	UPnP Server Disconnect	See Definitions in [3]	

Table 12: RTP server of payload type 0 is available – Test Steps

3.1.5 SR/AUDIO/LINK/IdentifyRtpServerPt98

Requirement: CONDITIONAL

Condition: Support for RTP payload type 98

The server's application list is searched for a RTP server announcing the payload type 98 in its format element.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	

Step	Name	Description	Expected Result
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes RTP servers with payload type 98 • RTP server with content category Media Audio Out listed first (if available) • RTP servers with all possible content category combinations advertised, individually (PIXIT)
3	UPnP Server Disconnect	See Definitions in [3]	

Table 13: RTP server of payload type 98 is available – Test Steps

3.1.6 SR/AUDIO/LINK/IdentifyRtpServerPt99

Requirement: MANDATORY

Condition: None

The server's application list is searched for a RTP server announcing the payload type 99 in its format element.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes RTP servers with payload type 99 • RTP server with content category Media Audio Out listed first (if available) • RTP servers with all possible content category combinations advertised, individually (PIXIT)
3	UPnP Server Disconnect	See Definitions in [3]	

Table 14: RTP server of payload type 99 is available – Test Steps

3.1.7 SR/AUDIO/LINK/IdentifyBtHFP

Requirement: CONDITIONAL

Condition: Server supports BT HFP

Test if a BT HFP application is available in the application listing.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing XML • Includes BT HFP application
3	UPnP Server Disconnect	See Definitions in [3]	

Table 15: Identify BT HFP – Test Steps

3.1.8 SR/AUDIO/LINK/IdentifyBtA2DP

Requirement: CONDITIONAL

Condition: Server support BT A2DP

Test if a BT A2DP application is available in the application listing.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Appli-cation Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing XML • Includes BT A2DP application
3	UPnP Server Disconnect	See Definitions in [3]	

Table 16: Identify BT A2DP – Test Steps

3.2 Bluetooth

3.2.1 SR/AUDIO/BT/LaunchHFP

Requirement: CONDITIONAL

Condition: Support for BT HFP AND

Support for BT connection setup through MirrorLink

Test if BT HFP can be launched on the MirrorLink server. If the BT HFP Server is announced via UPNP it is started via the LaunchApplication() SOAP action. The test passes if BT HFP is started and the application status is foreground.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes BT HFP application
3	UPnP Action SetClientProfile	Set the client profile via the UPnP service that specifies BT address of the test system. Set `startConnection` to "`false`" and "`true`" in two separate test runs.	• Received SetClientProfile response
4	Launch BT HFP	Invoke Launch Application for BT HFP Initiate BT connection (if required to do so) Check application status via UPnP Get Application Status.	• Receive URL on Launch Application • Server initiates the BT connection (if required to do so). • BT HFP status is "Foreground" • Audio working
5	Terminate BT HFP	Invoke Terminate Application action for BT HFP.	• BT HFP application terminated
6	UPnP Server Disconnect	See Definitions in [3]	.

Table 17: Launch BT HFP and check audio link - Test Steps

3.2.2 SR/AUDIO/BT/LaunchA2DP

Requirement: CONDITIONAL

Condition: Server supports BT A2DP AND

Support for BT connection setup through MirrorLink

Test if BT A2DP can be launched on the MirrorLink server. If the BT A2DP Server is announced via UPNP it is started via the LaunchApplication() SOAP action. The test passes if BT A2DP is started and the application status is foreground.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes BT A2DP application
3	UPnP Action SetClientProfile	Set the client profile via the UPnP service that specifies	• Received SetClientProfile response

Step	Name	Description	Expected Result
		BT address of the test system. Set `startConnection` to "`false`" and "`true`" in two separate test runs.	
4	Launch BT A2DP	Invoke Launch Application for BT A2DP Initiate BT connection (if required to do so) Check application status via UPnP Get Application Status.	• Receive URL on Launch Application • Server initiates the BT connection (if required to do so). • BT A2DP status is "Foreground" • Audio working
5	Terminate BT HFP	Invoke Terminate Application action for BT A2DP.	• BT A2DP application terminated
6	UPnP Server Disconnect	See Definitions in [3]	.

Table 18: Launch BT A2DP and check audio link - Test Steps

3.2.3 SR/AUDIO/BT/TerminateHFP

Requirement: CONDITIONAL

Condition: Support for BT HFP AND

Support for BT connection setup through MirrorLink

Test if BT HFP can be terminated on the MirrorLink server.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes BT HFP application
3	UPnP Action SetClientProfile	Set the client profile via the UPnP service that specifies BT address of the test system. Set `startConnection` to "`false`".	• Received SetClientProfile response
4	Launch BT HFP	Invoke Launch Application for BT HFP Check application status via UPnP Get Application Status.	• Receive URL on Launch Application • Server initiates the BT connection. • BT HFP status is "Foreground" • Audio working
5	Terminate BT HFP	Invoke Terminate Application action for BT HFP. Check application status via UPnP Get Application Status.	• BT HFP application terminated • BT HFP status is "Notrunning" • DUT MAY disconnect the BT connection
6	UPnP Server Disconnect	See Definitions in [3]	.

Table 19: Terminate BT HFP - Test Steps

3.2.4 SR/AUDIO/BT/TerminateA2DP

Requirement: CONDITIONAL

Condition: Server supports BT A2DP AND

Support for BT connection setup through MirrorLink

Test if BT A2DP can be terminated on the MirrorLink server.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes BT A2DP application
3	UPnP Action SetClientProfile	Set the client profile via the UPnP service that specifies BT address of the test system. Set `startConnection` to "`false`".	• Received SetClientProfile response
4	Launch BT A2DP	Invoke Launch Application for BT A2DP Check application status via UPnP Get Application Status.	• Receive URL on Launch Application • Server initiates the BT connection. • BT A2DP status is "Foreground" • Audio working
5	Terminate BT HFP	Invoke Terminate Application action for BT A2DP. Check application status via UPnP Get Application Status.	• BT A2DP application terminated • BT A2DP status is "Notrunning" • DUT MAY disconnect the BT connection
6	UPnP Server Disconnect	See Definitions in [3]	.

Table 20: Terminate BT A2DP - Test Steps

3.3 RTP Client

3.3.1 SR/AUDIO/RTPC/LaunchRtpClient

Requirement: CONDITIONAL

Condition: Support for RTP Client

Tests if the RTP Client can be launched

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes RTP client for payload type 99
3	Launch RTP Client	Invoke Launch Application for RTP client, supporting payload type 99. Check application status via UPnP Get Application Status.	• Receive URL on Launch Application • RTP client status is “Foreground”
4	RTP Client disconnect	See definitions	• RTP client terminated

Table 21: Launch RTP Client - Test Steps

3.3.2 SR/AUDIO/RTPC/ConnectRtpClient

Requirement: CONDITIONAL

Condition: Support for RTP Client

Tests if the RTP Server can connect to the RTP Client.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes RTP client for payload types 99
3	Launch RTP Client	Invoke Launch Application for RTP client, supporting payload type 99.	• Receive URL on Launch Application
4	Connect to RTP client	Open UDP socket Send empty RTP packet Send RTP packet stream	• Validate receiving of audio stream (if possible).
5	RTP Client disconnect	See definitions	

Table 22: Connect RTP Client - Test Steps

3.3.3 SR/AUDIO/RTPC/TerminateRtpClient

Requirement: CONDITIONAL

Condition: Support for RTP Client

Tests if the RTP Client can be terminated

Step	Name	Description	Expected Result
1	RTP Client Connect	See Definitions Select payload type 99	
2	Terminate RTP Client	Invoke Terminate Application action. Close UDP socket Check application status via UPnP Get Application Status.	• RTP Client terminated • RTP Client status is “Notrunning” • No audio playback after termination
3	UPnP Client Disconnect	See Definitions in [3]	

Table 23: Terminate RTP Client - Test Steps

3.3.4 SR/AUDIO/RTPC/InitialPlaybackLatency

Requirement: CONDITIONAL

Condition: Support for RTP Client

The test engineer gets asked to prepare to listen to audio. The server sends a couple of RTP packets to the client, together containing less than IPL samples as payload. The marker bit in the last packet is not set. The client is expected to wait for at least IPL samples to start playback, thus the test engineer SHOULD NOT hear anything. The test engineer is being asked if this is the case.

Step	Name	Description	Expected Result
1	RTP client connect	See Definitions Select payload type 98	
2	Send RTP packets	Send RTP packets to the MirrorLink Server’s RTP client. Marker bit is not set. RTP stream, number of samples in RTP stream is less than 90% of announced IPL. Payload type 99	• RTP packets received • No audio playback
3	RTP client disconnect	See Definitions	

Table 24: Send payload type 98 RTP packets – Test Steps

3.3.5 SR/AUDIO/RTPC/PayloadType0Receive

Requirement: CONDITIONAL

Condition: Support for RTP Client AND

Support for RTP payload type 0

RTP packets are generated and sent to the RTP client on the MirrorLink server. The stream takes 10 seconds and uses payload type 0.

Step	Name	Description	Expected Result
1	RTP client connect	See Definitions Select payload type 0	
2	Send RTP packets	Send RTP packets to the MirrorLink Server’s RTP client. RTP stream at least 10s Payload type 0	• RTP packets received • May be send to audio playback
3	RTP client disconnect	See Definitions	

Table 25: Send payload type 0 RTP packets – Test Steps

3.3.6 SR/AUDIO/RTPC/PayloadType99Receive

Requirement: CONDITIONAL

Condition: Support for RTP Client

RTP packets are generated and sent to the RTP client on the MirrorLink server. The stream takes 10 seconds and uses payload type 99.

Step	Name	Description	Expected Result
1	RTP client connect	See Definitions Select payload type 99	
2	Send RTP packets	Send RTP packets to the MirrorLink Server's RTP client. RTP stream at least 10s Payload type 99	• RTP packets received • May be send to audio playback
3	RTP client disconnect	See Definitions	

Table 26: Send payload type 99 RTP packets – Test Steps

3.3.7 SR/AUDIO/RTPC/PayloadType98Receive

Requirement: CONDITIONAL

Condition: Support for RTP Client AND

Support for RTP payload type 98

RTP packets are generated and sent to the RTP client on the MirrorLink server. The stream takes 10 seconds and uses payload type 98.

Step	Name	Description	Expected Result
1	RTP client connect	See Definitions Select payload type 98	
2	Send RTP packets	Send RTP packets to the MirrorLink Server's RTP client. RTP stream at least 10s Payload type 98	• RTP packets received • May be send to audio playback
3	RTP client disconnect	See Definitions	

Table 27: Send payload type 98 RTP packets – Test Steps

3.3.8 SR/AUDIO/RTPC/VCR/ClientInitiated

Requirement: CONDITIONAL

Condition: Support for RTP Client AND

Support for Voice Command Recognition over RTP

RTP packets are generated and sent to the Voice Command Recognition Engine on the MirrorLink server. A pre-recorded audio clip MUST be provided from the DUT vendor that will cause the device to perform a given action, as described in the PIXIT.

Step	Name	Description	Expected Result
1	RTP client connect	See Definitions Select payload type 99	• Audio Content entry of the RTP Client includes Voice Command In flag

Step	Name	Description	Expected Result
2	VNC connect	Test Engineer launches an application, which supports voice command recognition.	• DUT provides URL in response to UPnP launch application • VNC session established
3	Enable Voice Command Recognition	CTS sends VNC Device Status Request message, enabling Voice Command Input	• DUT responds with VNC Device Status message, enabling Voice Command Input • DUT responds with VNC Device Status message, enabling Microphone Input • Note: Device Status messages MAY be combined into a single message
4	Check Voice Command Recognition	CTS sends pre-recorded voice command to MirrorLink Server as RTP stream • Payload type 99 • RTP header extension set to 0xF0000010 • RTP stream finished with M flag set to 1	• RTP packets received • May be send to audio playback • Device performs expected voice command action (PIXIT)
5	Disable Voice Command Recognition	CTS sends VNC Device Status Request message, disabling Voice Command Input	• DUT responds with VNC Device Status message, disabling Microphone Input • DUT responds with VNC Device Status message, disabling Voice Command Input • Note: Device Status messages MAY be combined into a single message • DUT responds to the Voice Command with expected action (PIXIT)
6	RTP client disconnect	See definitions	

Table 28: Voice Command Recognition – Client Initiated

3.3.9 SR/AUDIO/RTPC/VCR/ServerInitiatedClientEnded

Requirement: CONDITIONAL

Condition: Support for RTP Client AND

Support for Voice Command Recognition over RTP

MirrorLink Server requests a voice command from the MirrorLink Client. RTP packets are generated and sent to the Voice Command Recognition Engine on the MirrorLink server. A pre-recorded audio clip MUST be provided from the DUT vendor that will cause the device to perform a given action, as described in the PIXIT. The Client ends the Voice Command input.

Step	Name	Description	Expected Result
1	RTP client connect	See Definitions Select payload type 99	• Audio Content entry of the RTP Client includes Voice Command In flag

Step	Name	Description	Expected Result
2	VNC connect	Test Engineer launches an application, which supports voice command recognition.	• DUT provides URL in response to UPnP launch application • VNC session established
3	Request Voice Command	Test Engineer executes the steps to request a voice command input (PIXIT).	• DUT sends VNC Device Status message, enabling Voice Command Input • DUT sends VNC Device Status message, enabling Microphone Input • Note: Device Status messages MAY be combined into a single message
4	Check Voice Command Recognition	CTS sends pre-recorded audio to MirrorLink Server as RTP stream • Payload type 99 • RTP header extension set to 0xF0000010 • RTP stream finishes with M flag set to 1	• RTP packets received
5	Confirm Voice Command	CTS sends Device Status message, disabling Voice Command Input	• DUT responds with VNC Device Status message, disabling Microphone Input • DUT responds with VNC Device Status message, disabling Voice Command Input • Note: Device Status messages MAY be combined into a single message • DUT responds to the Voice Command with expected action (PIXIT)
6	RTP client disconnect	See definitions	

Table 29: Voice Command Recognition – Server Initiated / Client Ended

3.3.10 SR/AUDIO/RTPC/VCR/ServerInitiatedServerEnded

Requirement: CONDITIONAL

Condition: Support for RTP Client AND

Support for Voice Command Recognition over RTP

MirrorLink Server requests a voice command from the MirrorLink Client. RTP packets are generated and sent to the Voice Command Recognition Engine on the MirrorLink server. A pre-recorded audio clip MUST be provided from the DUT vendor that will cause the device to perform a given action, as described in the PIXIT. The Server ends the voice command input.

Step	Name	Description	Expected Result
1	RTP client connect	See Definitions Select payload type 99	• Audio Content entry of the RTP Client includes Voice Command In flag

Step	Name	Description	Expected Result
2	VNC connect	Test Engineer launches an application, which supports voice command recognition.	• DUT provides URL in response to UPnP launch application • VNC session established
3	Request Voice Command	Test Engineer executes the steps to request a voice command input (PIXIT).	• DUT sends VNC Device Status message, enabling Voice Command Input • DUT sends VNC Device Status message, enabling Microphone Input • Note: Device Status messages MAY be combined into a single message
4	Check Voice Command Recognition	CTS sends pre-recorded audio to MirrorLink Server as RTP stream • Payload type 99 • RTP header extension set to 0xF0000010 • RTP stream does not finish with M flag set to 1	• RTP packets received
5	Confirm Voice Command	Test Engineer executes the steps to end the Voice Command (PIXIT). RTP stream finishes with M flag set to 1 on reception of the Device Status message.	• DUT sends VNC Device Status message, disabling Microphone Input • DUT sends VNC Device Status message, disabling Voice Command Input • Note: Device Status messages MAY be combined into a single message • DUT responds to the Voice Command with expected action (PIXIT)
7	RTP client disconnect	See definitions	

Table 30: Voice Command Recognition – Server Initiated / Server Ended

3.3.11 SR/AUDIO/RTPC/RequestMicrophoneInput

Requirement: CONDITIONAL

Condition: Support for RTP Client AND

Support for Conversational Audio over RTP

RTP packets are generated and sent to the MirrorLink server. A pre-recorded audio clip MUST be provided from the DUT vendor that will cause the device to perform a given action, as described in the PIXIT.

Step	Name	Description	Expected Result
1	RTP client connect	See Definitions Select payload type 99	• Audio Content entry of the RTP Client includes Phone flag
2	Enable Microphone Input	Test Engineer executes the steps to have the MirrorLink Server request to open the	• VNC Device Status message received. • Microphone Input enabled

Step	Name	Description	Expected Result
		MirrorLink Client's Microphone from the MirrorLink Client (PIXIT).	
3	Check Conversational Audio	Send pre-recorded audio to MirrorLink Server as RTP stream • Payload type 99 • RTP header extension set to 0xF0000020 • Effect of mic input is known to test engineer	• RTP packets received • May be send to audio playback • Device performs expected action (PIXIT)
4	Disable Microphone Input	Test Engineer executes the steps to have the MirrorLink Server request to close the MirrorLink Client's Microphone from the MirrorLink Client (PIXIT).	• VNC Device Status message received. • Microphone Input disabled
5	RTP client disconnect	See definitions	

Table 31: Request Microphone Input

3.4 RTP Server

3.4.1 SR/AUDIO/RTPS/LaunchRtpServer

Requirement: MANDATORY

Condition: None

Tests if the RTP Server can be launched

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes RTP server for payload type 99
3	Launch RTP Server	Invoke Launch Application for RTP server, supporting payload type 99. Check application status via UPnP Get Application Status.	• Receive URL on Launch Application • RTP server status is “Foreground”
4	RTP server disconnect	See Definitions	

Table 32: Launch RTP Server - Test Steps

3.4.2 SR/AUDIO/RTPS/ConnectRtpServer

Requirement: MANDATORY

Condition: None

Tests if the RTP Server can be connected to the RTP Client

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	UPnP Application Listing	Invoke UPnP Get Application List action	• Receive valid Application Listing • Includes RTP server for payload type 99
3	Launch RTP Server	Invoke Launch Application for RTP server, supporting payload type 99. Check application status via UPnP Get Application Status.	• Receive URL on Launch Application • RTP server status is “Foreground”
4	Connect to RTP server	Open UDP socket Send single bytes to RTP server until at least one RTP packet arrives	• First RTP packet arrives • Packets received from URL identical to the advertised one
5	RTP server disconnect	See Definitions	

Table 33: Connect RTP Server - Test Steps

3.4.3 SR/AUDIO/RTPS/TerminateRtpServer

Requirement: MANDATORY

Condition: None

Tests if the RTP Server can be terminated

Step	Name	Description	Expected Result
1	RTP Server Connect	See Definitions Select payload type 99	
2	Terminate RTP Server	Invoke Terminate Application action. Close UDP socket Check application status via UPnP Get Application Status.	• RTP server terminated • RTP server status is “Notrunning” • No RTP packets send after termination
3	UPnP Server Disconnect	See Definitions in [3]	

Table 34: Terminate RTP Server - Test Steps

3.4.4 SR/AUDIO/RTPS/PayloadType99Streaming

Requirement: MANDATORY

Condition: None

This step fails if the RTP packets received are not sent in payload type 99.

Step	Name	Description	Expected Result
1	RTP Server connect	See Definitions Select payload type 99	
2	Streaming in Payload Type 99	Start audio playback Test Engineer confirms that audio quality is reasonable.	• Correctly formatted RTP stream received • Receive at least 10s of audio • Payload type is 99
3	RTP server disconnect	See Definitions	

Table 35: Streaming in Payload Type 99 – Test Steps

3.4.5 SR/AUDIO/RTPS/PayloadType98Streaming

Requirement: CONDITIONAL

Condition: Support for RTP payload type 98

This step fails if the RTP packets received are not sent in payload type 98.

Step	Name	Description	Expected Result
1	RTP Server connect	See Definitions Select payload type 98	
2	Streaming in Payload Type 98	Start audio playback Test Engineer confirms that audio quality is reasonable.	• Correctly formatted RTP stream received • Receive at least 10s of audio • Payload type is 98
3	RTP server disconnect	See Definitions	

Table 36: Streaming in Payload Type 98 – Test Steps

3.4.6 SR/AUDIO/RTPS/PayloadType0Streaming

Requirement: CONDITIONAL

Condition: Support for RTP payload type 0

This step fails if the RTP packets received are not sent in payload type 0.

Step	Name	Description	Expected Result
1	RTP Server connect	See Definitions Select payload type 0	
2	Streaming in Payload Type 0	Start audio playback Test Engineer confirms that audio quality is reasonable.	• Correctly formatted RTP stream received • Receive at least 10s of audio • Payload type is 0
3	RTP server disconnect	See Definitions	

Table 37: Streaming in Payload Type 0 – Test Steps

3.4.7 SR/AUDIO/RTPS/GlobalAudioNormalization

Requirement: MANDATORY

Condition: None

This step fails if the audio volume does change, when the user changes external or global audio volume control on the MirrorLink Server device.

Step	Name	Description	Expected Result
1	RTP Server connect	See Definitions	
2	Streaming RTP audio	Start audio playback Test Engineer confirms that audio quality is reasonable.	• Correctly formatted RTP stream received
3	Global audio volume change	Test Engineer changes the audio volume on the DUT: • external volume controls (if available) and • global audio volume setting (if available) Note: This does not apply to any audio volume setting, applicable to a dedicated application.	• Audio volume is reasonable in the beginning • RTP audio volume does not change when audio volume is changed on the device.
4	RTP server disconnect	See Definitions	

Table 38: Normalization of Global Audio in RTP Stream

3.5 PICS Validation

The PICS validation test cases will independently detect the existence of MirrorLink features in the DUT. All features, which are detectable, could in practice be used from a connected MirrorLink device, and are therefore subject to validation in the certification program through other test cases. Hence the objective of the PICS validation test cases is not to assess whether the feature is implemented correctly, but to collect supported features from the DUT and to check this against the entries made in the PICS document.

A feature, which is detected, but marked as "not implemented" in the PICS document will fail the test case. A feature, which is not detected, but marked as "implemented" in the PICS document, will fail the test case.

3.5.1 SR/AUDIO/PICS/RTP

Requirement: MANDATORY

Condition: None

This test case validates the PICS entries with respect to the RTP settings.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	Set Payload Type	Invoke Set Client Profile Define support for selected payload types 0, 98, 99	
3	UPnP Application Listing	Invoke UPnP Get Application List action	
4	Check PICS feature	FEAT_SERVER_AUDIO_RTP_Client_Type0	• Application listing includes RTP Client with payload type "0"
5	Check PICS feature	FEAT_SERVER_AUDIO_RTP_Client_Type98	• Application listing includes RTP Client with payload type "98"
6	Check PICS feature	FEAT_SERVER_AUDIO_RTP_Client_Type99	• Application listing includes RTP Client with payload type "99"
7	Check PICS feature	FEAT_SERVER_AUDIO_RTP_Server_Type0	• Application listing includes RTP Server with payload type "0"
8	Check PICS feature	FEAT_SERVER_AUDIO_RTP_Server_Type98	• Application listing includes RTP Server with payload type "98"
9	Check PICS feature	FEAT_SERVER_AUDIO_RTP_Server_Type99	• Application listing includes RTP Server with payload type "99"
10	Check PICS feature	FEAT_SERVER_AUDIO_RTP_Server_Header	• Application listing includes RTP Server with payload type "99"
11	Check PICS feature	FEAT_SERVER_AUDIO_RTP_Audio_Context	• Application listing includes RTP Server with payload type "99"
12	Check PICS feature	FEAT_SERVER_AUDIO_RTP_Client_Voice	• Application listing includes RTP Client with audio type "phone" or "all" and "Voice Command In" flag enabled in audioInfo@contentCategory.
13	Check PICS feature	FEAT_SERVER_AUDIO_RTP_Client_Conversation	• Application listing includes RTP Client with audio type "phone" or "all" and "Phone Audio" flag enabled in audioInfo@contentCategory.

Table 39: MirrorLink Server RTP settings PICS Checkup

3.5.2 SR/AUDIO/PICS/Bluetooth

Requirement: MANDATORY

Condition: None

This test case validates the PICS entries with respect to the Bluetooth settings.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	Set Payload Type	Invoke Set Client Profile Define support for selected payload types 0, 98, 99	
3	UPnP Application Listing	Invoke UPnP Get Application List action	
4	Check PICS feature	FEAT_SERVER_AUDIO_RTP_BT_HFP	• Application listing includes BTHFP
5	Check PICS feature	FEAT_SERVER_AUDIO_RTP_BT_A2DP	• Application listing includes BTA2DP

Table 40: MirrorLink Server Bluetooth settings PICS Checkup

3.5.3 SR/AUDIO/PICS/Telephony

Requirement: MANDATORY

Condition: None

This test case validates the PICS entries with respect to the Telephony settings.

Step	Name	Description	Expected Result
1	UPnP Server Connect	See Definitions in [3]	
2	Set Payload Type	Invoke Set Client Profile Define support for selected payload types 0, 98, 99	
3	UPnP Application Listing	Invoke UPnP Get Application List action	
4	Check PICS feature	FEAT_SERVER_AUDIO_Telephony	• Application listing includes BTHFP with audio type "phone" and "Phone Audio" flag enabled in audioInfo@contentCategory. OR • Application listing includes RTP Client and Server with audio type "phone" or "all" and "Phone Audio" flag enabled in audioInfo@contentCategory.

Table 41: MirrorLink Server Telephony settings PICS Checkup

4 CLIENT FEATURE TEST CASES

4.1 Bluetooth

4.1.1 CL/AUDIO/BT/LaunchHFP

Requirement: CONDITIONAL

Condition: Support for BT HFP AND

Support for BT connection setup through MirrorLink

Test if BT HFP can be launched from the MirrorLink Client.

Step	Name	Description	Expected Result
1	UPnP Client Connect	See Definitions in [3]	
2	UPnP Action SetClientProfile	Receive UPnP Client Profile	• Received SetClientProfile with correct BT MAC address • Note: SetClientProfile action MAY be skipped
3	UPnP Application Listing	Wait for Get Application List action. Provide Application List including BT HFP.	• Invoke Get Application List action
4	Launch BT HFP	Wait for Launch Application action for the BT HFP.	• Invoke Launch Application • AppID is matching BT HFP component
5	BT connection setup	Initiate BT connection (if required to do so)	• Initiates the BT connection (if required to do so)
6	UPnP Server Disconnect	See Definitions in [3]	

Table 42: Launch BT HFP

4.1.2 CL/AUDIO/BT/LaunchA2DP

Requirement: CONDITIONAL

Condition: Support for BT A2DP AND

Support for BT connection setup through MirrorLink

Test if BT A2DP can be launched from the MirrorLink Client.

Step	Name	Description	Expected Result
1	UPnP Client Connect	See Definitions in [3]	
2	UPnP Action SetClientProfile	Receive UPnP Client Profile	• Received SetClientProfile with correct BT MAC address • Note: SetClientProfile action MAY be skipped
3	UPnP Application Listing	Wait for Get Application List action. Provide Application List including BT A2DP.	• Invoke Get Application List action
4	Launch BT HFP	Wait for Launch Application action for the BT A2DP.	• Invoke Launch Application

Step	Name	Description	Expected Result
			• AppID is matching BT A2DP component
5	BT connection setup	Initiate BT connection (if required to do so)	• Initiates the BT connection (if required to do so)
6	Audio playing	Test engineer launches an App on the DUT, providing media audio (PIXIT)	• Audio is being played from the MirrorLink client • Reasonable audio quality
7	UPnP Server Disconnect	See Definitions in [3]	

Table 43: Launch BT AD2P

4.2 Audio Link Identification

4.2.1 CL/AUDIO/LINK/IdentifyRtpPt0

Requirement: CONDITIONAL

Condition: Support for Payload Type 0

The currently active client profile is searched for the rtpStreaming structure. If the payloadType element is present, the contained list is searched for the payload type 0.

Test Engineer MAY need to execute known steps trigger the MirrorLink client invoking a SetClientProfile action.

Step	Name	Description	Expected Result
1	UPnP Client Connect	See Definitions in [3]	
2	RTP Client payload type 0 support	Test Engineer executes the knows steps invoking a Set Client Profile action (if required) Wait for MirrorLink Client to send Set Client Profile action (if required)	• Receive Set Client Profile action(s) • RTP payload type 0 announced OR no Client Profile set
3	UPnP Client Disconnect	See Definitions in [3]	

Table 44: RTP payload type 0 supported – Test Steps

4.2.2 CL/AUDIO/LINK/IdentifyRtpPt98

Requirement: CONDITIONAL

Condition: Support for Payload Type 98

The currently active client profile is searched for the rtpStreaming structure.

Test Engineer MAY need to execute known steps trigger the MirrorLink client invoking a SetClientProfile action.

Step	Name	Description	Expected Result
1	UPnP Client Connect	See Definitions in [3]	
2	RTP Client payload type 98 support	Test Engineer executes the knows steps invoking a Set Client Profile action (if required) Wait for MirrorLink Client to send Set Client Profile action	• Receive Set Client Profile action(s) • RTP payload type 98 announced
3	UPnP Client Disconnect	See Definitions in [3]	

Table 45: RTP payload type 98 supported – Test Steps

4.2.3 CL/AUDIO/LINK/IdentifyRtpPt99

Requirement: MANDATORY

Condition: None

The currently active client profile is searched for the rtpStreaming structure. If the payloadType element is present, the contained list is searched for the payload type 99.

Test Engineer MAY need to execute known steps trigger the MirrorLink client invoking a SetClientProfile action.

Step	Name	Description	Expected Result
1	UPnP Client Connect	See Definitions in [3]	
2	RTP Client payload type 99 support	Test Engineer executes the knows steps invoking a Set Client Profile action (if required) Wait for MirrorLink Client to send Set Client Profile action (if required)	• Receive Set Client Profile action(s) • RTP payload type 99 announced OR no Client Profile set
3	UPnP Client Disconnect	See Definitions in [3]	

Table 46: RTP payload type 0 supported – Test Steps

4.3 RTP Server

4.3.1 CL/AUDIO/RTPS/LaunchRtpClient

Requirement: CONDITIONAL

Condition: Support for RTP Server

Tests if the RTP Server can be launched from the MirrorLink client.

Step	Name	Description	Expected Result
1	UPnP Client Connect	See Definitions in [3]	
2	UPnP Application Listing	Wait for Get Application List action. Provide Application List including RTP client with selected payload type(s) and audio type(s). Do not include BT modules into the App listing;	• Invoke Get Application List action
3	Launch RTP Client	Wait for Launch Application action for the RTP client with selected payload type and audio type. If the RTP client is not launched automatically, the test engineer will start an application providing audio (PIXIT)	• Invoke Launch Application • AppID is matching RTP client • RTP client provides selected payload type(s) and audio type(s)
4	RTP server disconnect	See Definitions	• RTP server terminated

4.3.2 CL/AUDIO/RTPS/PayloadType99Streaming

Requirement: CONDITIONAL

Condition: Support for RTP Server

This step fails if the RTP packets received are not sent in payload type 99.

Step	Name	Description	Expected Result
1	RTP Server connect	See Definitions CTS advertises a single RTP client with payload type 99 and audio type phone and content category Voice Command In.	
2	Open Microphone	CTS sends a VNC Device Status message enabling the Mic Input and Voice Command Input.	
3	Streaming in Payload Type 99	Start audio playback Test Engineer confirms that audio quality is reasonable.	• Correctly formatted RTP stream received • Receive at least 10s of audio • Payload type is 99

Step	Name	Description	Expected Result
4	Close Microphone	CTS sends a VNC Device Status message disabling the Mic Input and Voice Command Input.	
5	RTP server disconnect	See Definitions	

Table 47: Streaming in Payload Type 99 – Test Steps

4.3.3 CL/AUDIO/RTPS/PayloadType98Streaming

Requirement: CONDITIONAL

Condition: Support for RTP Server AND

Support for RTP payload type 98

This step fails if the RTP packets received are not sent in payload type 98.

Step	Name	Description	Expected Result
1	RTP Server connect	See Definitions CTS advertises a single RTP client with payload type 98 and audio type phone and content category Voice Command In.	• Invoke Set Client Profile action to include RTP PT 98.
2	Open Microphone	CTS sends a VNC Device Status message enabling the Mic Input and Voice Command Input.	
3	Streaming in Payload Type 98	Start audio playback Test Engineer confirms that audio quality is reasonable.	• Correctly formatted RTP stream received • Receive at least 10s of audio • Payload type is 98
4	Close Microphone	CTS sends a VNC Device Status message disabling the Mic Input and Voice Command Input.	
5	RTP server disconnect	See Definitions	

Table 48: Streaming in Payload Type 98 – Test Steps

4.3.4 CL/AUDIO/RTPS/PayloadType0Streaming

Requirement: CONDITIONAL

Condition: Support for RTP Server AND

Support for RTP payload type 0

This step fails if the RTP packets received are not sent in payload type 0.

Step	Name	Description	Expected Result
1	RTP Server connect	See Definitions CTS advertises a single RTP client with payload type 0 and audio type	• Invoke Set Client Profile action to include RTP PT 0.

Step	Name	Description	Expected Result
		phone and content category Voice Command In.	
2	Open Microphone	CTS sends a VNC Device Status message enabling the Mic Input and Voice Command Input.	
3	Streaming in Payload Type 0	Start audio playback Test Engineer confirms that audio quality is reasonable.	• Correctly formatted RTP stream received • Receive at least 10s of audio • Payload type is 0
4	Close Microphone	CTS sends a VNC Device Status message disabling the Mic Input and Voice Command Input.	
5	RTP server disconnect	See Definitions	

Table 49: Streaming in Payload Type 0 – Test Steps

4.3.5 CL/AUDIO/RTPS/VCR/ClientInitiated

Requirement: CONDITIONAL

Condition: Support for RTP Server AND
Support for sending Voice Commands over RTP AND
Support for initiating the Voice Command AND
Support for terminating the Voice Command

The test case verifies, whether the MirrorLink Client device can send voice commands to the MirrorLink Server. The voice command is initiated and terminated from the client device, e.g. the user using a Push-to-Talk button.

Step	Name	Description	Expected Result
1	RTP Server connect	See Definitions CTS advertises a single RTP client with payload type 99 and audio type phone and content category Voice Command In.	
2	VNC connect	Test Engineer launches an application, which supports voice command recognition.	• DUT sends UPnP launch application • VNC session established
3	Initiate Voice Command	Test Engineer initiates the voice command (PIXIT)	• DUT sends VNC Device Status Request message, enabling Voice Input • RTP backchannel established • No RTP stream received
4	Voice Command Input	CTS sends VNC Device Status message with Voice Input and Mic Input enabled	• Correctly formatted RTP stream received • RTP header extension value set to 0xF0000010

Step	Name	Description	Expected Result
		Test Engineer speaks into the microphone of the DUT	
5	End Voice Command	Test Engineer executes steps to end voice command (PIXIT)	• DUT sends VNC Device Status Request message, disabling Voice Input
6	Mic is closed	CTS sends VNC Device Status message with Voice Input and Mic Input disabled Test Engineer speaks into the microphone of the DUT	• RTP stream finishes with M-flag set to 1 – latest 500ms after CTS sent the VNC Device Status message • No RTP stream received.
7	Voice Command Playback	CTS plays the received voice command audio stream	• Test Engineer confirms that audio is not garbled.
8	RTP server disconnect	See Definitions	

Table 50: Voice Command Input – Client Initiated

4.3.6 CL/AUDIO/RTPS/VCR/ServerInitiatedClientEnded

Requirement: CONDITIONAL

Condition: Support for RTP Server AND

Support for sending Voice Commands over RTP AND

Support for terminating the Voice Command

The test case verifies, whether the MirrorLink Client device can send voice commands to the MirrorLink Server. The voice command is initiated from the server device, e.g. the user using a Push-to-Talk button within the MirrorLink application. The Client device (DUT) ends the Voice Command input.

Step	Name	Description	Expected Result
1	RTP Server connect	See Definitions CTS advertises a single RTP client with payload type 99 and audio type phone and content category Voice Command In.	
2	VNC connect	Test Engineer launches an application, which supports voice command recognition.	• DUT sends UPnP launch application • VNC session established
3	Initiate Voice Command	CTS sends a VNC Device Status message enabling the Mic Input and the Voice Command Input	• RTP backchannel established • No RTP stream received
4	Voice Command Input	Test Engineer speaks into the microphone of the DUT	• Correctly formatted RTP stream received • RTP header extension value set to 0xF0000010
5	Client Ends Voice Command	Test Engineer executes the steps to end the voice command (PIXIT)	• DUT sends VNC Device Status Request message, disabling Voice Command Input

Step	Name	Description	Expected Result
6	Server ends Voice Command	CTS sends a VNC Device Status message disabling the Mic Input and the Voice Command Input in response	• RTP stream finished with M flag set to 1 (can happen already in step 5) – latest 500ms after CTS sent the VNC Device Status message.
7	Mic is closed	Test Engineer speaks into the microphone of the DUT	• No RTP stream received.
8	Voice Command Playback	CTS plays the received voice command audio stream	• Test Engineer confirms that audio is not garbled.
9	RTP server disconnect	See Definitions	

Table 51: Voice Command Input – Server Initiated / Client Ended

4.3.7 CL/AUDIO/RTPS/VCR/ServerInitiatedServerEnded

Requirement: CONDITIONAL

Condition: Support for RTP Server AND

Support for sending Voice Commands over RTP

The test case verifies, whether the MirrorLink Client device can send voice commands to the MirrorLink Server. The voice command is initiated from the server device, e.g. the user using a Push-to-Talk button within the MirrorLink application. The Server device ends the Voice Command input.

Step	Name	Description	Expected Result
1	RTP Server connect	See Definitions CTS advertises a single RTP client with payload type 99and audio type phone and content category Voice Command In.	
2	VNC connect	Test Engineer launches an application, which supports voice command recognition.	• DUT sends UPnP launch application • VNC session established
3	Initiate Voice Command	CTS sends a VNC Device Status message enabling the Mic Input and the Voice Command Input	• RTP backchannel established • No RTP stream received
4	Voice Command Input	Test Engineer speaks into the microphone of the DUT	• Correctly formatted RTP stream received • RTP header extension value set to 0xF0000010
5	Server Ends Voice Command	CTS sends a VNC Device Status message disabling the Mic Input and the Voice Command Input	• RTP stream finished with M flag set to 1 – latest 500ms after CTS sent the VNC Device Status message
6	Mic is closed	Test Engineer speaks into the microphone of the DUT	• No RTP stream received.
7	Voice Command Playback	CTS plays the received voice command audio stream	• Test Engineer confirms that audio is not garbled.

Step	Name	Description	Expected Result
8	RTP server disconnect	See Definitions	

Table 52: Voice Command Input – Server Initiated / Server Ended

4.3.8 CL/AUDIO/RTPS/MicrophoneInput

Requirement: CONDITIONAL

Condition: Support for RTP Server AND

Support for Conversational Audio over RTP

The test case verifies, whether the MirrorLink Client device can send conversational audio to the MirrorLink Server. The audio is initiated from the server device, e.g. trigger by the application.

Step	Name	Description	Expected Result
1	RTP Server connect	See Definitions CTS advertises a single RTP client with payload type 99 and audio type phone and content category Phone.	
2	Open Microphone	CTS sends a VNC Device Status message enabling the Mic Input.	
3	Audio Input	Test Engineer speaks into the microphone of the DUT	• Correctly formatted RTP stream received • RTP header extension value set to 0xF0000020
4	Close Microphone	CTS sends a VNC Device Status message disabling the Mic Input	• RTP stream finished with M flag set to 1
5	Mic is closed	Test Engineer speaks into the microphone of the DUT	• No RTP stream received.
6	Voice Command Playback	CTS plays the received audio stream	• Test Engineer confirms that audio is not garbled.
7	RTP server disconnect	See Definitions	

Table 53: Microphone Input

4.4 RTP Client

4.4.1 CL/AUDIO/RTPC/LaunchRtpServer

Requirement: MANDATORY

Condition: None

Tests if the RTP Client can be launched

Step	Name	Description	Expected Result
1	UPnP Client Connect	See Definitions in [3]	
2	UPnP Application Listing	Wait for Get Application List action. Provide Application List including RTP server with payload type 0 and 99. Do not include BT modules into the App listing;	• Invoke Get Application List action
3	Launch RTP Server	Wait for Launch Application action for the RTP server	• Invoke Launch Application • AppID is matching RTP Server
4	RTP Client disconnect	See Definitions	

Table 54: Launch RTP Client - Test Steps

4.4.2 CL/AUDIO/RTPC/ConnectRtpClient

Requirement: MANDATORY

Condition: None

Tests if the RTP Server can connect to the RTP Client.

Step	Name	Description	Expected Result
1	UPnP Client Connect	See Definitions in [3]	
2	UPnP Application Listing	Wait for Get Application List action. Provide Application List including RTP server with payload type 99. Do not include BT modules into the App listing;	• Invoke Get Application List action
3	Launch RTP Server	Wait for Launch Application action for the RTP server	• Invoke Launch Application • AppID is matching RTP server
4	Connect to RTP server	Open UDP socket Send empty RTP packet on single UDP byte Wait for at least 2 single UDP bytes prior sending an empty RTP packet	• Receive single UDP bytes, until at least one RTP packet is send.
5	RTP Client disconnect	See Definitions	

Table 55: Connect RTP Client - Test Steps

4.4.3 CL/AUDIO/RTPC/InitialPlaybackLatency

Requirement: MANDATORY

Condition: None

The test engineer gets asked to prepare to listen to audio. The server sends a couple of RTP packets to the client, together containing less than IPL samples as payload. The marker bit in the last packet is not set. The client is expected to wait for at least IPL samples to start playback, thus the test engineer SHOULD NOT hear anything. The test engineer is being asked if this is the case.

Step	Name	Description	Expected Result
1	RTP client connect	See Definitions Select payload type 99	
2	Initial Playback Latency	Send RTP packets to the MirrorLink Server's RTP client. Marker bit is not set. RTP stream, number of samples in RTP stream is less than 90% of announced IPL. Payload type 99	• RTP packets received • No audio playback
3	RTP Client disconnect	See Definitions	

Table 56: Initial Playback Latency – Test Steps

4.4.4 CL/AUDIO/RTPC/PayloadType0Receive

Requirement: CONDITIONAL

Condition: Support for Payload Type 0

The test engineer gets asked to prepare to listen to audio. For a 10 second interval audio is being streamed to the RTP client. The used payload type is 0 and MirrorLink header extensions are embedded. The test engineer is asked if the audio could be heard.

Step	Name	Description	Expected Result
1	RTP Client Connect	See definitions Select payload type 0	
2	Send Payload Type 0 Stream	Provide RTP stream with payload type 0 (at least 10s) Include valid MirrorLink RTP header extensions Test Engineer is asked to prepare to listen to audio and adjust audio levels at the MirrorLink client Test Engineer is asked if the audio can be heard and audio quality is reasonable.	• Audio is being played from the MirrorLink client • Reasonable audio quality
3	RTP Client Disconnect		

Table 57: Receive Payload Type 0 RTP Stream – Test Steps

4.4.5 CL/AUDIO/RTPC/PayloadType99Receive

Requirement: MANDATORY

Condition: None

The test engineer gets asked to prepare to listen to audio. For a 10 second interval audio is being streamed to the RTP client. The used payload type is 99 and MirrorLink header extensions are embedded. The test engineer is asked if the audio could be heard.

Step	Name	Description	Expected Result
1	RTP Client Connect	See definitions Select payload type 99	
2	Send Payload Type 99 Stream	Provide RTP stream with payload type 0 (at least 10s) Include valid MirrorLink RTP header extensions Test Engineer is asked to prepare to listen to audio and adjust audio levels at the MirrorLink client Test Engineer is asked if the audio can be heard and audio quality is reasonable.	• Audio is being played from the MirrorLink client • Reasonable audio quality
3	RTP Client Disconnect		

Table 58: Receive Payload Type 99 RTP Stream – Test Steps

4.4.6 CL/AUDIO/RTPC/PayloadType98Received

Requirement: CONDITIONAL

Condition: Support for Payload Type 98

The test engineer gets asked to prepare to listen to audio. For a 10 second interval audio is being streamed to the RTP client. The used payload type is 98 and MirrorLink header extensions are embedded. The test engineer is asked if the audio could be heard.

Step	Name	Description	Expected Result
1	RTP Client Connect	See definitions Select payload type 98	
2	Send Payload Type 98 Stream	Provide RTP stream with payload type 0 (at least 10s) Include valid MirrorLink RTP header extensions Test Engineer is asked to prepare to listen to audio and adjust audio levels at the MirrorLink client Test Engineer is asked if the audio can be heard and audio quality is reasonable.	• Audio is being played from the MirrorLink client • Reasonable audio quality
3	RTP Client Disconnect		

Table 59: Receive Payload Type 98 RTP Stream – Test Steps

4.5 PICS Validation

The PICS validation test cases will independently detect the existence of MirrorLink features in the DUT. All features, which are detectable, could in practice be used from a connected MirrorLink device, and are therefore subject to validation in the certification program through other test cases. Hence the objective of the PICS validation test cases is not to assess whether the feature is implemented correctly, but to collect supported features from the DUT and to check this against the entries made in the PICS document.

A feature, which is detected, but marked as "`not implemented`" in the PICS document will fail the test case. A feature, which is not detected, but marked as "`implemented`" in the PICS document, will fail the test case.

4.5.1 CL/AUDIO/PICS/RTP

Requirement: MANDATORY

Condition: None

This test case validates the PICS entries with respect to the RTP settings.

Step	Name	Description	Expected Result
1	UPnP Client Connect	See Definitions in [3]	
2	UPnP Application Listing	Wait for Get Application List action. Provide Application List including RTP Servers with payload types 0, 98, 99.	
3	Check PICS feature	FEAT_CLIENT_AUDIO_RTP_Client_Type0	• `payloadType` includes "`0`" in Client Profile
4	Check PICS feature	FEAT_CLIENT_AUDIO_RTP_Client_Type98	• `payloadType` includes "`98`" in Client Profile
5	Check PICS feature	FEAT_CLIENT_AUDIO_RTP_Client_Type99	• `payloadType` includes "`99`" in Client Profile OR Client Profile not set.

Table 60: MirrorLink Client RTP settings PICS Checkup

5 REFERENCES

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

[2] Car Connectivity Consortium, “MirrorLink – Audio”, Version 1.1, CCC-TS-012

[3] Car Connectivity Consortium, “MirrorLink – UPnP Server Device”, Version 1.1, CCC-TS-031