Quarch Technology Ltd

Quarch Compliance Suite

Setup & Test Specification

QCS1007 – Custom Power Vs Performance

V1.0
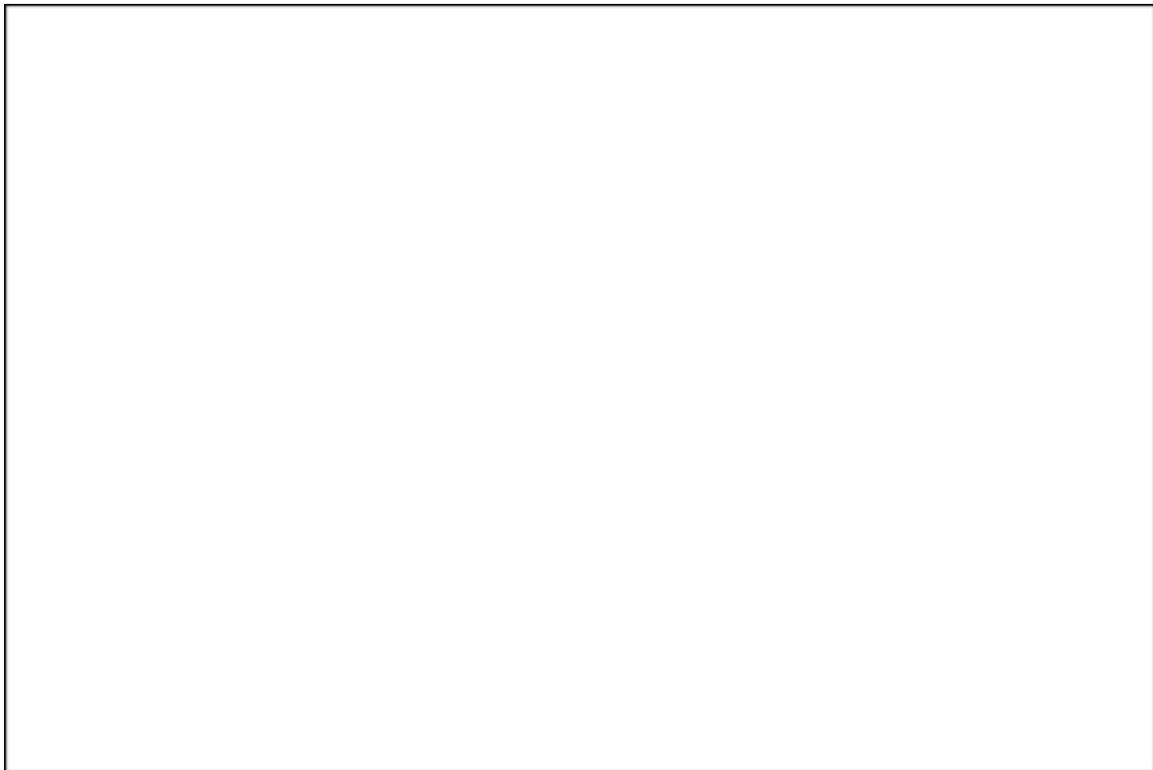
Quarch Compliance Suite v1.08

File   Action   Help

| Setup | Results | | Select Test |

Connection

Select a Test

Test Name	Version	Qtl Number	Licensed
Full range hotplug test	1.4	QCS1001	YES: Free
Power Margining	1.4	QCS1005	YES: Free
Power vs performance - Custom Job	1.0	QCS1007	YES: Free
Power vs performance - Free Test	1.0	QCS1008	YES: Free
Power vs performance - Drive Test	1.1	QCS1006	YES: Free
Pin-bounce during hotplug	1.4	QCS1002	YES: Free
Signal timing sweep during hotplug	1.4	QCS1003	YES: Free
UNH-IOL Plugfest - Basic hotplug	1.4	QCS1004	YES: Free

Connect to a host

Enter IP of Python Server

Connect to QCS Server

Description

Test Name: Power vs performance - Drive Test

Test Requirements:
Required parts
   * 1x Quarch PPM or PAm, made available to the Test PC (LAN or USB)

No test running   Conn Status : No connection

Change History

1.0		Initial Release

Contents

Introduction

To provide a high-quality comparison for the performance and power consumption of a storage device, Quarch has created this suite to allow user jobs for the test suite.

To accompany the Power Vs Performance test, this test suite allows user defined FIO jobs to be used within this test.

Requirements

- Host PC

- This is the PC which will mount the storage device under test (DUT). This system required admin privileges to install and execute the QCS server. Windows and Linux us supported.

- Client PC

- This is the PC which will run the QCS client and record the results. This can be the same as the Host PC but it NOT recommended for this test. The Java applications running here may significantly impact the performance test. Windows and Linux is supported.

- Quarch PPM or PAM and appropriate fixture

- The Quarch power analyzer that will capture the power consumption. The correct fixture will also be required for the storage device that you are using.

  Supported Quarch Power Modules: XLC, HD, and PAM

  - https://quarch.com/products/xlc-programmable-power-module/
  - https://quarch.com/products/hd-programmable-power-module/
  - https://quarch.com/products/power-analysis-module/

- Device Under Test (DUT)

- Your storage device. SAS, SATA and PCIe NVMe devices are supported.

Installation

Initial installation and setup is described in the QCS 'Quickstart' guide. Please see this document if you are setting up for the first time. It will walk you through the QCS install process.

Setup

Host and Client PC setup is common across all QCS tests, so some of the steps below are only required the first time you prepare for testing

- Setup the Host PC

    - As described in the QCS Quickstart document

    - Ensure the Host PC is connected to the LAN (assuming a separate Client PC is in use

- Setup the Client PC

    - As described in the QCS Quickstart document

    - Ensure the Client PC is connected to the LAN (assuming a separate Host PC is in use

    - Launch QPS and QIS on this machine. If Quarchpy is already installed on this machine, this can be launched via the command
    python -m quarchpy.run qps
    Alternatively, this can be install from the quarch website:
    https://quarch.com/file/power-studio/

- Setup the Quarch PPM / PAM

    - Place the power fixture between the DUT and host slot. Connect the fixture cable to the Quarch Power Module. If you are using an SFF drive fixture, ensure the voltage selection jumper is correct for your drive.

    - Power on the Quarch Module

    - Choose either USB or LAN for connection of the Quarch Power Module. The Power Module must be accessible to the **Client** PC, so be sure you cable to the right one if using USB.

        - If you need to configure the Power Module LAN settings, you can do so via TorridonTerminal: https://quarch.com/file/torridon-terminal/

        - This is also helpful to ensure you have connected the module correctly and can see it. If you are using a PPM, the DUT will NOT be powered on yet. This will happen at the start of the test, if you want to turn it on now, use TorridonTerminal to issue the command:

```
> run:power up
```

Typical equipment layout

A typical equipment layout is shown below. The Quarch Power Module can be optionally connected via USB to the **Client** PC instead of using the LAN.

The Quarch Power Fixture must be fitted to correctly:

- For a PPM, the fixture (or output cable) must be able to supply power to the drive

- For a PAM, the fixture must be in the path of the power supplied by the host.

Example using a simple injection cabling with a PPM
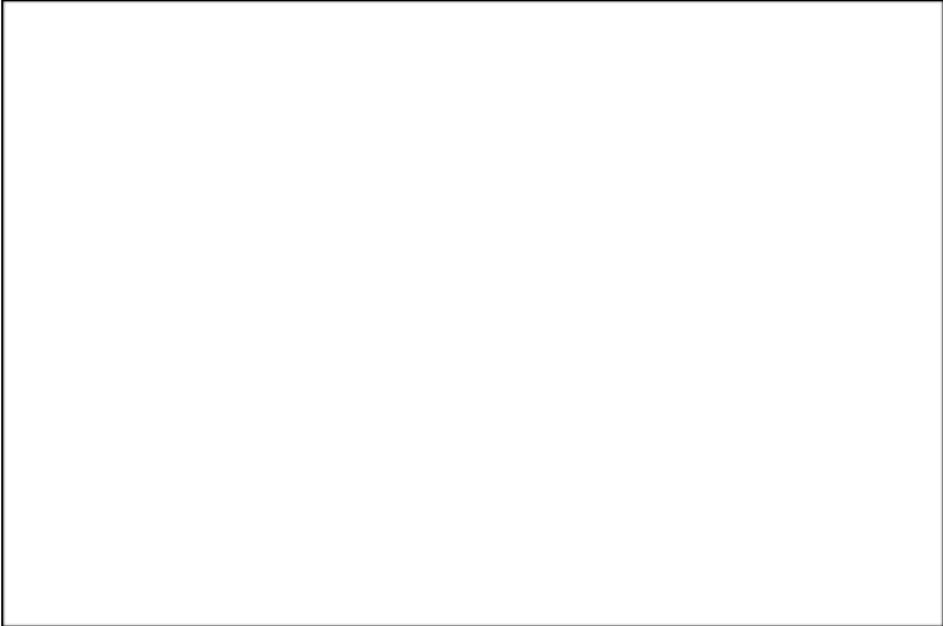
Example using SerialCables JBOD and SFF injection fixture
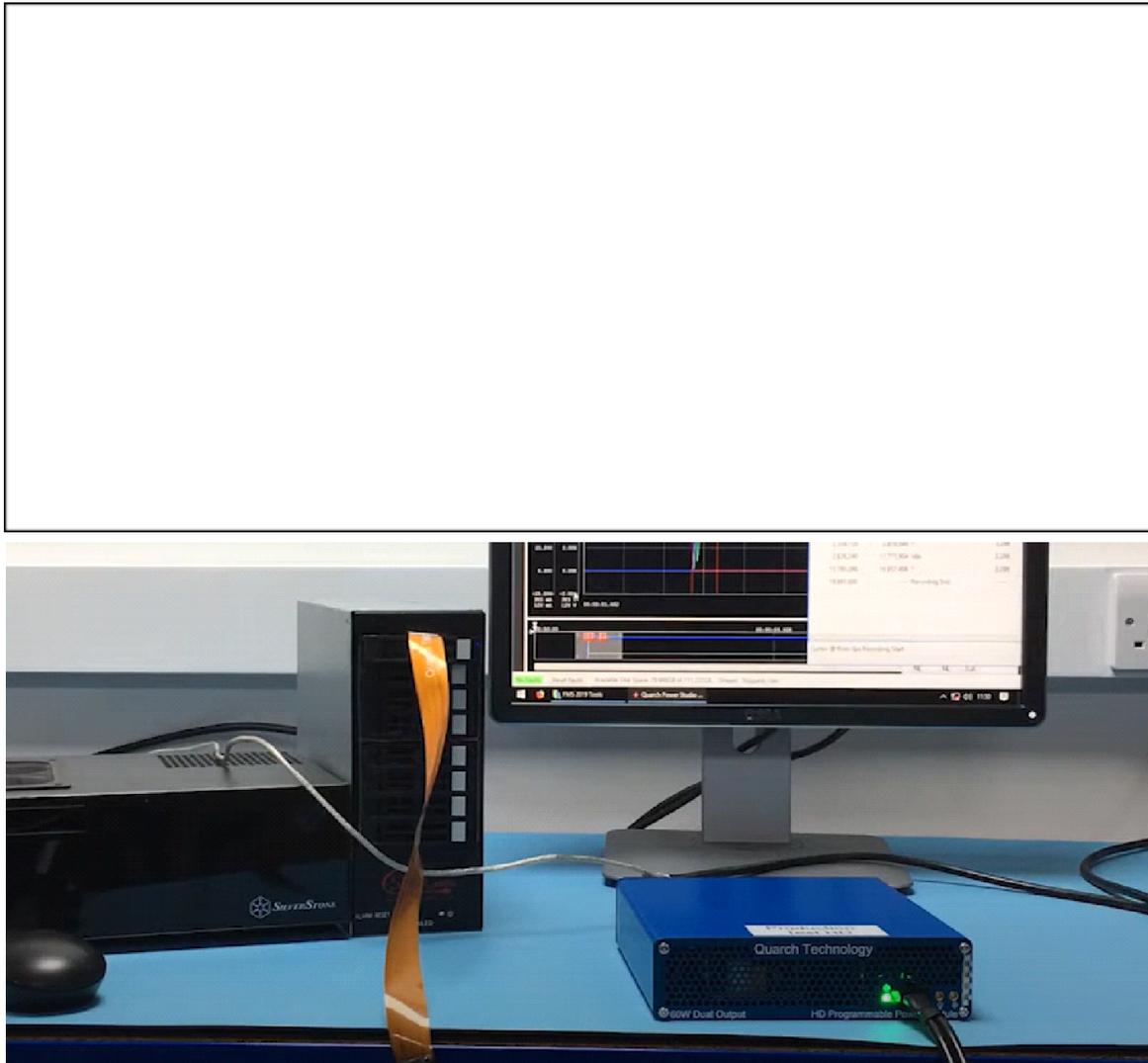
Begin the test

- Start QCS server of the Host PC

- > python -m quarchpy.run qcs

The server should start up almost immediately. Note the IP address and mDNS name which you will use to connect to the server later.
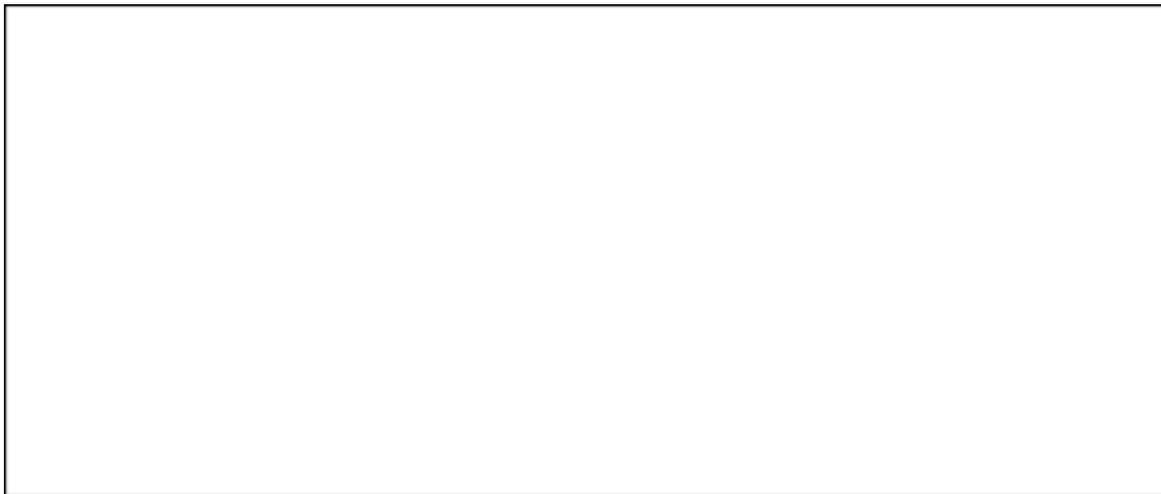


```
Administrator: Command Prompt - python -m quarchpy.run qcs

Microsoft Windows [Version 10.0.17763.864]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>python -m quarchpy.run qcs

#########################################################################
                              Welcome to
                         Quarch Technology's
                        Quarch Compliance Suite
                     Quarchpy Version : 2.0.11.dev1
#########################################################################

----Remote Server Activated----
       Server IP: 192.168.1.45
----mDNS Registered----
       Server Name: MATT-PC
```

- Start QCS application on the Client PC

- > Double click on the QCS icon to start

- Connect the Client to the Server

- Enter the IP address of the Server into the Client connection box. If 'zeroconf' is installed on the server then it should autodetect and be visible in the connection drop-down menu for fast connection.

Connect to a host

Server Name: MATT-PC
Server IP: 192.168.1.45

Connect
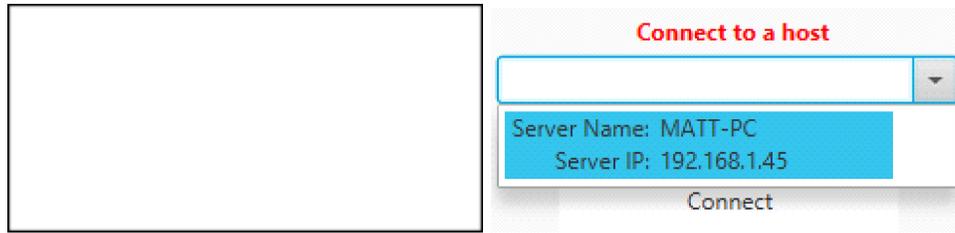
- Select the test to run

- In this case, select the QCS1006, 'Power Vs Performance' and either double-click or select 'Select Test'
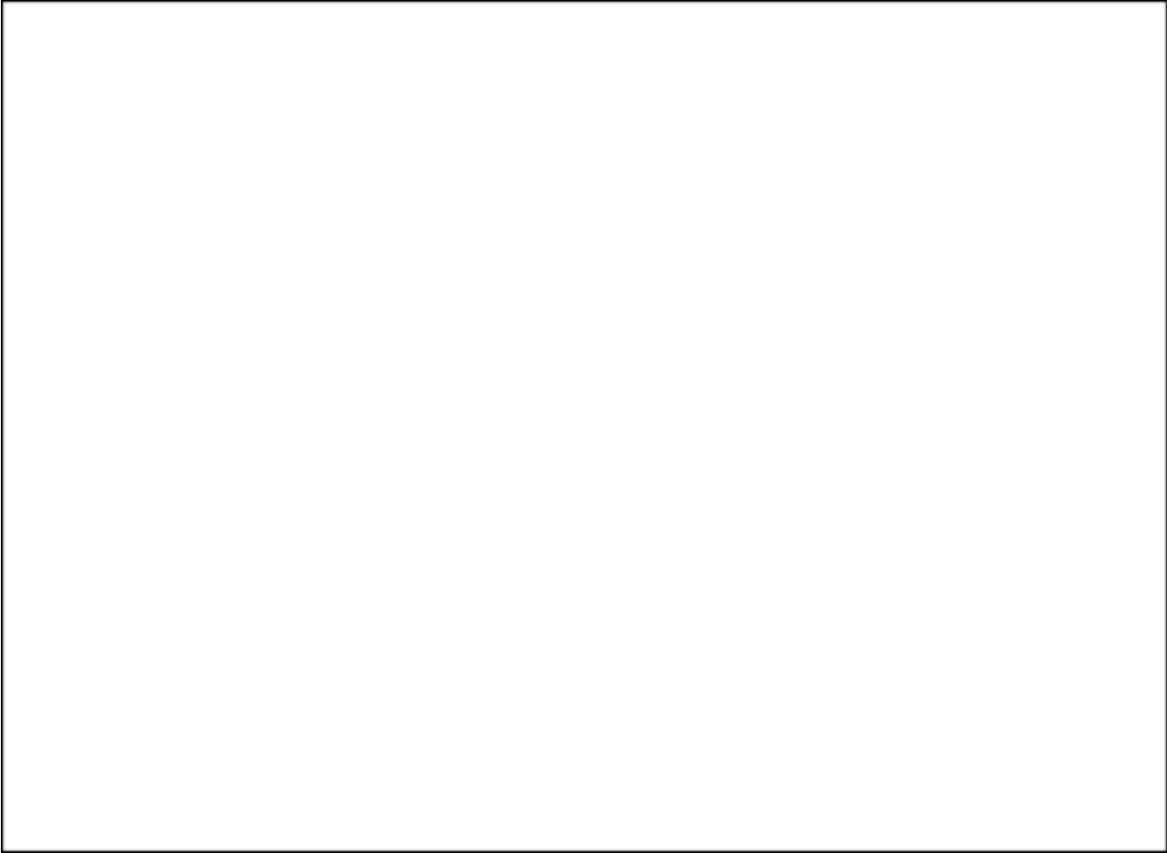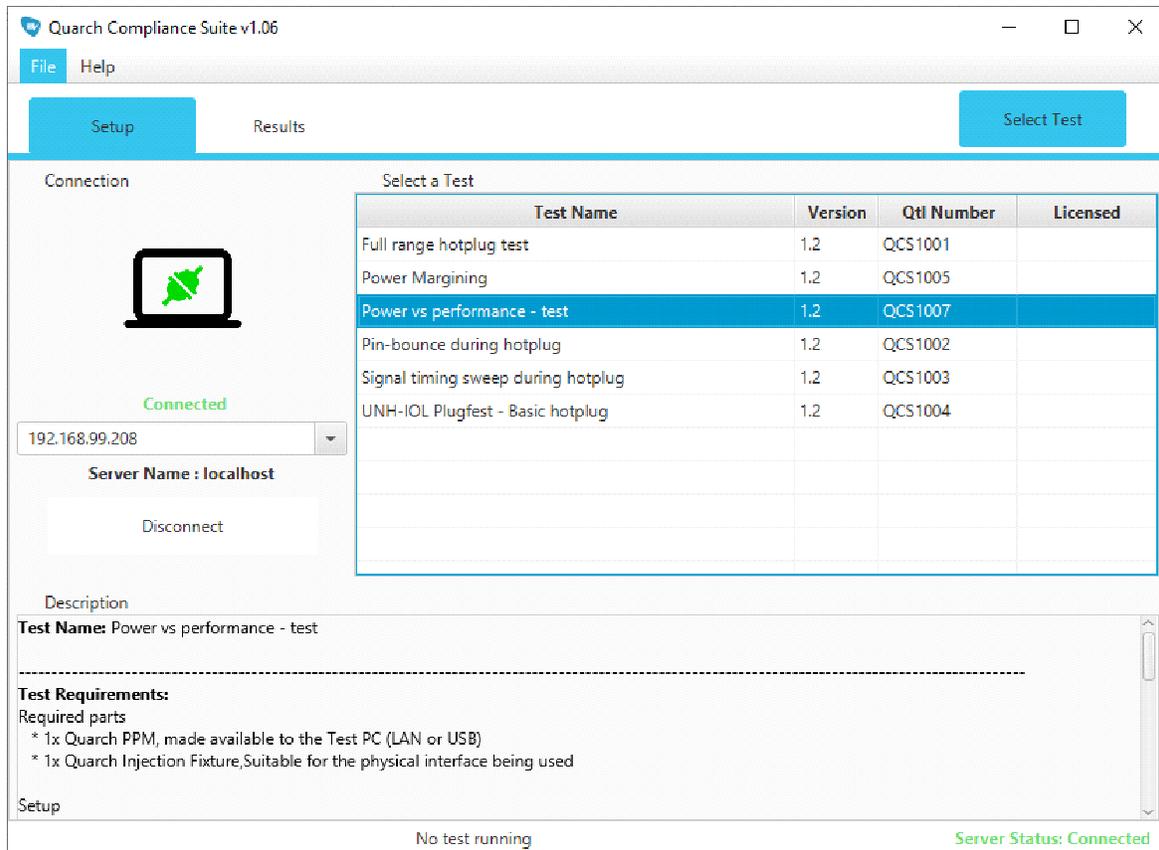
- This process can take 30 seconds or so, as the test is sent to the Server and the required applications are started on the Client.

- When the test is ready, the 'Start/Play' button will become available to begin running. If you want to change any setting for the test, you can do so now in the 'Custom Variables' window.

- When you have made any changes you require, press the run button to begin.

Custom variables

Most tests have several variables that can be set. These allow for things such as setting the number of times that a test loops or setting the time to wait for a drive to enumerate. These will be different in each test suite.

QCS1007 has 2 useful settings to consider:
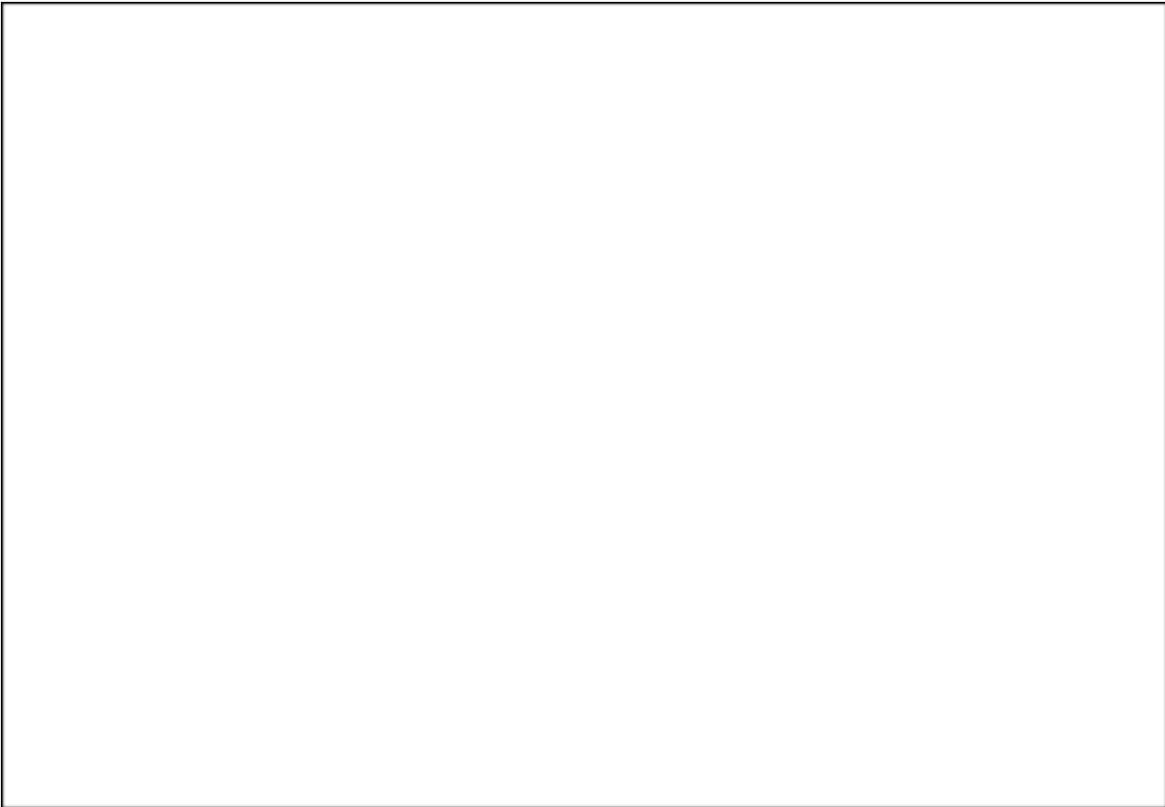
Custom Variables

Custom Variables

Variables left blank or "auto" will automatically have their value set as the test proceeds

STOP ON FAIL: **False** — Stop test at first failure point

AVERAGING: **16k** — Sampling rate for QPS

RUN POWER CYCLE TEST: **False** — Choose to skip optional initial power cycle

RUN WRITE TEST: **True** — Choose to skip all write tests

Reset Defaults

Apply Values

Stop on fail

- When set to true, the test will halt if there are any errors or test failures

Averaging

- Changing the averaging rate will affect the resolution of the power data captured.

- The rate combines a set number of 4uS samples, so an averaging value of 4 is 4 x 4uS = 16uS sampling rate. This is the fastest setting that is likely to work for a long test like this (due to bandwidth limits).

- A low averaging rate will produce a very large capture file though so take care!

  16k sampling equates to roughly 15 samples per second. Every 4uS sample is combined into the final sample, so the average power result should be very accurate regardless of the rate chosen.

While the test aims to make no modification to a drive when the write tests are disabled, mistakes can happen so we STRONGLY recommend you do not run this test on a drive which contains important data.

Select the devices

As the test starts running, you will be prompted to select the Quarch Power Module and storage device to use. The dialogs have a rescan button: just in case you have forgotten to plug something in!

Select the power module

First you will be prompted to select the Power Module. Here we have a QTL2312 (PAM) module connected to the Client PC via USB.

The power module must be available to the **Client** PC. If this is not the case, you will not see it shown here.

Module Selection

Rescan

Please pick the Quarch module attached to DUT

Connection Type	Serial #	Connection Target
usb	QTL2312-01-002	QTL2312-01-002

Select

Select the storage device (DUT)

The custom Power vs Performance test initially looks at the FIO job for a filename or directory argument. If neither are specified, the test displays the drive selection page for user to select drive to run test on.

Module Selection   — ☐ ✕

Rescan

Please pick the drive attatched to selected Quarch Module

Connection Type	Name	Description
UNKNOWN	SAMSUNG MZ7LN256HAJQ-000L7	\\.\PHYSICALDRIVE0
UNKNOWN	WDC WD10SPZX-21Z10T0	\\.\PHYSICALDRIVE1
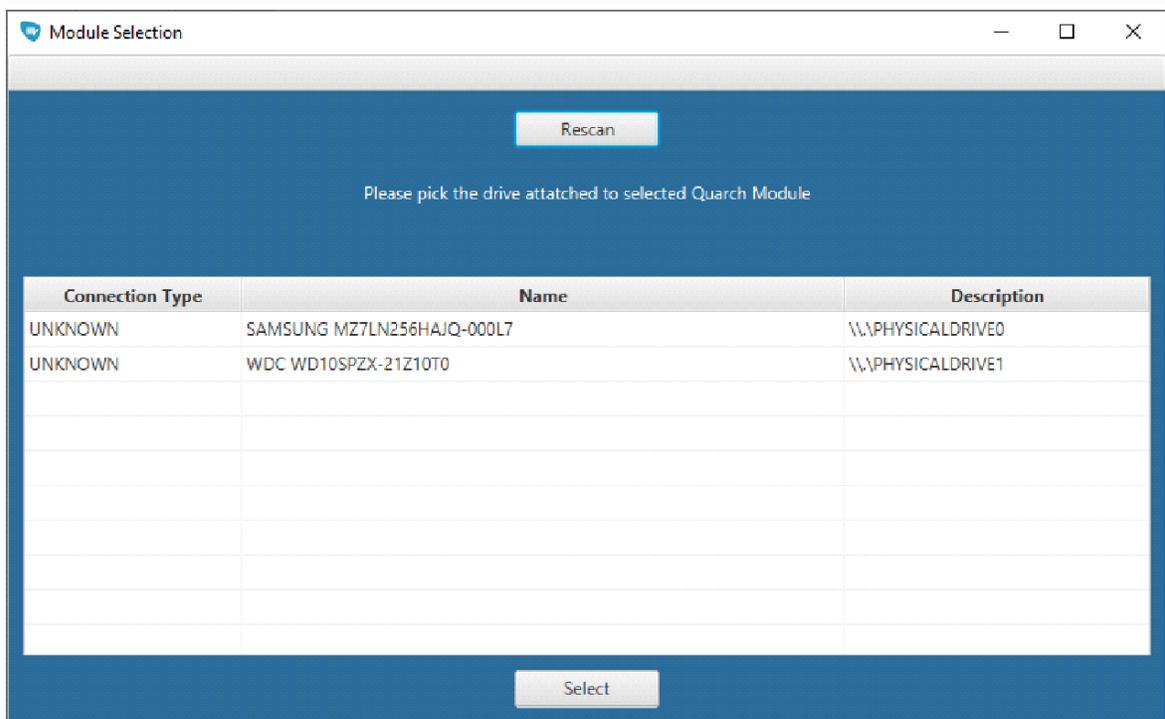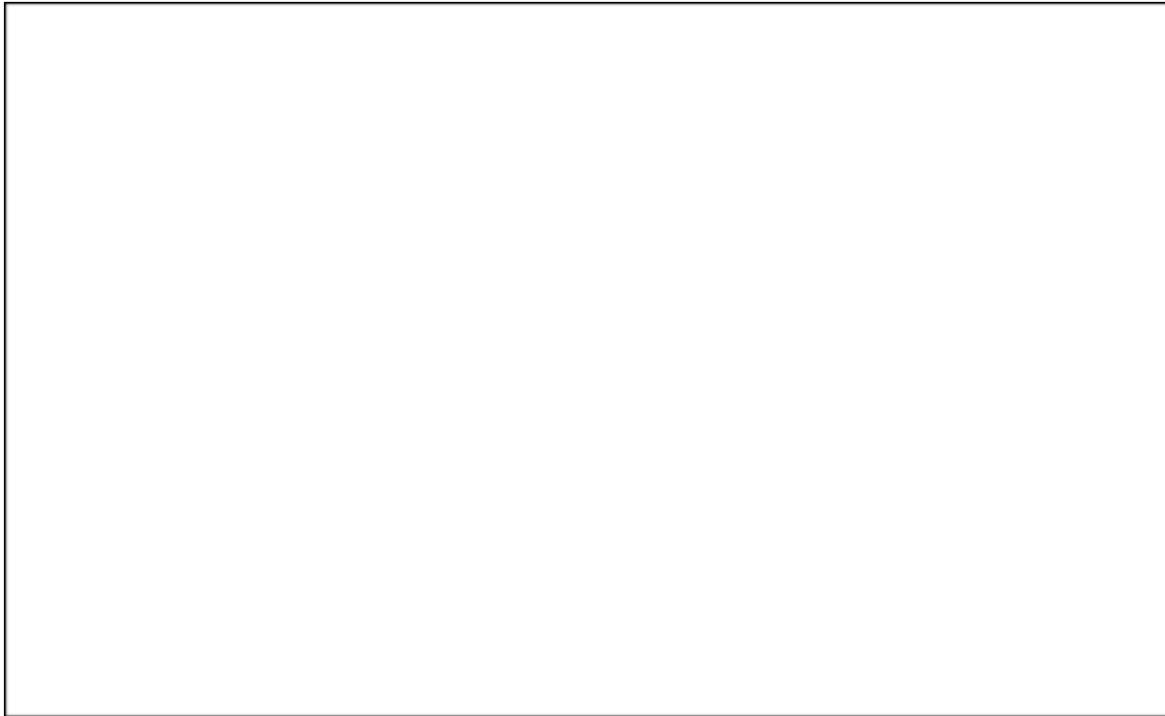
Select

Be sure that you select the correct DUT, *especially* for tests such as Power Vs Performance which will write to the drive and cause loss of any data on it.

View test progress

This test suite can take significant time to complete. Currently around 17 hours, though this will depend on the size of the drive. A progress indicator shows the level of completion.

Real time results are displayed in the log. Any failures will be clearly marked in red, and noted on the error counters.

If many failures occur early on, it is likely that you have a problem with the setup of the equipment. Expanding the failed rows gives more information on the failure.
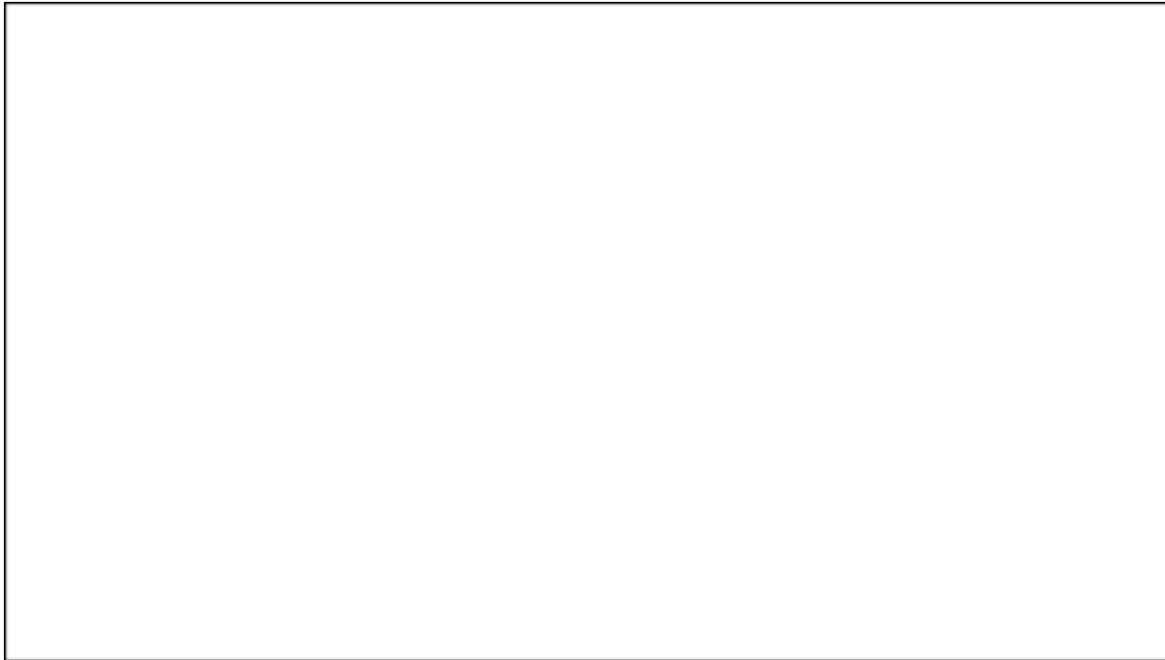
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File Help

Setup   Results

Passed:	160	Errors:	0	Total Progress	Test status
Failed:	0	Warnings:	0	Current Test	**PASSED**
Elapsed Time:	01:40				Expand/Collapse

Custom Variables   Start Tests ▶

Id	Type	Time	Description	Details
▼ 0	testDescription	2020-11-27...	Setting up required test resources	n/a
▶ 0.1	testDescription	2020-11-27...	User module selection	n/a
▶ 0.2	testDescription	2020-11-27...	User drive selection	n/a
▼ 1	testDescription	2020-11-27...	Beginning tests core	n/a
▼ 1.1	testDescription	2020-11-27...	10mS Staged hot-plug test, with enumeration and link verification	n/a
▼ 1.1.1	testDescription	2020-11-27...	Repeat cycle 1 of 10	n/a
▼ 1.1.1.1	testDescription	2020-11-27...	Setting up hotplug test	n/a
	quarchCommand	2020-11-27...	Quarch Command: source:1:delay 0 - Response: OK	{textDetails=Executing command on module, debugLevel=1}
	quarchCommand	2020-11-27...	Quarch Command: source:2:delay 10 - Response: OK	{textDetails=Executing command on module, debugLevel=1}
	quarchCommand	2020-11-27...	Quarch Command: source:3:delay 20 - Response: OK	{textDetails=Executing command on module, debugLevel=1}
	quarchCommand	2020-11-27...	Quarch Command: source:4:delay 30 - Response: OK	{textDetails=Executing command on module, debugLevel=1}
	quarchCommand	2020-11-27...	Quarch Command: source:5:delay 40 - Response: OK	{textDetails=Executing command on module, debugLevel=1}
	quarchCommand	2020-11-27...	Quarch Command: run:power down - Response: OK	{textDetails=Executing command on module, debugLevel=1}
▶ 1.1.1.3	testDescription	2020-11-27...	Polling system for indication of drive removal	n/a
▼ 1.1.1.5	testDescription	2020-11-27...	Polling system for indication of drive insertion	n/a
1.1.1.6	testResult	2020-11-27...	Checking device enumerated after power up	{Test Result =True}
	Debug	2020-11-27...	Was: 8GT/s Now: 8GT/s	n/a
1.1.1.7	testResult	2020-11-27...	Checking device's reported link speed	{Test Result =True}
	Debug	2020-11-27...	Was: x2 Now: x2	n/a
1.1.1.8	testResult	2020-11-27...	Checking device's reported lane width	{Test Result =True}
▶ 1.1.2	testDescription	2020-11-27...	Repeat cycle 2 of 10	n/a

Test Running : UNH-IOL Plugfest - Basic hotplug   Server Status: Connected

Common test failures

- **Command to a Quarch module fails to get a response**.

- Module has become disconnected or powered down. Check your cabling.

- **Command to a Quarch module returns a bad command or invalid parameter error.**

- The Module connected is not the correct one for the test, or it required an upgrade.

- **The DUT is not removed from the system correctly during the power cycle test.**

- The wrong DUT may be selected. Make sure you have chosen the right device. If uncertain, you can use TestMonkey or TorridonTerminal to manually hot swap the DUT and verify that it is powering the correct drive.

- **The DUT is not enumerated on the system after the power cycle test.**

- Does the DUT and Host system support hot plug? If you cannot manually hot plug a device in the Host and have it enumerated correctly, then the test will not work.

- This test can be disabled in the custom variable settings.

Test specification

Basis for testing

This test is to allow users to run their own test bench with automated QPS and FIO results gathering. As this test aims to visually represent the results on QPS, all fio jobs ran will have their IOPS / throughput plotted at a rate of once per second with the status-interval argument.

Future versions of the test suite will aim to include improvements where practical.

Assumptions

We assume that the drive connected is in 'optimal' condition, to begin testing (ie: that it is empty and in 'out the box' condition).

Tests are assumed to have **only 1 job** per test file.

Test 0 – Setup

This test block is purely for setup and preparation of the required resources. No actual performance tests are done here.

Test 1 – Used defined Custom FIO job

Aims

Run user defined FIO job and report results based on job specified.

Steps

- Check FIO arguments specified

- **Add any required arguments for test**

    - **Output – Test requires file to read results**

    - **Output Type – Test reads output as JSON format**

    - **Status Interval – Test requires output from FIO every second of test in order to plot data to QPS**

Reporting

What is reported depends on the arguments specified in the FIO Job. Should you think another statistic of interest, send an email to support@quarch.com specifying the test in question (QCS1007) alongside the statistics wanted for display.

- Read Job
    - Read IOPS
    - Read throughput MB/S
- Write job
    - Write IOPS
    - Write throughput MB/S
- Latency_percentiles
    - Requires the "percentile_list" argument
    - Records last 3 items in percentile list
- Power
    - Power total Max
    - Power total mean