Q-SYS Validation Service

Q-SYS Validation Test Plan

Technical Document

Version 1.0

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Routing Test Service
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Acknowledgements

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Marko Rogan	QSC

Introduction

The University of New Hampshire's InterOperability Laboratory (UNH-IOL) is an institution designed to improve the interoperability of standards-based products by providing an environment where a product can be tested against other implementations of a standard.

Scope:

The following tests define the metrics and methodology used to verify a network switch is capable of handling high levels of Q-SYS traffic without a drop in performance or quality.

Definitions

TWAMP	Two-Way Active Measurement Protocol - RFC 5357
DUT	Device Under Test
Q-SYS Core	QSC Processing Device
Q-SYS Device	Q-SYS endpoints (Video camera, microphone, control screen, etc.)

Possible Problems

Non-PoE Switches	If a switch does not support PoE then Q-SYS devices must be connected via PoE injectors.
8 Port Switches	If a switch does not have enough ports, then some Q-SYS devices must be removed from the test and note what devices were removed.

Test Organization

This document organizes tests by group based on related test methodology or goals. Each group begins with a brief set of comments pertaining to all tests within that group. This is followed by a series of description blocks; each block describes a single test. The format of the description block is as follows:

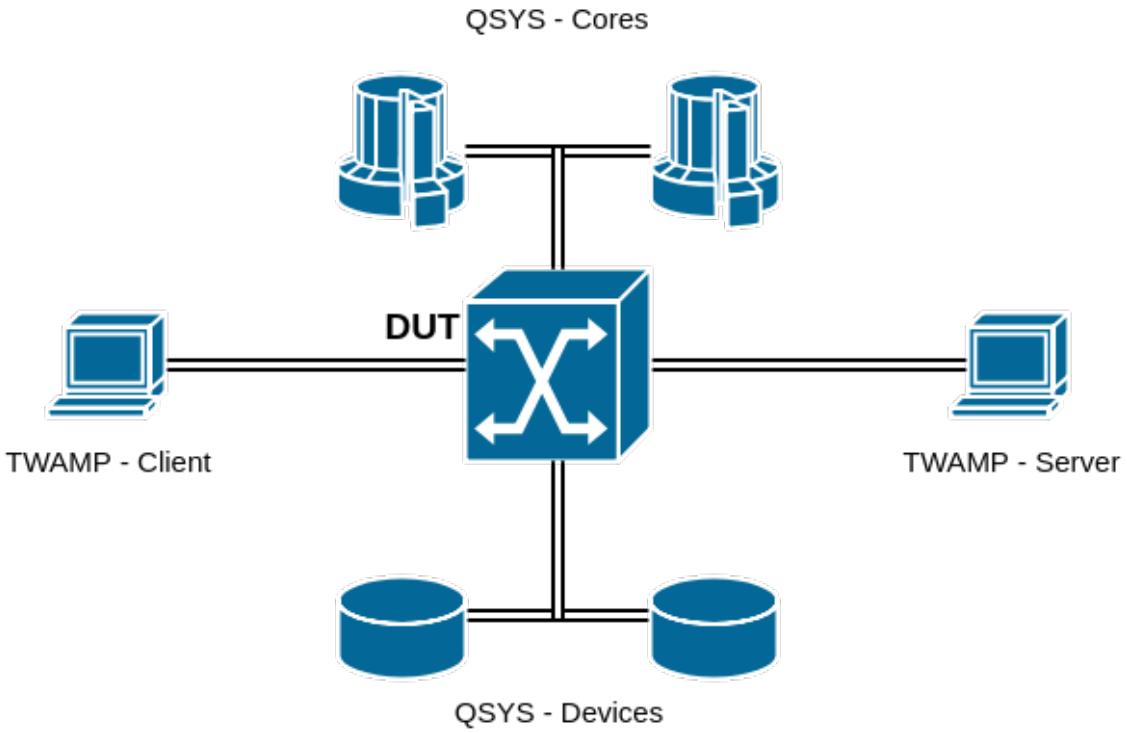
Test Label	The **Test Label** is the first line of the test page. It will have the following form: IP.IOP.A.B Where each component indicates the following: IP – Test Suite Identifier IOP – Interoperability Test Suite A – Group Number B – Test Number Scripts implementing this test suite should follow this convention, and may also append a character in the set [a-z] indicating a particular test part.
Purpose	The **Purpose** is a short statement describing what the test attempts to achieve. It is usually phrased as a simple assertion of the feature or capability to be tested.
Test Setup	The **Test Setup** section describes the configuration of all devices prior to the start of the test. Different parts of the procedure may involve configuration steps that deviate from what is given in the test setup. If a value is not provided for a protocol parameter, then the protocol's default is used for that parameter.
Procedure and Expected Behavior	The **Procedure and Expected Behavior** table contains the step-by-step instructions for carrying out the test. These steps include such things as enabling interfaces, unplugging devices from the network, or sending packets from a test station. The test procedure also cues the tester to make observations of expected behavior, as needed, as not all steps require observation of results. If any behavior is expected for a procedure, it is to be observed prior to continuing to the next step. Failure to observe any behavior prior to continuing constitutes a failed test. Note, that while test numbers continue between test parts, each test part is to be executed independently (Following Common Test Setup and Cleanup as indicated), and are not cascaded from the previous part.
Possible Problems	The **Possible Problems** section contains a description of known issues with the test procedure, which may affect test results in certain situations.

Common Test Setup

Summary: This setup is defined by QSC as a standard configuration of switches for Q-SYS installations

1. The DUT should be configured to prioritize Q-SYS packets such that those packets are given max priority and should not be dropped over regular traffic.
2. Q-SYS Devices should be connected to the Q-SYS Cores such that traffic passes through the DUT.
3. The DUT should be configured such that packets are prioritized based on TOS headers and not the interface that devices are connected to.
4. Any DUT that supports speeds higher then 1Gbps will be run with 1Gbps links to all connected devices.

Common Test Topology



Section 1: Baseline

Overview: These tests gather metrics about the DUT regarding Q-SYS in various scenarios.

Test Q-SYS.Interoperability.1.1: Baseline measurements

Purpose: Gather metrics without other types of traffic.

Reference:
- [RFC-5357] – Section 4

Test Setup: The devices are setup according to Common Test Setup.

TWAMP Session #1	TWAMP Session #2
TOS Header: 0x88 Test Packets: 100	TOS Header: 0xB8 Test Packets: 100

Procedure:

Step	Action	Expected Behavior
1.	TWAMP Controller starts Sessions #1 and #2 simultaneously and records round trip jitter, one-way latency, and packet loss. *(Repeat 10 times)*	Average of round-trip jitter is below **60** µs with a packet loss of **0**%. The latency must be less then **280** µs.

Possible Problems: None.

Test Q-SYS.Interoperability.1.2: Baseline measurements with interference

Purpose: Gather metrics with artificial traffic.

Reference:

- [RFC-5357] – Section 4

Test Setup: The devices are setup according to Common Test Setup.

TWAMP Session #1	TWAMP Session #2	Artificial Traffic
TOS Header: 0x88 Test Packets: 100	TOS Header: 0xB8 Test Packets: 100	Protocol: UDP Bandwidth: 950 Mbps

Procedure:

Step	Action	Expected Behavior
1.	Artificial traffic sent over the switch.	Traffic generator initialized and 950Mbps being sent.
2.	TWAMP Controller starts Sessions #1 and #2 simultaneously and records round trip jitter, one-way latency, and packet loss. *(Repeat 10 times)*	Average of round-trip jitter is below **60** µs with a packet loss of **0**%. The latency must be less then **280** µs.

Possible Problems: None.

Section 2: Low Audio Channels

Overview: Test a DUT's performance when 128 sending and receiving channels are streaming.

Test Q-SYS.Interoperability.2.1: Low Audio – Low Interference

Purpose: Get measurements of a switch with a low number of audio channels loaded and low interference traffic.

Reference:

- [RFC-5357] – Section 4

Test Setup: The devices are setup according to Common Test Setup.

TWAMP Session #1	TWAMP Session #2	Artificial Traffic
TOS Header: 0x88 Test Packets: 100	TOS Header: 0xB8 Test Packets: 100	Protocol: UDP Bandwidth: 256 Mbps

Procedure:

Step	Action	Expected Behavior
1.	Stream 128 Audio channels from Q-SYS system.	Q-SYS Devices should be active and communicating with their Q-SYS Cores.
2.	Send artificial traffic over the switch.	Traffic generator initialized and 256Mbps being sent.
3.	TWAMP Controller starts Sessions #1 and #2 simultaneously and records round trip jitter, latency and packet loss.	Average of round-trip jitter is below **60** µs with a packet loss of **0**%. The latency must be less than **280** µs.
4.	Check Q-SYS Designer software for any reported overruns or timeouts.	Q-SYS Designer must report **0** timeouts and overruns.
5.	Check Q-SYS video bridge for drops in framerate.	Video stream should maintain ~29fps during testing, and not go below 24fps.
6.	Repeat Steps 2-5 10 times.	Record the measurements for each execution.

Possible Problems: None.

Test Q-SYS.Interoperability.2.2: Low Audio – Medium Interference

Purpose: Get measurements of a switch with a low number of audio channels loaded and medium interference traffic.

Reference:

- [RFC-5357] – Section 4

Test Setup: The devices are setup according to Common Test Setup.

TWAMP Session #1	TWAMP Session #2	Artificial Traffic
TOS Header: 0x88 Test Packets: 100	TOS Header: 0xB8 Test Packets: 100	Protocol: UDP Bandwidth: 512 Mbps

Procedure:

Step	Action	Expected Behavior
1.	Stream 128 Audio channels from Q-SYS system.	Q-SYS Devices should be active and communicating with their Q-SYS Cores.
2.	Send artificial traffic over the switch.	Traffic generator initialized and 512Mbps being sent.
3.	TWAMP Controller starts Sessions #1 and #2 simultaneously and records round trip jitter, latency and packet loss.	Average of round-trip jitter is below **60** µs with a packet loss of **0**%. The latency must be less than **280** µs.
4.	Check Q-SYS Designer software for any reported overruns or timeouts.	Q-SYS Designer must report **0** timeouts and overruns.
5.	Check Q-SYS video bridge for drops in framerate.	Video stream should maintain ~29fps during testing, and not go below 24fps.
6.	Repeat Steps 2-5 10 times.	Record the measurements for each execution.

Possible Problems: None.

Test Q-SYS.Interoperability.2.3: Low Audio – High Interference

Purpose: Get measurements of a switch with a low number of audio channels loaded and high interference traffic.

Reference:

- [RFC-5357] – Section 4

Test Setup: The devices are setup according to Common Test Setup.

TWAMP Session #1	TWAMP Session #2	Artificial Traffic
TOS Header: 0x88 Test Packets: 100	TOS Header: 0xB8 Test Packets: 100	Protocol: UDP Bandwidth: 950 Mbps

Procedure:

Step	Action	Expected Behavior
1.	Stream 128 Audio channels from Q-SYS system.	Q-SYS Devices should be active and communicating with their Q-SYS Cores.
2.	Send artificial traffic over the switch.	Traffic generator initialized and 950Mbps being sent.
3.	TWAMP Controller starts Sessions #1 and #2 simultaneously and records round trip jitter, latency and packet loss.	Average of round-trip jitter is below **60** µs with a packet loss of **0**%. The latency must be less than **280** µs.
4.	Check Q-SYS Designer software for any reported overruns or timeouts.	Q-SYS Designer must report **0** timeouts and overruns.
5.	Check Q-SYS video bridge for drops in framerate.	Video stream should maintain ~29fps during testing, and not go below 24fps.
6.	Repeat Steps 2-5 10 times.	Record the measurements for each execution.

Possible Problems: None.

Section 3: Medium Audio Channels

Overview: Test a DUT's performance when 256 sending and receiving channels are streaming.

Test Q-SYS.Interoperability.3.1: Medium Audio – Low Interference

Purpose: Get measurements of a switch with a medium number of audio channels loaded and low interference traffic.

Reference:

- [RFC-5357] – Section 4

Test Setup: The devices are setup according to Common Test Setup.

TWAMP Session #1	TWAMP Session #2	Artificial Traffic
TOS Header: 0x88 Test Packets: 100	TOS Header: 0xB8 Test Packets: 100	Protocol: UDP Bandwidth: 256 Mbps

Procedure:

Step	Action	Expected Behavior
1.	Stream 256 Audio channels from Q-SYS system.	Q-SYS Devices should be active and communicating with their Q-SYS Cores.
2.	Send artificial traffic over the switch.	Traffic generator initialized and 256Mbps being sent.
3.	TWAMP Controller starts Sessions #1 and #2 simultaneously and records round trip jitter, latency and packet loss.	Average of round-trip jitter is below **60** µs with a packet loss of **0**%. The latency must be less than **280** µs.
4.	Check Q-SYS Designer software for any reported overruns or timeouts.	Q-SYS Designer must report **0** timeouts and overruns.
5.	Check Q-SYS video bridge for drops in framerate.	Video stream should maintain ~29fps during testing, and not go below 24fps.
6.	Repeat Steps 2-5 10 times.	Record the measurements for each execution.

Possible Problems: None.

Test Q-SYS.Interoperability.3.2: Medium Audio – Medium Interference

Purpose: Get measurements of a switch with a medium number of audio channels loaded and medium interference traffic.

Reference:

- [RFC-5357] – Section 4

Test Setup: The devices are setup according to Common Test Setup.

TWAMP Session #1	TWAMP Session #2	Artificial Traffic
TOS Header: 0x88 Test Packets: 100	TOS Header: 0xB8 Test Packets: 100	Protocol: UDP Bandwidth: 512 Mbps

Procedure:

Step	Action	Expected Behavior
1.	Stream 256 Audio channels from Q-SYS system.	Q-SYS Devices should be active and communicating with their Q-SYS Cores.
2.	Send artificial traffic over the switch.	Traffic generator initialized and 512Mbps being sent.
3.	TWAMP Controller starts Sessions #1 and #2 simultaneously and records round trip jitter, latency and packet loss.	Average of round-trip jitter is below **60** µs with a packet loss of **0**%. The latency must be less than **280** µs.
4.	Check Q-SYS Designer software for any reported overruns or timeouts.	Q-SYS Designer must report **0** timeouts and overruns.
5.	Check Q-SYS video bridge for drops in framerate.	Video stream should maintain ~29fps during testing, and not go below 24fps.
6.	Repeat Steps 2-5 10 times.	Record the measurements for each execution.

Possible Problems: None.

Test Q-SYS.Interoperability.3.3: Medium Audio – High Interference

Purpose: Get measurements of a switch with a medium number of audio channels loaded and high interference traffic.

Reference:

- [RFC-5357] – Section 4

Test Setup: The devices are setup according to Common Test Setup.

TWAMP Session #1	TWAMP Session #2	Artificial Traffic
TOS Header: 0x88 Test Packets: 100	TOS Header: 0xB8 Test Packets: 100	Protocol: UDP Bandwidth: 950 Mbps

Procedure:

Step	Action	Expected Behavior
1.	Stream 256 Audio channels from Q-SYS system.	Q-SYS Devices should be active and communicating with their Q-SYS Cores.
2.	Send artificial traffic over the switch.	Traffic generator initialized and 950Mbps being sent.
3.	TWAMP Controller starts Sessions #1 and #2 simultaneously and records round trip jitter, latency and packet loss.	Average of round-trip jitter is below **60** µs with a packet loss of **0**%. The latency must be less than **280** µs.
4.	Check Q-SYS Designer software for any reported overruns or timeouts.	Q-SYS Designer must report **0** timeouts and overruns.
5.	Check Q-SYS video bridge for drops in framerate.	Video stream should maintain ~29fps during testing, and not go below 24fps.
6.	Repeat Steps 2-5 10 times.	Record the measurements for each execution.

Possible Problems: None.

Section 4: High Audio Channels

Overview: Test a DUT's performance when 512 sending and receiving channels are streaming.

Test Q-SYS.Interoperability.4.1: High Audio – Low Interference

Purpose: Get measurements of a switch with a high number of audio channels loaded and low interference traffic.

Reference:

- [RFC-5357] – Section 4

Test Setup: The devices are setup according to Common Test Setup.

TWAMP Session #1	TWAMP Session #2	Artificial Traffic
TOS Header: 0x88 Test Packets: 100	TOS Header: 0xB8 Test Packets: 100	Protocol: UDP Bandwidth: 256 Mbps

Procedure:

Step	Action	Expected Behavior
1.	Stream 512 Audio channels from Q-SYS system.	Q-SYS Devices should be active and communicating with their Q-SYS Cores.
2.	Send artificial traffic over the switch.	Traffic generator initialized and 256Mbps being sent.
3.	TWAMP Controller starts Sessions #1 and #2 simultaneously and records round trip jitter, latency and packet loss.	Average of round-trip jitter is below **60** µs with a packet loss of **0**%. The latency must be less than **280** µs.
4.	Check Q-SYS Designer software for any reported overruns or timeouts.	Q-SYS Designer must report **0** timeouts and overruns.
5.	Check Q-SYS video bridge for drops in framerate.	Video stream should maintain ~29fps during testing, and not go below 24fps.
6.	Repeat Steps 2-5 10 times.	Record the measurements for each execution.

Possible Problems: None.

Test Q-SYS.Interoperability.4.2: High Audio – Medium Interference

Purpose: Get measurements of a switch with a high number of audio channels loaded and medium interference traffic.

Reference:

- [RFC-5357] – Section 4

Test Setup: The devices are setup according to Common Test Setup.

TWAMP Session #1	TWAMP Session #2	Artificial Traffic
TOS Header: 0x88 Test Packets: 100	TOS Header: 0xB8 Test Packets: 100	Protocol: UDP Bandwidth: 512 Mbps

Procedure:

Step	Action	Expected Behavior
1.	Stream 512 Audio channels from Q-SYS system.	Q-SYS Devices should be active and communicating with their Q-SYS Cores.
2.	Send artificial traffic over the switch.	Traffic generator initialized and 512Mbps being sent.
3.	TWAMP Controller starts Sessions #1 and #2 simultaneously and records round trip jitter, latency and packet loss.	Average of round-trip jitter is below **60** µs with a packet loss of **0**%. The latency must be less than **280** µs.
4.	Check Q-SYS Designer software for any reported overruns or timeouts.	Q-SYS Designer must report **0** timeouts and overruns.
5.	Check Q-SYS video bridge for drops in framerate.	Video stream should maintain ~29fps during testing, and not go below 24fps.
6.	Repeat Steps 2-5 10 times.	Record the measurements for each execution.

Possible Problems: None.

Test Q-SYS.Interoperability.4.3: High Audio – High Interference

Purpose: Get measurements of a switch with a high number of audio channels loaded and high interference traffic.

Reference:

- [RFC-5357] – Section 4

Test Setup: The devices are setup according to Common Test Setup.

TWAMP Session #1	TWAMP Session #2	Artificial Traffic
TOS Header: 0x88 Test Packets: 100	TOS Header: 0xB8 Test Packets: 100	Protocol: UDP Bandwidth: 950 Mbps

Procedure:

Step	Action	Expected Behavior
1.	Stream 512 Audio channels from Q-SYS system.	Q-SYS Devices should be active and communicating with their Q-SYS Cores.
2.	Send artificial traffic over the switch.	Traffic generator initialized and 950Mbps being sent.
3.	TWAMP Controller starts Sessions #1 and #2 simultaneously and records round trip jitter, latency and packet loss.	Average of round-trip jitter is below **60** µs with a packet loss of **0**%. The latency must be less than **280** µs.
4.	Check Q-SYS Designer software for any reported overruns or timeouts.	Q-SYS Designer must report **0** timeouts and overruns.
5.	Check Q-SYS video bridge for drops in framerate.	Video stream should maintain ~29fps during testing, and not go below 24fps.
6.	Repeat Steps 2-5 10 times.	Record the measurements for each execution.

Possible Problems: None.

Modification Record

Version	Date	Editor	Modification
1.0	2020-04-21	Matthew Hartman	• Removed tests 1.3 & 1.4 • Added sections 2-4
0.1	2018-10-25	Matthew Hartman	• Initial Document