

Shared Storage Solutions Using UltraSCSI Hubs

COMPAQ
STORAGEWORKS

Application Note
EK-SMA21-AN. C01

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Introduction

This application note describes STORAGEWORKS UltraSCSI shared storage configurations using UltraSCSI hubs. The shared storage configurations outlined here consist of a STORAGEWORKS UltraSCSI hub connected to multiple host systems and a STORAGEWORKS storage subsystem. The configurations can be either homogeneous or heterogeneous.

- *Homogeneous configuration:*
 - All host servers run the same operating system and can be either clustered servers or non-clustered standalone servers. The version of the operating system and the hardware platform are not significant for this definition.
- *Heterogeneous configuration:*
 - At least one host server runs an operating system that is different from the operating system run by the other servers. All servers must be non-clustered standalone servers.

Non-clustered servers do not share disks; each server has exclusive access to its own disks. They share the SCSI bus and use of the storage controllers. The storage subsystem is shared, not the data.

These configurations can be set up utilizing the following STORAGEWORKS storage subsystems:

- STORAGEWORKS RAID Array (RA) 7000 or STORAGEWORKS Enterprise Storage Array (ESA) 10000, HSZ70 controllers
 - ◊ Clustered or non-clustered configurations
 - ◊ Up to two pairs of controllers
- STORAGEWORKS RAID Array (RA) 3000, HSZ22 controller
 - ◊ Clustered configurations only
 - ◊ Windows NT only

- STORAGEWORKS RAID Array (RA) 450, HSZ50 controllers
 - ◊ Clustered configurations only
 - ◊ SCSI bus transfer rate is limited to Fast-10 (20 MB/sec, 10 MHz)
 - ◊ Only SCSI IDs 0-7; devices requiring SCSI IDs 8-15 cannot be used

Non-clustered homogeneous and heterogeneous configurations are not supported by the RA3000 and RA450 subsystems as they do not support exclusive storage unit access. However, the RA3000 has two host ports on its HSZ22 controller. Each port has its own set of disks and can be connected to a different SCSI bus. Thus, the RA3000 can support two Windows NT clusters, one on each host port.

The UltraSCSI hubs used in shared storage configurations are:

- *DS-DWZZH-03*, a 3-port UltraSCSI hub with three differential ports
- *DS-DWZZH-05*, a 5-port UltraSCSI hub with five differential ports and fair arbitration

NOTE

The DWZZH-21 3-port UltraSCSI hub with 2 single-ended ports and 1 differential port is for special OEM applications only. It is not supported in shared storage configurations.

At this release, Windows NT, OpenVMS, DIGITAL UNIX and Sun Solaris are the supported operating systems, in any combination, using UltraSCSI hubs in a shared storage configuration.

Shared Storage Concepts

In a multiple-host environment where each host requires exclusive access to its own data, a separate data storage system for each host is typically employed. In this scenario, each storage subsystem must be individually configured and maintained, each has its own set of hardware components and each requires its own physical location.

Shared storage, however, provides a better alternative to the complex storage demands of a multiple-host environment. With shared storage, multiple host storage needs may be consolidated into a single storage subsystem. Each host maintains exclusive access to its own data. Only one storage subsystem needs to be configured and maintained; i.e., there is only one set of hardware components and just one physical location is required.

The immediate benefits of using an UltraSCSI hub in a shared storage configuration include:

- Hub-radial topology and greater total bus length
 - Hubs are a central connectivity point for the SCSI bus; the bus segments radiate from the hub. This provides a more direct and simplified cabling topology.
 - Hubs act as bus extenders, allowing each bus segment to be up to 25 meters; 50-meter total bus length end-to-end.
- Higher signal reliability
 - Each bus segment is electrically isolated. A bus segment is immediately disabled should it become invalid; e.g., a cable is accidentally disconnected from a host. The remainder of the bus continues to function.
 - Bus signals are captured and the timing is resynchronized before being transmitted on the next bus segment.

- Greater physical reliability and fewer physical constraints
 - Extra cables and bus terminators are eliminated, providing cleaner host connections and better access to host port locations.
 - There are fewer pieces that could fail or accidentally be disconnected. Less weight is placed as a strain on the connectors.
- Fair Arbitration
 - Fair Arbitration is a feature specific to 5-port UltraSCSI hubs which allows host systems to have equal access to the SCSI bus.
 - Fair Arbitration is applied only to the host ports and not the storage port. The storage port uses normal SCSI arbitration. Having a higher ID and thus higher priority, it is able to return completed I/O requests as quickly as possible.

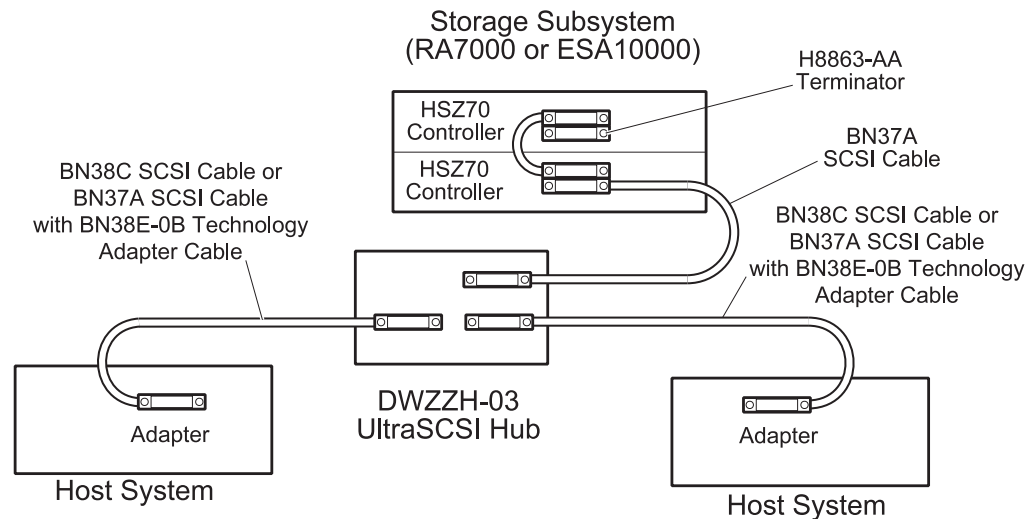
UltraSCSI Hub Configurations

Examples of a 3-port UltraSCSI hub configuration and a 5-port UltraSCSI hub configuration are shown below:

NOTE

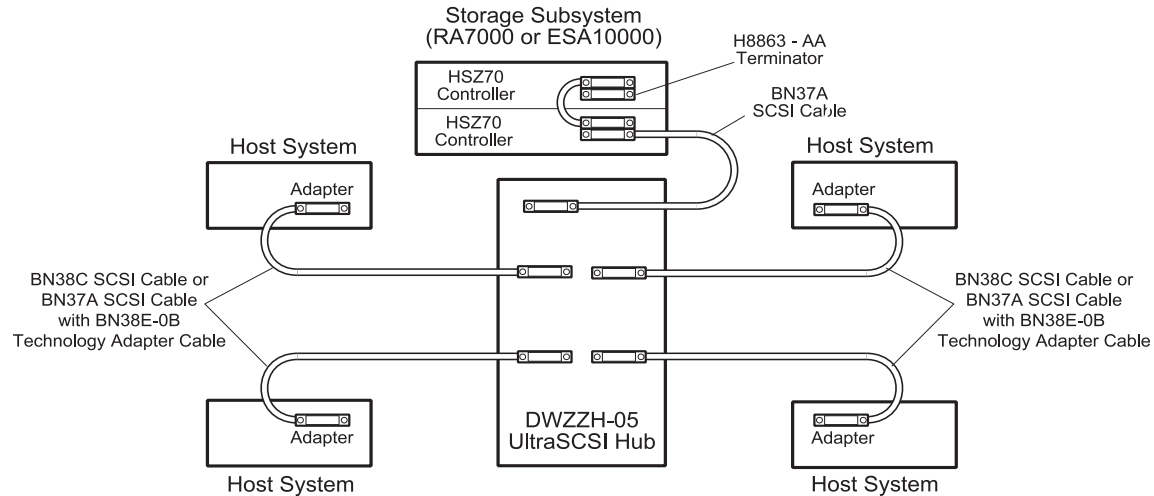
The host adapters shown in the following diagrams are configured with internal termination.

Figure 1 Example 3-Port UltraSCSI Hub Configuration Layout



SHR-1101

Figure 2 Example 5-Port UltraSCSI Hub Configuration Layout



SHR-1132

The host adapters can be connected to the UltraSCSI hubs using two interchangeable cabling options:

- BN38C VHDCI-to-HD68 SCSI cables
- BN37A VHDCI-to-VHDCI SCSI cables coupled with BN38E-0B VHDCI-to-HD68 technology adapter cables

The BN38C cables are recommended. See the *UltraSCSI Configuration Guidelines* for a complete list of the available cables.

Shared Storage Prerequisites

The implementation of a shared storage configuration requires:

- The RA7000 or ESA10000 with either dual-redundant HSZ70 controllers or a single HSZ70 controller using HSOV V7.0 or newer firmware. The HSZ70 controllers, when used in a dual-redundant configuration, will usually be set in transparent controller failover mode.

NOTE

For more information regarding RA7000 or ESA10000 configuration requirements, please consult the *HSZ70 Array Controller, HSOV Version 7.0, Configuration Manual* and other supporting documentation supplied with your storage subsystem.

OR

- The RA3000 with a single HSZ22 controller using D10i or newer firmware (Windows NT clusters only).

NOTE

For more information regarding RA3000 configuration requirements, please consult the *Getting Started, RAID Array 3000 for Windows NT, Installation Guide* and other supporting documentation supplied with your storage subsystem.

OR

- The RA450 with either dual-redundant HSZ50 controllers or a single HSZ50 controller using HSOF V5.2 or newer firmware (for clustered configurations only). The HSZ50 controller, when used in a dual-redundant configuration, will usually be set in failover mode.

NOTES

- For more information regarding RA450 configuration requirements, please consult the *HSZ50 Array Controller, HSOF 5.1, Configuration Manual* and other supporting documentation supplied with your storage subsystem.
- The RA450 subsystem only supports SCSI IDs 0-7. Devices requiring SCSI IDs 8-15 **cannot** be used in a RA450 configuration without causing substantial SCSI bus problems.

- Each host system must have the *Solution Software Kit* for the storage subsystem / host operating system combination.
- UltraSCSI hubs must be installed in a STORAGEWORKS DS-BA356-xx shelf equipped with at least one 180-watt power supply or in the BA370 shelf of the RA7000 or ESA10000. The 3-port hub may also be installed in the RA3000. Installation in a BA356 shelf is the preferred approach.

NOTES

- It is highly recommended that two power supplies be employed in a BA356 shelf for redundancy.
- If the UltraSCSI hub is installed in the RA3000 enclosure, the enclosure door will not close.

- The STORAGEWORKS Command Console (SWCC) is recommended to set up and manage these storage configurations. SWCC is a centralized graphical storage management console that allows real-time configuration of the storage environment and delivers reliable, real-time monitoring and notification of storage events.

NOTE

In a multi-host environment, only **one** SWCC agent is to be activated. A single SWCC agent gives the Command Console client complete ability to monitor and control the RAID subsystem. For more information about SWCC, please consult the *Command Console Version 2.0, User's Guide*.

Shared Storage Configuration Notes

The following represent points common to both heterogeneous and homogeneous shared storage configurations as well as any inherent limitations:

- OpenVMS, DIGITAL UNIX, Windows NT and Sun Solaris operating systems can coexist on the same UltraSCSI hub in any combination up to a maximum of four hosts. See each operating system's specific *Shared Storage Application Note* for details.

- A cluster must have exclusive use of the SCSI bus. A cluster is not supported with additional non-clustered hosts nor with additional clusters on the same UltraSCSI hub.
- At the time of this writing, DIGITAL UNIX only supports narrow SCSI addressing.
- In a configuration that includes a 5-port UltraSCSI hub and a Windows NT host using the SWXA3-BD (Adaptec 2944UW) host adapter, the hub itself (Part No. 70-33250-03) must have a minimum revision level of E01. For Part No. DS-DWZZH-05, which includes the hub and documentation, the minimum revision level is F01.

Shared Storage Document Reference

NOTE

For information specific to your host operating system, refer to your operating system's *Shared Storage Application Note*.

The following table provides a list of current *Shared Storage Application Notes* as well as other documents pertinent to each of the operating systems:

| Topic | Document Title | Order Number |
|---|--|---------------------|
| <i>Windows NT</i> | <i>Shared Storage for Windows NT Using UltraSCSI Hubs</i> | <i>EK-SMA17-AN</i> |
| <i>OpenVMS</i> | <i>Shared Storage for OpenVMS Using UltraSCSI Hubs</i> | <i>EK-SMA19-AN</i> |
| <i>DIGITAL UNIX</i> | <i>Shared Storage for DIGITAL UNIX Using UltraSCSI Hubs</i> | <i>EK-SMA20-AN</i> |
| <i>Sun Solaris</i> | <i>Shared Storage for Sun Solaris Using UltraSCSI Hubs</i> | <i>EK-SMA18-AN</i> |
| <i>RA7000 / ESA10000 (HSZ70 Controller)</i> | <i>RA7000 and ESA10000 Storage Subsystems, User's Guide</i> | <i>EK-SMCP-UG</i> |
| <i>HSZ70 Controller</i> | <i>HSZ70 Array Controller, HSOF Version 7.0, Configuration Manual</i> | <i>EK-HSZ70-CG</i> |
| <i>RAID Array 450 (HSZ50 Controller)</i> | <i>HSZ50 Array Controller, HSOF 5.1, Configuration Manual</i> | <i>EK-HSZ50-CG</i> |
| <i>RAID Array 3000 (HSZ22 Controller)</i> | <i>Getting Started, RAID Array 3000 for Windows NT-Alpha, Installation Guide</i> | <i>AA-RACUA-TE</i> |
| <i>RAID Array 3000 (HSZ22 Controller)</i> | <i>Getting Started, RAID Array 3000 for Windows NT-Intel, Installation Guide</i> | <i>AA-RACZA-TE</i> |
| <i>STORAGEWORKS Command Console</i> | <i>Command Console Version 2.0, User's Guide</i> | <i>AA-R60EA-TE</i> |
| <i>UltraSCSI</i> | <i>UltraSCSI Configuration Guidelines</i> | <i>EK-ULTRA-CG</i> |
| <i>UltraSCSI Hub</i> | <i>DWZZH 16-Bit UltraSCSI Hub, Users' Guide</i> | <i>EK-DWZZH-UG</i> |

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