



Virtual Services Platform 7000

Engineering

>Avaya Virtual Services Platform 7000
with Coraid EtherDrive SRX-Series
Storage Appliances Technical
Configuration Guide

Avaya Networking

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Abstract

This Technical Configuration Guide describes a solution comprised of the Avaya Virtual Services Platform 7000 and Coraid EtherDrive storage appliances. During interoperability testing, two Coraid SRX EtherDrive SAN storage appliances successfully received and stored data transmitted from the Avaya Virtual Services Platform 7000 over 10 GbE links.

Information in this Technical Configuration Guide has been obtained through Avaya Networking interoperability testing and additional technical discussions. Testing was conducted at the Avaya Networking Test Lab.

Acronym Key

Throughout this guide the following acronyms will be used:

AoE	ATA over Ethernet
ATA	Advanced Technology Attachment
HBA	Host Bus Adapter
LACP	Link Aggregation Control Protocol
LUN	Logical Unit Number
MLT	Multi-Link Trunking
RAID	Redundant Array of Independent Disks
SAN	Storage Area Network
SAS	Serial Attached SCSI
SATA	Serial ATA
SCSI	Small Computer System Interface
SSD	Solid State Disk Drive

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Conventions

This section describes the text, image, and command conventions used in this document.

Symbols



Tip – Highlights a configuration or technical tip.



Note – Highlights important information to the reader.



Warning – Highlights important information about an action that may result in equipment damage, configuration or data loss.

Text

Bold text indicates emphasis.

Italic text in a Courier New font indicates text the user must enter or select in a menu item, button or command:

```
VSP_CoreA:1#show running-config
```

Output examples from Avaya devices are displayed in a Lucida Console font:

```
VSP_CoreA:1#show sys-info
```

```
General Info :
```

```

SysDescr      : Virtual Services Platform 7024XLS
HW: ROB.0     : FW: 10.0.0.5      SW:v10.0.0.034
Mfg Date      : 20110222         HW Dev:none
SysContact    : http://support.avaya.com/
SysLocation   : 211 Mt. Airy Road,Basking Ridge,NJ 07920

```

```
Chassis Info:
```

```

Serial#              :SDNL2400064
Operational Software :FW: 10.0.0.5      SW:v10.0.0.034
Installed Software   :FW: 10.0.0.5      SW:v10.0.0.022
Operational License  :Base software
Installed License    :Base software
sysObjectID         : 1.3.6.1.4.1.45.3.79.1
sysUpTime            : 15 days, 22:37:51
sysNtpTime           : SNTP not synchronized
sysRtcTime           : Monday 2005/03/21 22:22:52
sysServices          : 6

```

1. Introduction

This Technical Configuration Guide describes an Ethernet storage solution comprised of the Avaya Virtual Services Platform 7000 and the Coraid EtherDrive™ SRX4200 Ethernet SAN array.

1.1 Avaya Virtual Services Platform 7000

The Avaya Virtual Services Platform (VSP 7000) is a new family of 1/10Gigabit, Top of Rack, Ethernet Switches. These high-density, high-capacity switches provide a high performance forwarding engine for data centers aggregation and small to medium core switches. The following is a list of some of the Avaya VSP 7000 features:

- 1RU stackable switch with class-leading switching performance of over 1.2Tbps
- Data center grade hardware that supports front-to-back or back-to-front cooling
- 5th generation ASIC technology for future proof feature requirements
- 24 ports of SFP+ supporting both/either 1 and 10 GbE
- Media Dependant Adaptor (MDA) for a range of high-speed expansion options
- SFP+ connectivity to connect at 1 Gigabit or 10 Gigabit speeds
- Future-ready with flexible support for 40Gbps, 100Gbps Ethernet and Fibre Channel
- Support network-wide fabric-based Virtualized Services and Lossless environments
- Dual, hot-swappable AC or DC power supplies and fan trays for always-on high-performance

The Avaya VSP 7000 is designed for Enterprise customers requiring high density, high performance 10 Gigabit connectivity. In a high-performance Data Center, the Avaya VSP 7000 can serve as a Top-of-Rack Switch. In a network with an existing Core Switch deployment, it can provide a cost-effective 10 Gigabit Ethernet fan-out capability. In a Campus distribution layer, it can deliver flexible connectivity and consolidation options.



Figure 1 – Avaya VSP 7000 Ethernet Switch

1.2 Coraid EtherDrive SRX Series

Coraid is redefining the fundamental economics of storage with Ethernet SAN solutions that provide enterprises of all sizes with a flexible tier of high-performance, scale-out storage. The Coraid EtherDrive SRX Series storage arrays deliver performance up to 1,800 MB/sec, with multiple 10 GbE connections per shelf, providing a 5-8x price performance advantage over other SAN storage solutions. EtherDrive SRX scales to multiple petabytes, uniquely delivering the fundamental building blocks necessary to build the next generation SAN infrastructure for a range of applications including server virtualization, high-performance computing, and cloud storage.

Coraid uses RAID technology as a method of logically treating several hard drives as one unit to improve performance and/or provide redundancy. The Coraid EtherDrive SRX-Series storage appliances support all standard RAID types (0, 1, 5, 6, and 10). The Coraid EtherDrive SRX-Series appliances are block storage RAID devices with front loading, hot-swappable SATA, SAS, and SSD disk drives. Each EtherDrive SRX appliance can be used individually or in RAID sets.



Figure 2 – Coraid EtherDrive SRX Storage Array

1.3 Interoperability and Resiliency Testing

The Avaya / Coraid solution testing focused primarily on verifying interoperability and resiliency simulating various fault conditions to ensure high availability. During interoperability testing, the Avaya VSP 7000 communicated with two Coraid EtherDrive SRX-Series storage appliances.

The Coraid EtherDrive SRX-Series uses the ATA over Ethernet (AoE) protocol to communicate between the logical storage devices and servers across a standard Ethernet network. AoE enables you to share disk drives through a standard Ethernet network. AoE arranges the communication that would normally take place between a server and a disk drive into data packets called datagrams and sends these across Layer 2 Ethernet with minimal overhead. Datagrams are addressed to storage devices using their Ethernet MAC addresses.

AoE does not run over high level networking protocols like IP so AoE datagrams cannot be routed. The data packets can travel across the switches that make up an Ethernet LAN, but routers cannot send them to another network and devices outside of the LAN cannot communicate with them. This provides an inherent layer of security. AoE is designed to run on a datagram networking protocol such as Ethernet, which makes a best effort attempt to deliver datagrams. AoE has developed a sophisticated congestion avoidance algorithm to maximize throughput while avoiding dropped frames. AoE can quickly recover from lost datagrams on the network due to congestion so it is guaranteed to not lose data.

For technical support, access to documentation, frequently asked questions, AoE tools for Linux, and contact telephone numbers on Coraid EtherDrive SRX-Series storage appliances, contact Coraid's technical support at their Web site: http://www.coraid.com/support/customer_support.

2. Reference Configuration

Figure 3 shows a sample storage area network (SAN) configuration with an Avaya VSP 7000, five PC servers and two Coraid EtherDrive SRX-Series storage appliances. All communication between these devices use 10 GbE links in a Layer 2 topology. All of the 10 GbE connections use SFP+ connectors with multimode fiber.



Coraid recommends that you isolate the SAN from other network traffic.

To verify data integrity and measure the performance of the Coraid EtherDrive SRX-Series storage appliances, the Avaya Networking Test Lab used the Open Source software, Vdbench, which is a disk and tape I/O workload generator for directly attached and network connected storage devices.

For Vdbench downloads and documentation, go to <http://sourceforge.net/projects/vdbench/>.

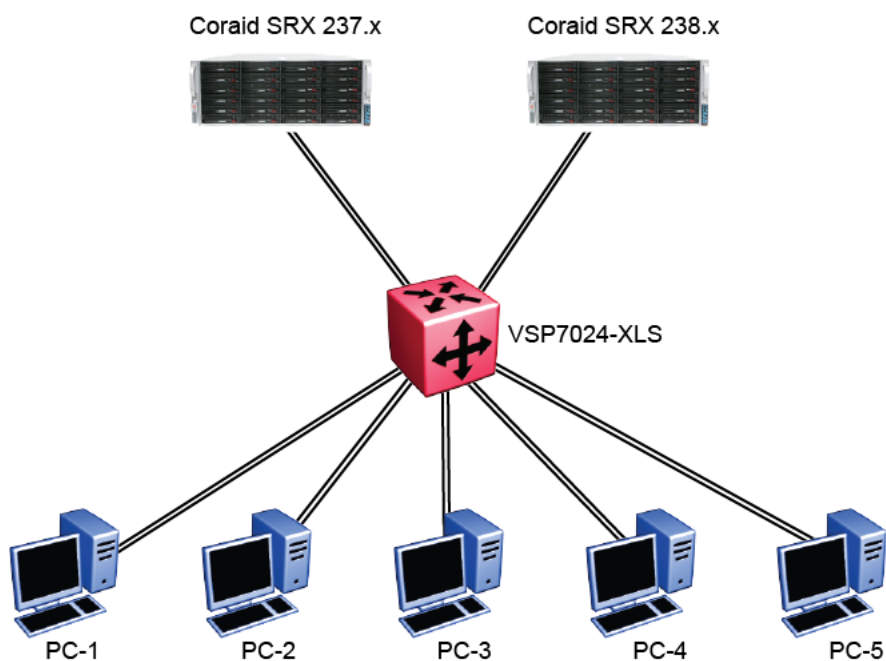


Figure 3 – SAN Test Bed Configuration

3. Equipment and Software Validated

The following equipment and software were used for the sample configuration provided:

Equipment	Software
<ul style="list-style-type: none"> 2 Avaya VSP7024-XLS Ethernet Switches 	Software Release 10.0.0b36
<ul style="list-style-type: none"> 5 PC 1U servers with Coraid Host Bus Adapter (HBA) network cards installed 	Coraid HBA build 48 CentOS 5.5 64-bit
<ul style="list-style-type: none"> 2 SRX-Series storage appliances each containing: <ul style="list-style-type: none"> 2 dual-port 10GbE network interface cards 25 300GB SATA drives 	CorOS 5.1.4
<ul style="list-style-type: none"> 5 Coraid 10GbE, dual port, SFP+ HBA Cards (1 per server) 	
	Vdbench verification software

Table 1 – Hardware and Software Versions

4. Storage Area Network Configuration

This section provides configuration details for the following SAN components:

- Avaya VSP 7000
- PC servers
- Coraid EtherDrive SRX-Series storage appliances

4.1 Avaya Virtual Services Platform 7000 Configuration

This section describes how to configure the Avaya VSP 7000. To allow for full utilization of the network for SAN storage, Coraid recommends isolating SAN storage networks from other network traffic.



Note – In this test setup, STP is disabled on all connected ports for faster transition time when a port is unplugged and plugged during. Also, the specific VLANs and ports used have no special significance and therefore can be changed at the user's discretion.

4.1.1 Configuring VLANs

Configure VLAN 50 and ensure that all ports connected to the Coraid HBAs and SRX-Series appliances are in VLAN 50. The following steps show how to configure the VLAN:

1 Enter the *Privilege Exec* context:

```
7024XLS>enable
```

2 Enter the *Global Configuration* context:

```
7024XLS# configure terminal
```

3 Create the port based VLAN 50:

```
7024XLS(config)# vlan create 50 name CORAID type port 1
```

4 Remove the ports from the default VLAN 1:

```
7024XLS(config)# vlan members remove 1 1-12
```

5 Add ports to the VLAN 50:

```
7024XLS(config)# vlan members add 50 1-12
```

4.1.2 Configuring Jumbo Frames, STP and the IP Address

Use the following steps to enable jumbo frame support, disable STP, and set the IP address:

1 In *Global Configuration* mode, enable jumbo frames:

```
7024XLS(config)# jumbo-frame enable
```

2 Confirm that jumbo frames are enabled:

```
7024XLS(config)# show jumbo-frames
```

3 Disable STP on the ports:

```
7024XLS(config)# interface fastEthernet 1-12
7024XLS(config-if)# spanning-tree learning disable
```

4 Set the IP address (for management purposes only):

```
7024XLS(config)# ip address 100.100.50.71 netmask 255.255.255.0 default-gateway
100.100.50.254
```

4.2 Server Configuration

This section describes how to configure the PC servers, which must run a 64-bit OS. The Avaya Networking Test Lab setup uses five PC servers running CentOS 5.5 (x64-bit version).

The Coraid HBA and associated driver must be installed in each PC server. The Coraid HBA requires a PCI Express slot and provides functionality similar to a standard NIC.

Before using the Coraid HBA SAN storage solution, one or more Logical Unit Adapters (LUN) must be configured on the Coraid EtherDrive SRX-Series storage appliance. More information on configuring Coraid appliances may be found at <http://support.coraid.com/support/quickstart/>. Figure 4 shows a sample LUN configuration:

- 1) create RAID groups
- 2) assign hot spares
- 3) bring LUNs online

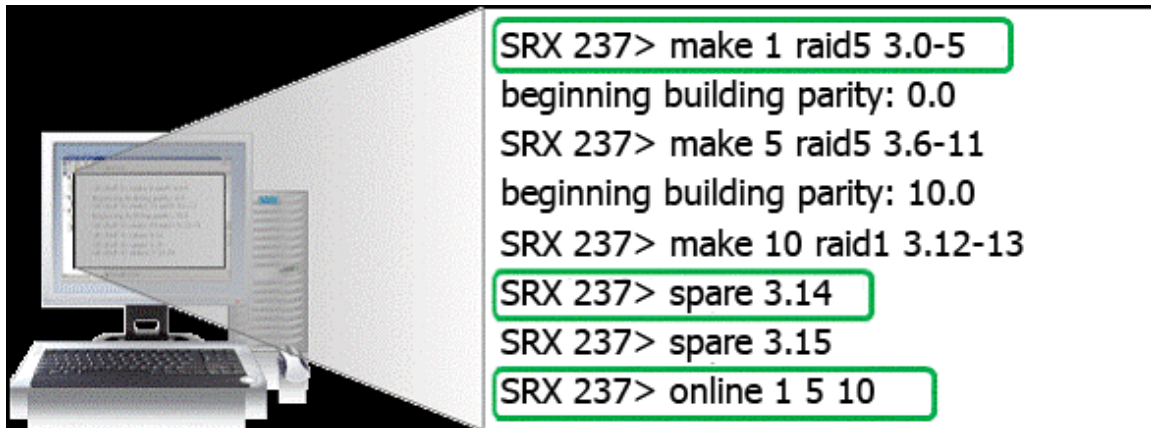


Figure 4 – Sample LUN Configuration

Use the following steps to configure the PC servers:

- 1) Use the **make** command to configure five different RAID groups of various sizes on the SRX-Series appliances. Coraid EtherDrive SRX-Series appliances automatically create one LUN per RAID group.
- 2) Use the **spare** command to assign hot spares.

- 3) Use the **online** command to bring the LUNs online.
- 4) Use the **ethdrv-stat** command to confirm that each PC can communicate with the drives and the drives are mountable.
- 5) Use the **mkfs** command to create and format a file system on each RAID. The AoE protocol makes the RAID look like a local storage device:
mkfs -t ext3 /dev/<device>
- 6) Each PC should mount a different RAID array:
mount -t ext3 /dev/<device> /mnt/coraid
- 7) Confirm that the RAID is reachable to the drive and write a file to it with the following command:
cd /mnt/coraid;touch foo

The Coraid HBAs have two ports and utilize every available port between the server initiator and target (see Figure 5). The HBAs have Coraid firmware to manage the Ethernet SAN and cannot be configured as a regular network card.



Coraid HBAs load balance and provide high performance link redundancy without the need for port aggregation, bonding, or traditional SAN MPIO software. Coraid EtherDrive SRX-Series storage appliances do not support MLT or LACP.

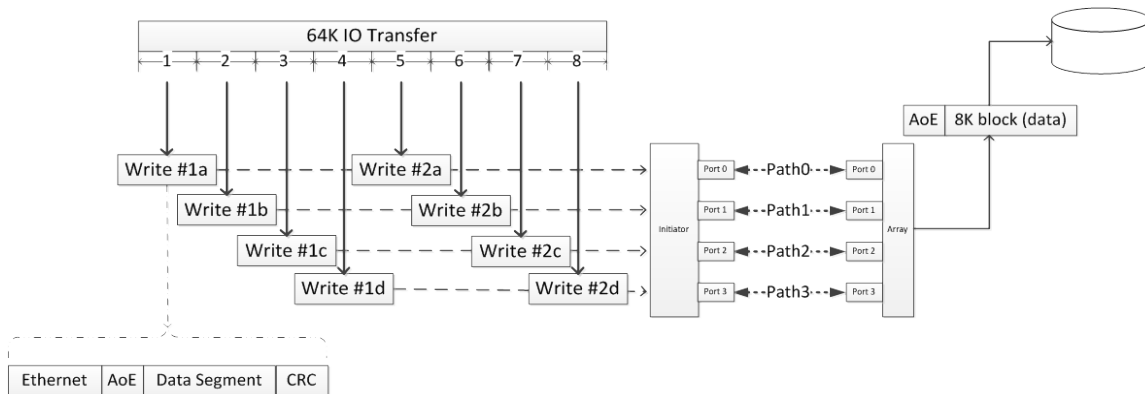


Figure 5 – Coraid Parallel Path Utilization w/o MPIO



For Coraid HBA support information, go to Coraid EtherDrive: Ethernet SAN for Virtualization, Cloud, and Enterprise Storage at http://www.coraid.com/support/customer_support.

4.3 EtherDrive SRX-Series Storage Appliance Configuration

In the Avaya Networking Test Lab setup, there are two Coraid EtherDrive SRX-Series storage appliances. Between the EtherDrive SRX appliances are five different RAID arrays so that each PC server writes to its own RAID. The RAID types are: RAID 1, RAID 5 and RAID 10 arrays.



For EtherDrive SRX-Series firmware and documentation support, go to http://www.coraid.com/support/customer_support.

Server	RAID Type	Number of Disks	Disk Type
1	1, 5 or 10	5	WD1002FBYS, 1TB, SATA, 7200 RPM
2	1, 5 or 10	5	WD1002FBYS, 1TB, SATA, 7200 RPM
3	1, 5 or 10	5	WD1002FBYS, 1TB, SATA, 7200 RPM
4	1, 5 or 10	5	WD1002FBYS, 1TB, SATA, 7200 RPM
5	1, 5 or 10	5	WD1002FBYS, 1TB, SATA, 7200 RPM

Table 2 – Storage Appliance Configuration

5. Test Methodology

The Avaya Networking Test Lab conducted comprehensive tests using a methodology that verified various fault conditions. Using Vdbench to write and then read x number of bytes, the Test Lab used the following scenarios to test the solution with a strong focus on High Availability (HA):

- 1) [Test Case 1 - Baseline Test](#)
- 2) [Test Case 2 - Simulate HBA Link Failure](#)
- 3) [Test Case 3 - Send traffic on Link p1 Only](#)
- 4) [Test Case 4 - Send traffic on Link p2 Only](#)
- 5) [Test Case 5 - Simulate Link p1 Failure on SRX](#)
- 6) [Test Case 6 - Simulate Link p2 Failure on SRX](#)
- 7) [Test Case 7 - Simulate Link p1 Failure on VSP with the CLI](#)
- 8) [Test Case 8 - Simulate Link p2 Failure on VSP with the CLI](#)
- 9) [Test Case 9 – Simulate Link p1 Failure on VSP](#)
- 10) [Test Case 10 – Simulate Link p2 Failure on VSP](#)
- 11) [Test Case 11 – Simulate Link p1 Failure on SRX](#)
- 12) [Test Case 12 – Simulate Link p2 Failure on SRX](#)
- 13) [Test Case 13 – Simulate Link p1 Failure on SRX](#)
- 14) [Test Case 14 – Simulate Link p2 Failure on SRX](#)
- 15) [Test Case 15 – Reboot the VSP](#)

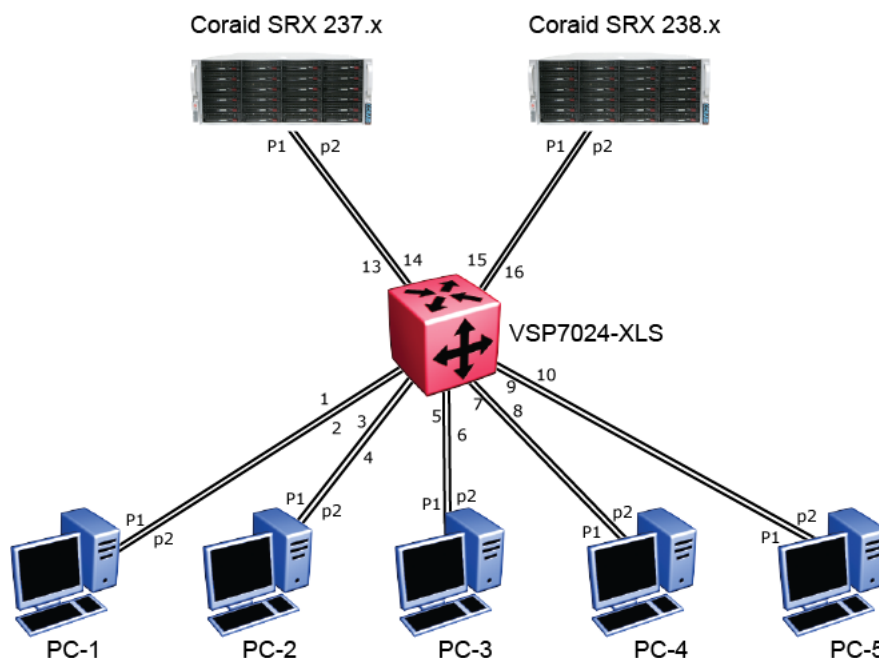


Figure 6 – Avaya Networking Test Lab Configuration

5.1 Test Case 1 – Baseline Test

The objective of this test case is to test the solution under normal conditions and retrieve baseline operating data.

Test Steps	Expected Results	Actual Results
1) Confirm that VLAN 50 was created on the VSP. All ports connected to the PC's HBAs and the SRXs should be in VLAN 50. Confirm that all ports come up.	All 10 GbE ports should have links and be up.	Pass
2) Configure five different RAID LUNs of various sizes on the SRX. After the LUNs are online, confirm that each PC can see the drives and the drives are mountable via <i>ethdrv-stat</i> . Format each LUN for testing <i>mkfs -t ext3 /dev/<device></i> . Each PC should mount a different RAID array <i>mount -t ext3 /dev/<device> /mnt/coraid</i>	Confirm that the RAID LUNs were created on the SRXs and can be seen from the PCs. From the PCs, you should be able to format the LUNs and then mount them.	Pass
3) Confirm that the LUN is reachable to the drive and write a file to it with the following command: <i>cd /mnt/coraid;touch foo</i>	RAID LUNs should be readable and writable from the PCs. RAID LUNs should appear local to the PC.	Pass
4) Launch Vdbench on each PC with the target being the RAID LUN. Set the test to run for one hour, <i>./vdbench -f param -vr</i> . This will read the parameter file for its configuration and do immediate data validation.	Vdbench should have a parameter file setup so that Vdbench knows which drive to write to and how much writing and reading it should do as well as duration. Vdbench should launch and begin reading and writing to the arrays.	Pass
5) Wait one hour for the reading and writing to complete. Vdbench stores all the results in html format in the output directory. Launch Firefox to read the results. Confirm that the error log contains no errors. Also confirm that the data verification confirms that all data was verified and accounted for.	The Vdbench error log should contain no errors. When Vdbench terminates, it should also verify that all data was written, read, and accurate.	Pass

5.2 Test Case 2 – Simulate HBA Link Failure

The objective of this test case is to verify operations when one link fails.

Test Steps	Expected Results	Actual Results
1) The HBAs have two 10 GbE links. Confirm that both links are active and sending traffic.	Both links on the HBAs should be up. The command <code>ethdrv-stat</code> should show the RAID LUNs reachable from both HBA ports. Confirm on the VSP that the links are up.	Pass
2) The HBAs use any available port to read and write data. Start Vdbench on all the PCs and confirm that the tool is working for each.	All PCs should be reading and writing to the storage array.	Pass
3) With traffic running from one PC, unplug one link from either the HBA or from the VSP. Look at the VSP stats for both HBA links to see which one has the greater amount of traffic and unplug that link.	Vdbench should keep on reading and writing to the array as if nothing happened.	Pass
4) Wait for the test to finish to determine if any data was lost. Check the output at the end of Vdbench as well as the summary and error logs on Vdbench.	Vdbench should not have any errors or invalid data issues so that you know that all data was correctly processed.	Pass

5.3 Test Case 3 – Send Traffic on Link p1 Only

The objective of this test case is to verify that you can send traffic on HBA Link p1 only.

Test Steps	Expected Results	Actual Results
1) Run Vdbench from all the PCs. Confirm that Vdbench is running correctly.	Vdbench should be reading and writing on all PCs.	Pass
2) On the PC that only has one link, link number p1 is active. Link number p2 is unplugged.	Vdbench should continue to read and write with no issues.	Pass
3) Wait for Vdbench to finish testing. Confirm that all data is validated and the error log has no errors.	Vdbench should validate all data and the error log in the output directory should be empty.	Pass

5.4 Test Case 4 – Send Traffic on Link p2 Only

The objective of this test case is to verify that you can send traffic on HBA Link p2 only.

Test Steps	Expected Results	Actual Results
1) Confirm that all links are up on the VSP. Start Vdbench from the PCs.	Vdbench should launch and begin reading and writing to the storage array.	Pass
2) On the PC that only has one link, link number p2 is active. Link number p1 is unplugged.	Vdbench should continue to read with no errors. However, the rate may drop because there is only one port.	Pass
3) Confirm that Vdbench on each PC continues reading and writing to the storage array.	Confirm that Vdbench continues to read and write to the storage array with half the links available.	Pass
4) Wait for Vdbench to finish reading and writing to verify the results.	Vdbench should finish with no errors in the log file and all data should be validated.	Pass

5.5 Test Case 5 – Simulate Link p1 Failure on SRX

The objective of this test case is to simulate Link p1 failure on the Coraid SRX while sending traffic and then validate that data continues to run on the remaining link.

Test Steps	Expected Results	Actual Results
1) Restart Vdbench with both links on the HBA and two links per SRX.	Vdbench should start with no issues.	Pass
2) After Vdbench has been running for a few minutes, remove link number p1 on the SRX.	Vdbench should continue to read and write to the storage array.	Pass
3) Wait for Vdbench to finish reading and writing to verify the results.	Vdbench should finish with no errors in the log file and all data should be validated.	Pass

5.6 Test Case 6 – Simulate Link p2 Failure on SRX

The objective of this test case is to simulate Link p2 failure on the Coraid SRX while sending traffic and then validate that data continues to run on the remaining link.

Test Steps	Expected Results	Actual Results
1) Restart Vdbench with both links on the HBA and two links per SRX.	Vdbench should launch and begin reading and writing to the storage array.	Pass
2) After Vdbench has been running for a few minutes, remove link number p2 on the SRX.	Vdbench should continue to read and write to the storage array.	Pass
3) Wait for Vdbench to finish reading and writing to verify the results.	Vdbench should finish with no errors in the log file and all data should be validated.	Pass

5.7 Test Case 7 – Simulate Link p1 Failure on VSP with the CLI

The objective of this test case is to simulate Link p1 failure on the Avaya VSP 7000 with the CLI while sending traffic. Then validate that data continues to run on the remaining link.

Test Steps	Expected Results	Actual Results
1) Confirm that all links are up on the VSP. Start Vdbench from the PCs.	Vdbench should launch and begin reading and writing to the storage array.	Pass
2) After Vdbench has been running for a few minutes, disable Link p1 on all PCs using the VSP CLI.	Transfer rate will be affected since one port will be removed, but I/O should continue.	Pass
3) On each PC, confirm that Vdbench continues reading and writing to the storage array.	Confirm that Vdbench continues to read and write to the storage array with half the links available.	Pass
4) Wait for Vdbench to finish reading and writing to verify the results.	Vdbench should finish with no errors in the log file and all data should be validated.	Pass

5.8 Test Case 8 – Simulate Link p2 Failure on VSP with the CLI

The objective of this test case is to simulate Link p2 failure on the Avaya VSP 7000 with the CLI and while sending traffic. Then validate that data continues to run on the remaining link.

Test Steps	Expected Results	Actual Results
1) Confirm that all links are up on the VSP. Start Vdbench from the PCs.	Vdbench should launch and begin reading and writing to the storage array.	Pass
2) After Vdbench has been running for a few minutes, disable Link p2 on all PCs using the VSP CLI.	Transfer rate will be affected since one port will be removed, but I/O should continue.	Pass
3) On each PC, confirm that Vdbench continues reading and writing to the storage array.	Confirm that Vdbench continues to read and write to the storage array with half the links available.	Pass
4) Wait for Vdbench to finish reading and writing to verify the results.	Vdbench should finish with no errors in the log file and all data should be validated.	Pass

5.9 Test Case 9 – Simulate Link p1 Failure on VSP

The objective of this test case is to simulate a link failure on the Avaya VSP 7000.

Test Steps	Expected Results	Actual Results
1) Confirm that all links are up on the VSP. Start Vdbench from the PCs.	Vdbench should launch and begin reading and writing to the storage array.	Pass
2) After Vdbench has been running for a few minutes, unplug link number p1 on all the PCs. Wait two minutes to ensure that the system sees the link down (ethdrv -stat), and then plug it back in.	Coraid driver takes 80-100 seconds to detect and mark the link as down. After the link is plugged back in, it takes 8-10 secs for I/O traffic to resume on that link. The downed link that came back up had to re-initialize and do SAN disk discovery before I/O traffic starts flowing again. Test observation – If you unplug a link and plug it back in quickly (1-2 secs), I/O traffic resumes on that link sub-second since the link is not yet marked down by the Coraid driver.	Pass

3) On each PC, confirm that Vdbench continues reading and writing to the storage array.	Confirm that Vdbench continues to read and write to the storage array with half the links available.	Pass
4) Wait for Vdbench to finish reading and writing to verify the results.	Vdbench should finish with no errors in the log file and all data should be validated.	Pass

5.10 Test Case 10 – Simulate Link p2 Failure on VSP

The objective of this test case is to simulate a link failure on the Avaya VSP 7000.

Test Steps	Expected Results	Actual Results
1) Confirm that all links are up on the VSP. Start Vdbench from the PCs.	Vdbench should launch and begin reading and writing to the storage array.	Pass
2) After Vdbench has been running for a few minutes, unplug link number p2 on all the PCs. Wait two minutes to ensure that the system sees the link down (ethdrv -stat), and then plug it back in.	Coraid driver takes 80-100 seconds to detect and mark the link as down. After the link is plugged back in, it takes 8-10 secs for I/O traffic to resume on that link. The downed link that came back up had to re-initialize and do SAN disk discovery before I/O traffic starts flowing again. Test observation – If you unplug a link and plug it back in quickly (1-2 secs), I/O traffic resumes on that link sub-second since the link is not yet marked down by the Coraid driver.	Pass
3) On each PC, confirm that Vdbench continues reading and writing to the storage array.	Confirm that Vdbench continues to read and write to the storage array with half the links available.	Pass
4) Wait for Vdbench to finish reading and writing to verify the results.	Vdbench should finish with no errors in the log file and all data should be validated.	Pass

5.11 Test Case 11 – Simulate Link p1 Failure on SRX

The objective of this test case is to simulate Link p1 failure on the Coraid SRX while sending traffic and then validate that data continues to run on the remaining link.

Test Steps	Expected Results	Actual Results
1) Start Vdbench with both links active on the SRX.	Vdbench should start with no issues.	Pass
2) While Vdbench is running, remove link number p1 on the SRX.	Traffic switches over to the other link.	Pass
3) Verify that traffic resumes on the link that was plugged back in.	Vdbench should continue to read and write to the storage array.	Pass
4) Verify output for errors, if any.	Vdbench should finish with no errors in the log file and all data should be validated.	Pass

5.12 Test Case 12 – Simulate Link p2 Failure on SRX

The objective of this test case is to simulate Link p2 failure on the Coraid SRX while sending traffic and then validate that data continues to run on the remaining link.

Test Steps	Expected Results	Actual Results
1) Start Vdbench with both links active on the SRX.	Vdbench should start with no issues.	Pass
2) While Vdbench is running, remove link number p2 on the SRX.	Traffic switches over to the other link.	Pass
3) Verify that traffic resumes on the link that was plugged back in.	Vdbench should continue to read and write to the storage array.	Pass
4) Verify output for errors, if any.	Vdbench should finish with no errors in the log file and all data should be validated.	Pass

5.13 Test Case 13 – Simulate Link p1 Failure on SRX

The objective of this test case is to simulate a link failure on the Coraid SRX.

Test Steps	Expected Results	Actual Results
1) Confirm that both links are active on the SRX. Start Vdbench from the PCs.	Vdbench should launch and begin reading and writing to the storage array.	Pass
2) After Vdbench has been running for a few minutes, unplug link number p1 on the SRX. Wait two minutes and then plug it back in.	I/O should switch over to the other link even though throughput may be affected due to the link failover.	Pass
3) Verify that traffic resumes on the link that was plugged back in.	Coraid driver takes 80-100 seconds to detect and mark the link as down. After the link is plugged back in, it takes 8-10 secs for I/O traffic to resume on that link. The downed link that came back up had to re-initialize and do SAN disk discovery before I/O traffic starts flowing again. Test observation – If you unplug a link and plug it back in quickly (1-2 secs), I/O traffic resumes on that link sub-second since the link is not yet marked down by the Coraid driver.	Pass
4) Wait for Vdbench to finish reading and writing to verify the results.	Vdbench should finish with no errors in the log file and all data should be validated.	Pass

5.14 Test Case 14 – Simulate Link p2 Failure on SRX

The objective of this test case is to simulate a link failure on the Coraid SRX.

Test Steps	Expected Results	Actual Results
1) Confirm that both links are active on the SRX. Start Vdbench from the PCs.	Vdbench should launch and begin reading and writing to the storage array.	Pass
2) After Vdbench has been running for a few minutes, unplug link number p2 on the SRX. Wait two minutes and then plug it back in.	I/O should switch over to the other link even though throughput may be affected due to the link failover.	Pass
3) Verify that traffic resumes on the link that was plugged back in.	Coraid driver takes 80-100 seconds to detect and mark the link as down. After the link is plugged back in, it takes 8-10 secs for I/O traffic to resume on that link. The downed link that came back up had to re-initialize and do SAN disk discovery before I/O traffic starts flowing again. Test observation – If you unplug a link and plug it back in quickly (1-2 secs), I/O traffic resumes on that link sub-second since the link is not yet marked down by the Coraid driver.	Pass
4) Wait for Vdbench to finish reading and writing to verify the results.	Vdbench should finish with no errors in the log file and all data should be validated.	Pass

5.15 Test Case 15 – Reboot the VSP

The objective of this test case is to reboot the Avaya VSP 7000 and validate that data resumes running.

Test Steps	Expected Results	Actual Results
1) While Vdbench is running, reboot the VSP 7000. Make sure the test duration is longer than the VSP 7000 boot up time to allow the VSP to complete its boot up process.	This is a negative test so results may vary.	Pass
2) Wait for VSP to complete its boot up process		
3) Verify Vdbench to see if it still runs when the VSP is rebooted.	Traffic resumes when the VSP completes its boot process.	

6. Conclusion

The Avaya Networking Test Lab conducted comprehensive interoperability and resiliency tests using a methodology that verified various fault conditions. There were no errors observed during the testing of the various fault conditions.

The test lab confirmed through various scenarios that the solution passed all High Availability (HA) tests. The test lab simulated many HA fault conditions to ensure that the PCs continued to read and write to the storage arrays with no errors. After thorough interoperability testing, all test cases were successfully completed and confirm that this solution meets Avaya's quality and interoperability standards.

7. Additional Resources

- For Avaya product documentation, go to <http://support.avaya.com/>.
- For Coraid product documentation, go to <http://www.coraid.com/products>.
- For Coraid HBA support information, go to http://www.coraid.com/support/customer_support.
- For Coraid configuration information, go to <http://support.coraid.com/support/quickstart/>.
- For Coraid SRX firmware and documentation support, go to http://www.coraid.com/support/customer_support.
- For AoE information, go to <http://www.coraid.com/support/faqs>.
- For Vdbench downloads and documentation, go to <http://sourceforge.net/projects/vdbench/>.

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