



EVA Optimizing and Troubleshooting on Windows, Session ID 3415



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AGENDA

- EVA Introduction
- Section 1: EVA Best Practices
 - Cost of Ownership
 - Availability
 - Performance
- Section 2: Better Troubleshooting through Proper Configuration
 - Windows Server Configuration
 - Switch Configuration and Management
 - Storage Management Appliance (SMA)
 - EVA Configuration





AGENDA (continued)

- Section 3: Basic Error Troubleshooting
 - Disk Appearance
 - Server Event Decoding
 - SMA Event Decoding



Enterprise Virtual Array Tutorial

INTRODUCTION



Optimizing and Troubleshooting the EVA in a Windows environment



- Assumptions:
 - Basic knowledge of RAID concepts-RAID 0, RAID 1, RAID 5
 - Basic knowledge of RAID storage systems
 - Basic knowledge of Storage Area Networks (SANs)- fabric switches, fibre channel host bus adapters, cabling
 - Basic system administration knowledge on Windows

HP Enterprise Virtual Array (EVA) Introduction



- The EVA is a high-performance, high-capacity, and high-availability RAID storage solution.
- 2 Gb/s transfer speeds end to end
- No single point of failure
- Multi-vendor platform support (Windows, HP Tru64 Unix, HP OpenVMS, HP-UX, Sun Solaris, IBM AIX, Red Hat and Suse Linux, Novell Netware)

HP Enterprise Virtual Array (EVA)

Introduction



- Supports virtually capacity-free and fully allocated snapshots
- Virtually instantaneous Business Copy replication (snapclones)
- Automatic, self-tuning controller performance
- 168 drive bays native-up to 240 with expansion rack
- Supports 36, 72, and 146 GB fibre channel disk drives
- Supports a maximum capacity of 35 TB with 146 GB drives and expansion cabinet.



“... it is
not always possible to simultaneously
optimize a configuration for cost,
performance, and
availability
”

Ken Bates

Storage Performance Engineering



Section 1: EVA BEST PRACTICES

Cost of Ownership,
Performance,
and Availability

EVA Best Practices

Trade-offs and compromises



- Choices must be made between optimizing for cost, performance, or availability.
- VRAID 0 = 100% storage utilization-best choice for cost, but not for availability.
- VRAID 1 = 50% storage utilization-best choice for availability, but not for cost.
- VRAID 5 = Compromise between utilization and cost.
- The “best” choice depends on the needs of the environment.

EVA BEST PRACTICES: Cost of Ownership

EVA Best Practices

Cost of Ownership Best Practices

- 3 protection levels: none, single (1), double (2)
- Protection level reserved by:
 - Doubling the size of the largest disk in the disk group
 - Multiplying that by 0, 1, or 2 (depending on protection level)
 - Removing that capacity from free space.
- Having a few larger disks added in with smaller disks results in extra, unusable space being reserved.
- **COST OF OWNERSHIP BEST PRACTICE:** Do not mix disk drive sizes in a single disk group.

EVA Best Practices

Cost of Ownership Best Practices



- Protected space cannot be shared by different disk groups.
- A single disk group with a protection level of 2 will set aside 4 disks for reserved space.
- With 2 disk groups, each group will set aside 4 disks for reserved space, for a total of 8 disks of unusable space.
- Each additional disk group uses additional disks for protected space.
- **COST OF OWNERSHIP BEST PRACTICE:** Use a single disk group.

EVA Best Practices

Cost of Ownership Best Practices



- Spare capacity = space left after space has been reserved for protected space.
 - used for creating new virtual disks, snapshots, or snapclones.
- Spare capacity increases or decreases as snapshots, snapclones, or virtual disks are created or deleted, or new physical drives are added or removed.
- If available, spare capacity is used for recovery from a disk failure before protected space.
- Stranded capacity results from an excess of spare capacity divided across disk groups.
- **COST OF OWNERSHIP BEST PRACTICE:** Use a single disk group.

EVA Best Practices

Cost of Ownership Best Practices



- Using a large number of disk drives maximizes the investment in the EVA storage controllers and supporting equipment.
- **COST OF OWNERSHIP BEST PRACTICE:** Fill the EVA with as many disk drives as possible.
- Larger disks typically offer a higher price-capacity ratio.
 - 15K RPM drives are usually more expensive than 10K RPM drives of the same capacity.
- **COST OF OWNERSHIP BEST PRACTICE:** Use lower performance, larger capacity disks when possible.

EVA BEST PRACTICES: Availability

EVA Best Practices

Best Practices for Availability



- EVA creates sub-groupings of drives called Redundant Storage Sets (RSS) within disk groups.
- RSSs protect against data loss in the event of multiple, simultaneous disk failures.
- User cannot specify which drives will comprise a RSS.
- Target size for a RSS is 8 disks
 - Can be as few as 6 and as many as 11
 - EVA will grow and shrink them to make as many 8 disk RSSs as possible.
- Configuration guidelines can be followed to increase RSS availability.

EVA Best Practices

Best Practices for Availability



- VRAID 5 AVAILABILITY BEST PRACTICES (use VRAID 5 guidelines when mixing VRAID 5 and VRAID 1 in same disk group):
 - Use a minimum of 8 shelves in a VRAID 5 config.
 - Arrange all disks in a vertical fashion; the same bay in each shelf should contain a disk.
 - Total number of disks in the disk group should be a multiple of 8
 - Allow the EVA to choose which disks make up a disk group.

EVA Best Practices

Best Practices for Availability



- VRAID 1 AVAILABILITY BEST PRACTICES:
 - With VRAID 1, EVA will automatically attempt to place the individual members of a mirror pair on different shelves, so 8 shelves is not a requirement
 - Arrange all disks in a vertical fashion; the same bay in each shelf should contain a disk
 - Let the EVA choose which disks to place in the group

EVA Best Practices

Best Practices for Availability



- Disk replacement availability guidelines:
 - On disk hardware failure, EVA rebuilds volume through sparing process; may place RSS members on the same shelf
 - To restore RSS configuration, wait for sparing to complete, as indicated in the event log
 - Remove the failed disk, insert replacement disk
 - Add new disk into original disk group.
 - When inserting multiple disks, wait 60 seconds between each disk insertion.

EVA Best Practices

Best Practices for Availability



- EVA is highly redundant, but multiple, simultaneous disk failures within the same RSS could lead to loss of the disk group. Very unlikely.
- For highest availability, create two separate disk groups (results in higher cost of ownership and potentially lower performance).
- In a database environment, place database files on one disk group and log files on another.
- Multiple database environment suggested config.:
 - Disk Group 1: Database 1, DB 1 log files, DB 2 log files
 - Disk Group 2: Database 2, DB 2 log files, DB 1 log files

EVA BEST PRACTICES: Performance

EVA Best Practices

Best Practices for Performance

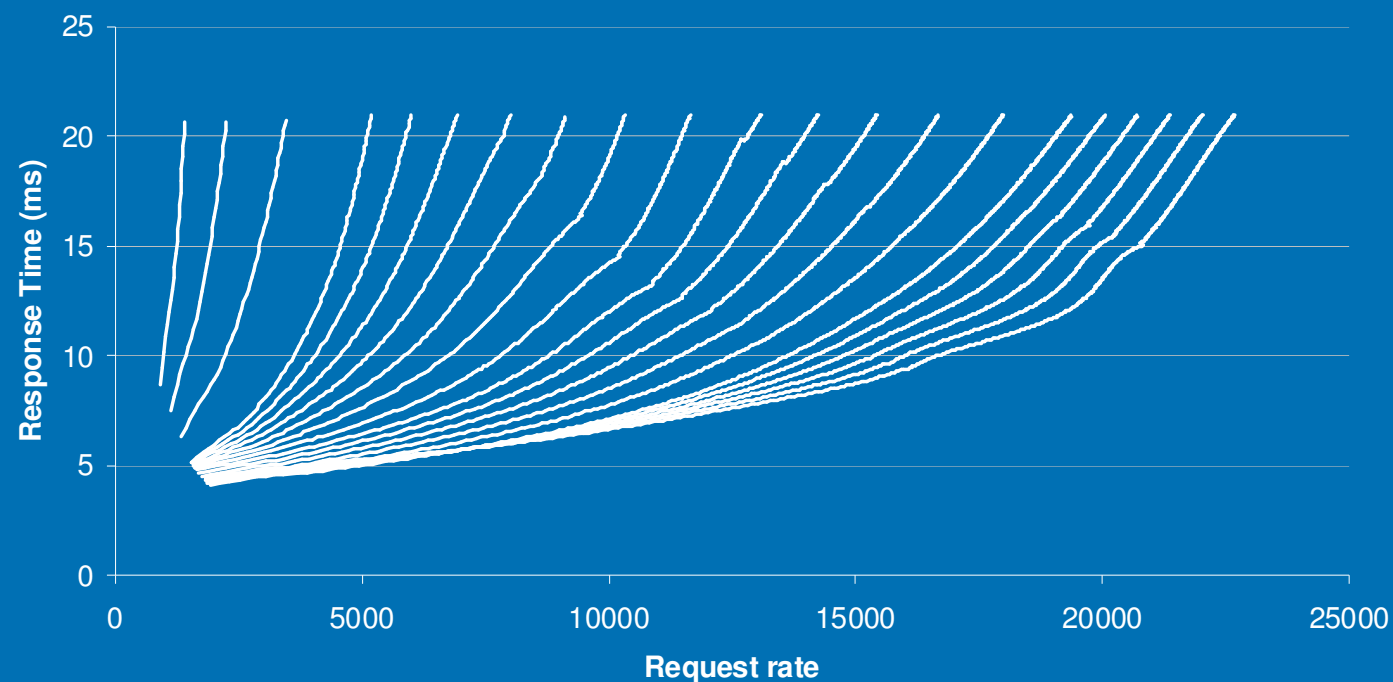


- Random access applications are limited by physical disk speeds, so increased number of disks = increased performance potential.
- The larger number of drives under a single disk group = increased performance potential.
- **PERFORMANCE BEST PRACTICE:** Fill the EVA with as many disk drives as possible in a single disk group.



Effects of Larger Disk Groups

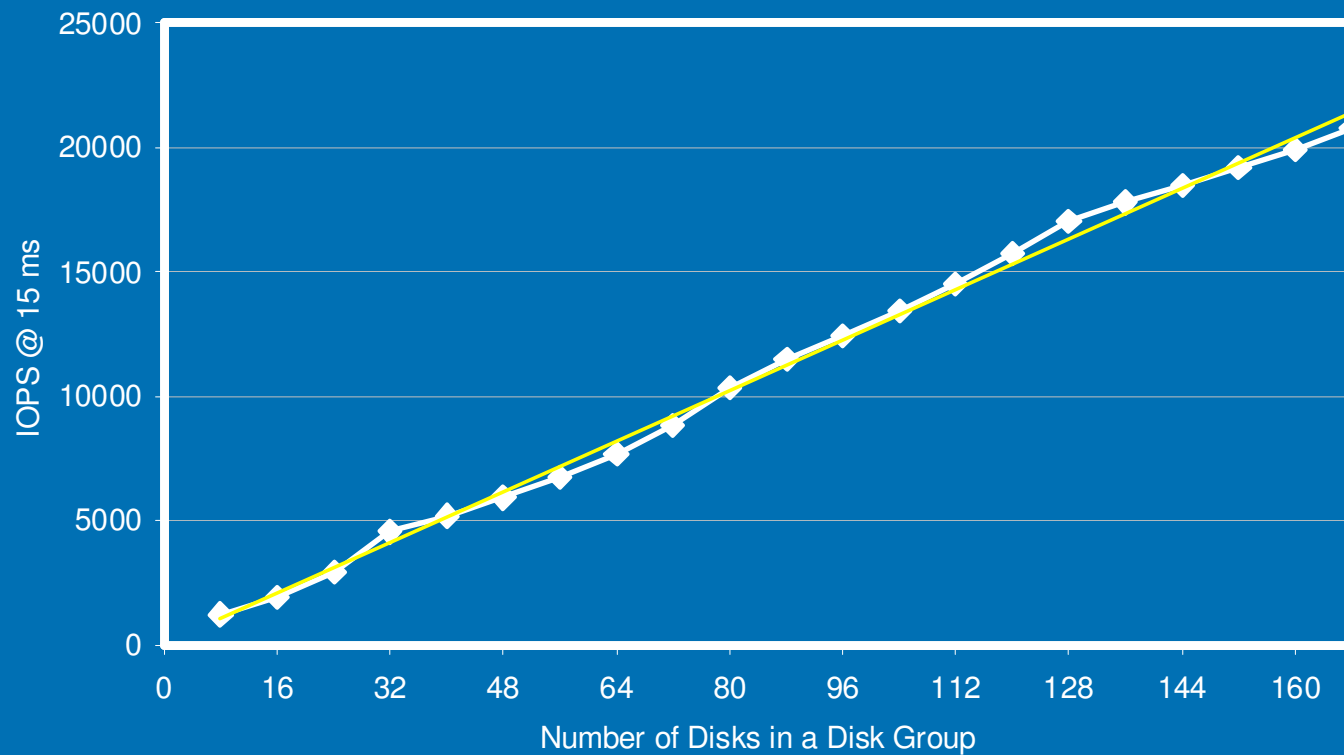
OLTP Scaling - 8 to 168 Disks/Group
(In steps of 8)





More Disks = More Performance

Effects of Adding Disks



EVA Best Practices

Best Practices for Performance



- For large block I/O applications, disk RPM has little effect on performance.
- For small block, random I/O applications, performance 30%-40% higher with 15K RPM drives versus 10K RPM drives.
- If 15K RPM drives are 30%-40% more expensive than 10K RPM drives, and the EVA can accommodate more drives, purchase more 10K RPM drives.
- **PERFORMANCE BEST PRACTICE:** 15K RPM drives can offer better performance, but consider cost and quantity tradeoffs with 10K RPM drives.

EVA Best Practices

Best Practices for Performance



- Mixing 10K and 15K RPM drives in a disk group is supported.
- Host level performance depends on which drive processes the I/O request.
- The disk group does not slow down to the speed of the slowest drive.
- Even with mixed speeds, highest performance still achieved with the largest number of drives possible in a single disk group.
- **PERFORMANCE BEST PRACTICE:** Mix 10K RPM drives and 15K RPM drives into a single disk group for best performance.

EVA Best Practices

Best Practices for Performance



- Drives with different capacities offer better performance when placed in a single disk group.
- PERFORMANCE BEST PRACTICE: Place drives with different capacities in the same disk group.
- **Rule of thumb**: for performance, the more drives in a single disk group the better, even if drive capacities and disk speeds are mixed.

EVA Best Practices

Best Practices for Performance



- Cache mirroring protects data in cache in the event of a cache module failure.
- Cache mirroring impacts write performance due to the data copy operation.
- PERFORMANCE BEST PRACTICE: When protection of data in cache is not a concern, disabling write cache mirroring can result in increased write performance.
- **Consider carefully the trade-off between performance and data redundancy.**

EVA Best Practices

Best Practices for Performance



- The EVA detects I/O workload -enables and disables random access caching and sequential (pre-fetch) caching dynamically.
- No negative impact from leaving read cache enabled; there is often a performance advantage.
- **PERFORMANCE BEST PRACTICE:** Always leave read caching enabled on a LUN.

Section 2: Troubleshooting improper configuration

- Windows Server Configuration
- Switch Configuration and Management
- Storage Management Appliance (SMA)
- EVA Configuration



Windows Server Configuration



Configure it right the first time



- From experience, we find that many problems related to troubleshooting the EVA are related to an improper server configuration.
- So as a first step in troubleshooting and in order to avert this problem, we are going to cover proper driver installation via the EVA Platform Kit.
- Then we will cover Secure Path and some HBA utilities you can use for troubleshooting.
- Most of the server configuration that follows is specific to the Windows platform, but the concepts are not.

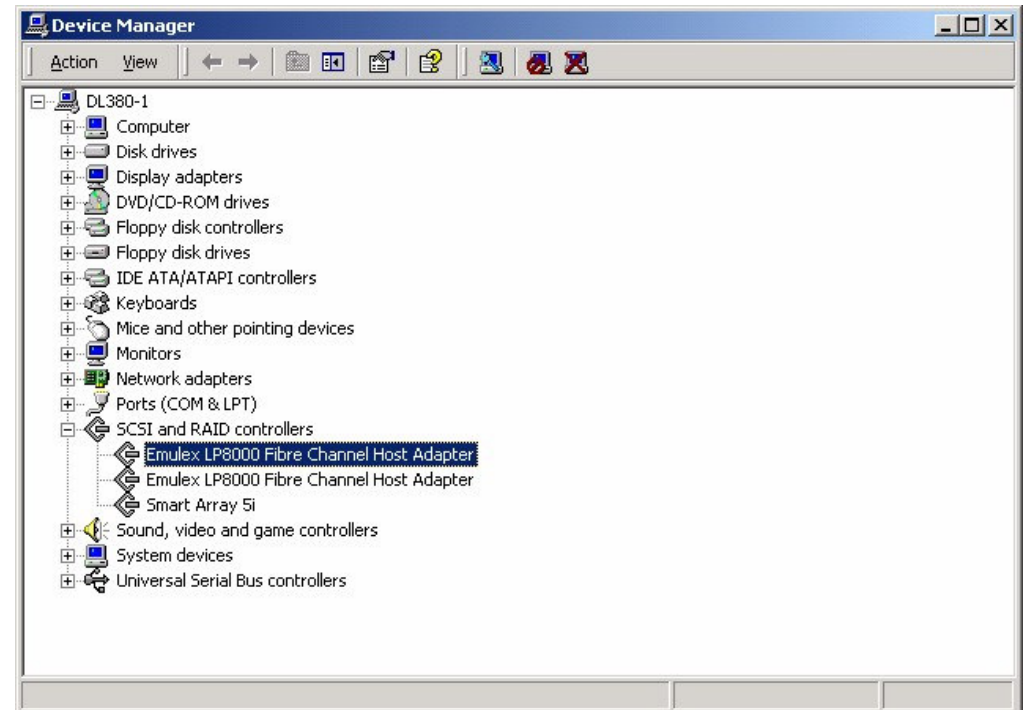


Host Bus Adapters for Windows (32-bit)

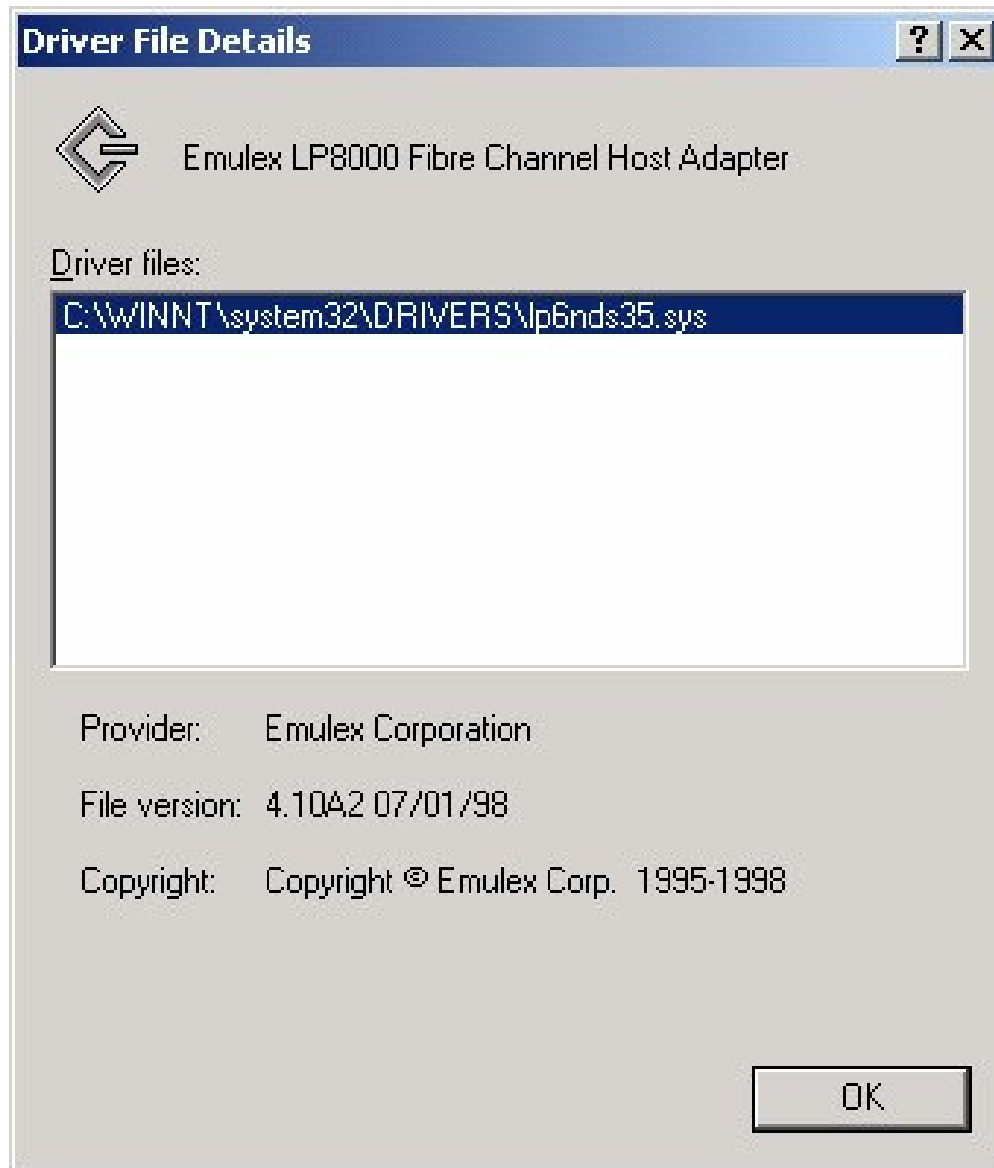
- The following HP Fibre Channel Host Bus Adapters (HBAs) are some of the adapters recommended for Windows 2000 and Windows Server 2003:
 - FCA2101 - 2Gb/s, 64-Bit/66-MHz PCI-to-Fibre Channel HBA (Emulex)
 - FCA2214 - 2Gb/s 64-Bit/133 MHz PCI-X to-Fibre Channel HBA (Qlogic)
 - FCA2355 - 2Gb/s Dual Channel PCI 64-Bit/66 MHz to-Fibre Channel HBA (Emulex)
 - FCA2408 - 2Gb/s Fibre Channel PCI-X133 HBA (Emulex)
- Not recommended for the configuration, but supported:
 - KGPSA – 1Gb/s 64-Bit PCI-to-Fibre Channel HBA (Emulex)
- HBAs for 64-bit Windows are available from HP as well.

Host Bus Adapter Driver Installation

- **Windows 2000 will install its native Host Bus Adapter (HBA) Driver installs for 1Gb HBAs**
 - The native driver is incorrect for all HP StorageWorks Devices, not just the EVA

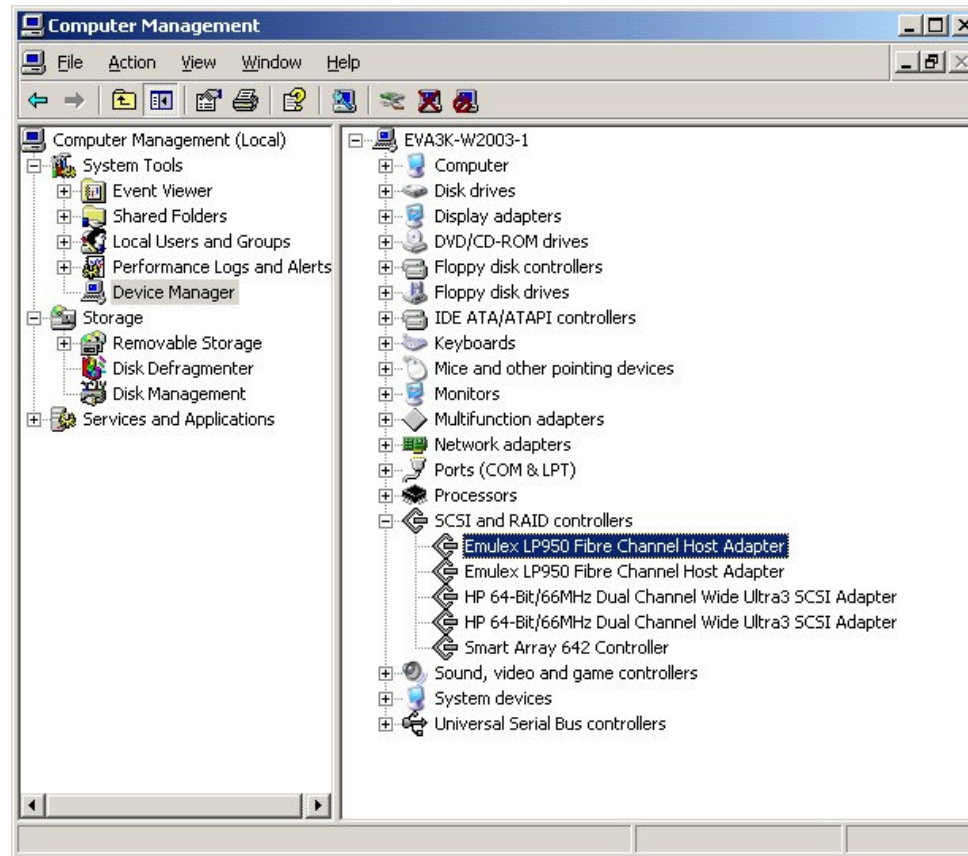


- Driver is lp6nds35.sys



- **In Windows 2000, a native driver for 2Gb HBAs (FCA-2xxx) will not be found**
 - Windows 2000 will search for a native 2Gb HBA driver
 - 2Gb HBA Shows up as “Unknown Device” in Device Manager for Windows 2000
 - Recommend that you do not install drivers using Device Manager
 - “Manual” Driver Installation is supported
- **In Windows 2003, a native driver for 1Gb and 2Gb HBAs will be installed**

Windows Server 2003



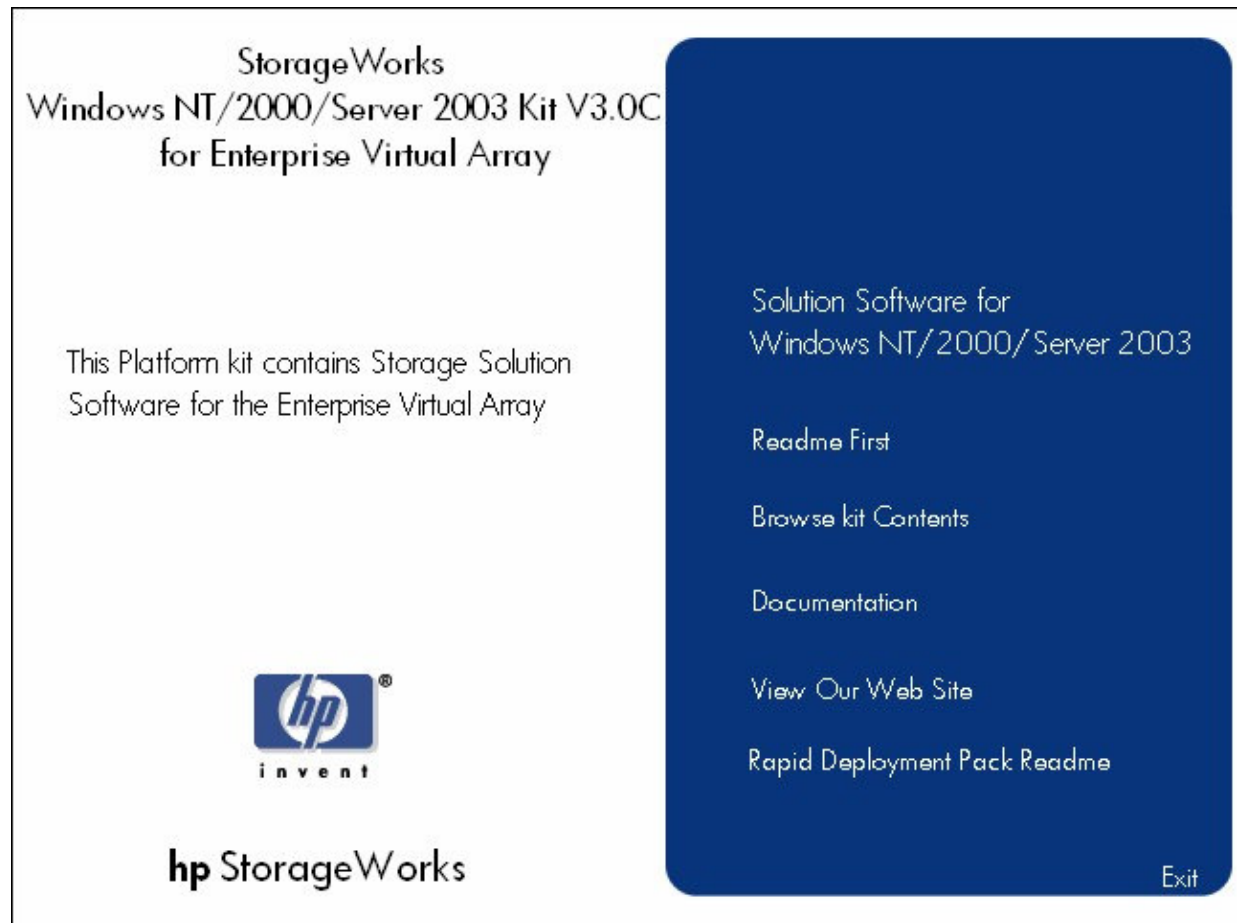
For Windows 2000/2003, the Emulex driver is incorrect

- Incorrect due to the default registry settings
- May work initially but will likely cause problems later and is not supported by HP

EVA Platform Kit Overview (version 3.0C)



- Platform Kit is also known as “Solution Software for Windows” or other OSes (i.e. Tru64, HP-UX, OpenVMS, etc)



Platform Kit Contents



- **Windows Platform Kit contains the following:**
 - Solution Software for Windows NT 4.0 and higher
 - Check OS Utility
 - HBA Drivers (including 32-bit and 64-bit Windows 2003 drivers)
 - Fibre Channel Utility
 - Storage System Scripting Utility
 - Solution Software Uninstall Utility
 - Platform Kit Installation Reference guide
 - Storage System Scripting Utility Reference guide
 - Rapid Deployment Pack (RDP) Overview and Installation
 - Always read the Release Notes BEFORE installing any software



Platform Kit Availability

- Platform kits have been free since the release of VCS version 3.0
- Comes from HP on a CD but can also be downloaded from <http://www.hp.com/go/evaplatformkit/> as an ISO file or a ZIP file.

Solution Software Installation



- Driver Install will show the Platform Kit version and HBA driver version (QLogic and Emulex-based cards)

StorageWorks
Windows NT/2000/Server 2003 Kit V3.0C
for Enterprise Virtual Array

The minimum hp StorageWorks Fibre Channel Adapter (KGPSA, FCA - Emulex) driver version 4.82a16, and hp StorageWorks Fibre Channel adapter (FCA - QLogic) driver version 8.2.0.73 must be installed before proceeding with the Solution Software Installations. For the latest driver, check the Storage web site on <http://www.hp.com>.



hp StorageWorks

Perform Multi Driver Install/Update

Run Fibre Channel Utility

Install SSSU

Main Menu Exit



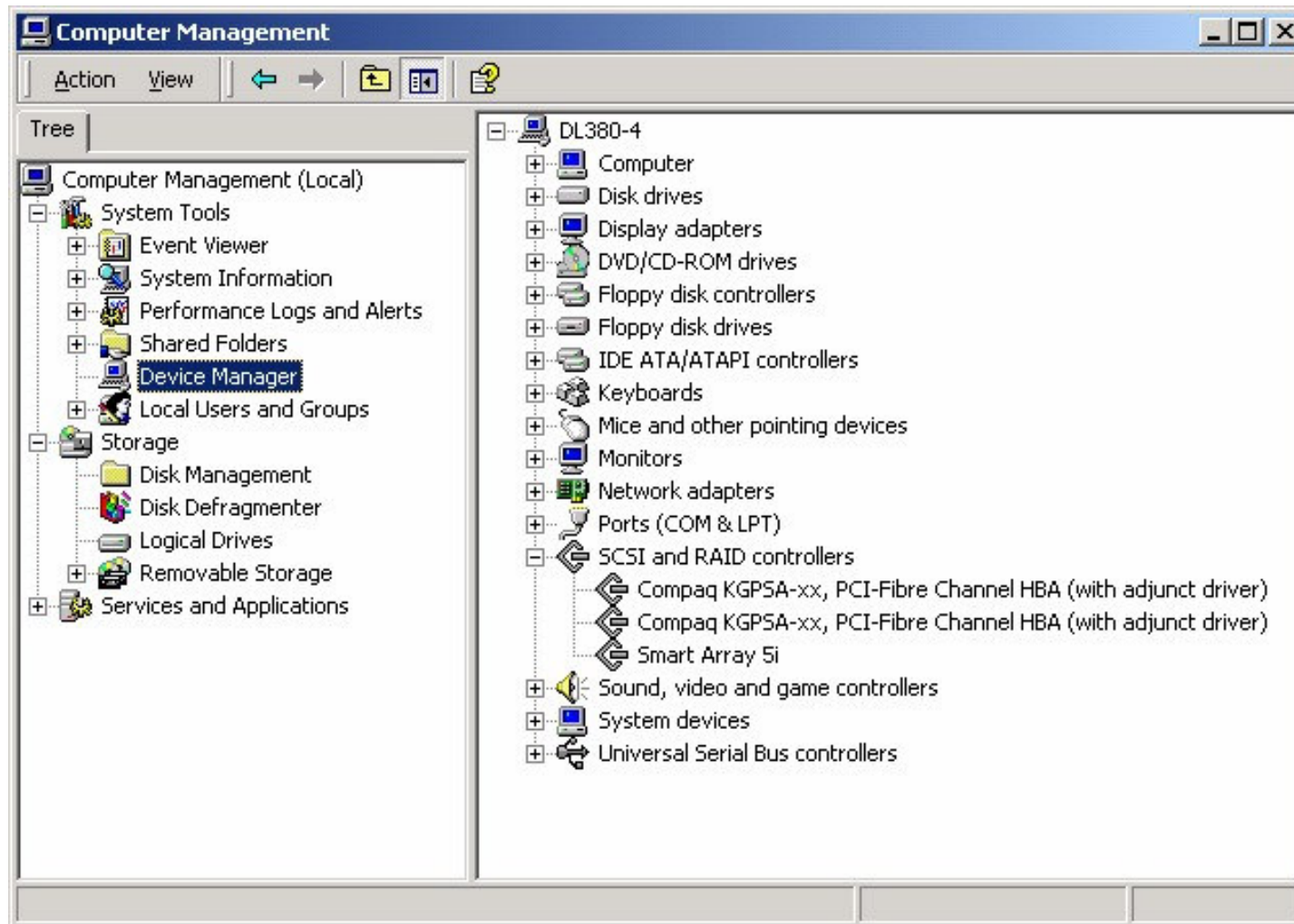
StorageWorks
Windows NT/2000/Server 2003 Kit V3.0C
for Enterprise Virtual Array

Please wait while the server is
updated...



hp StorageWorks

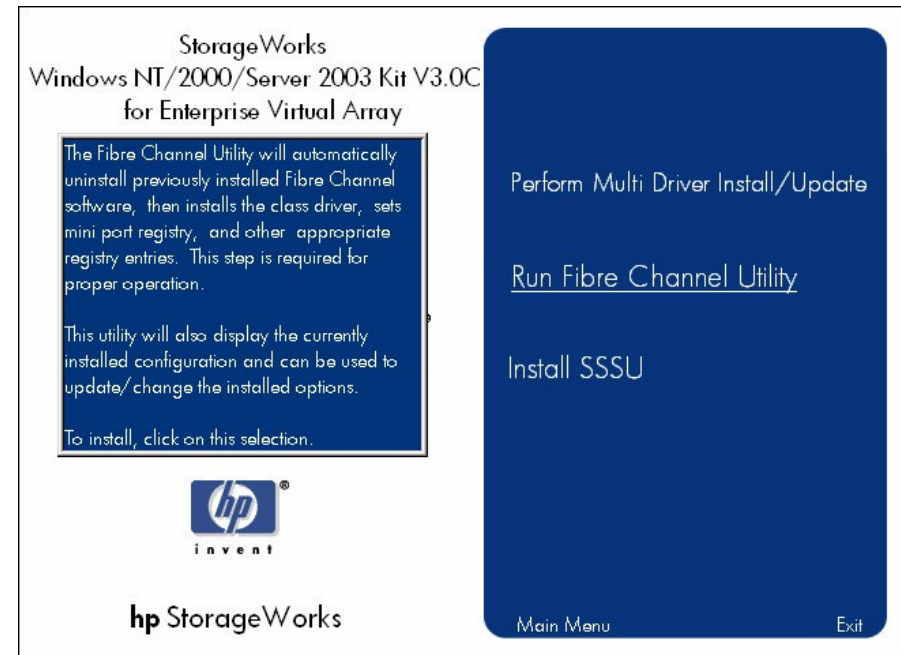
After the driver installation, you will see the correct driver in Device Manager.



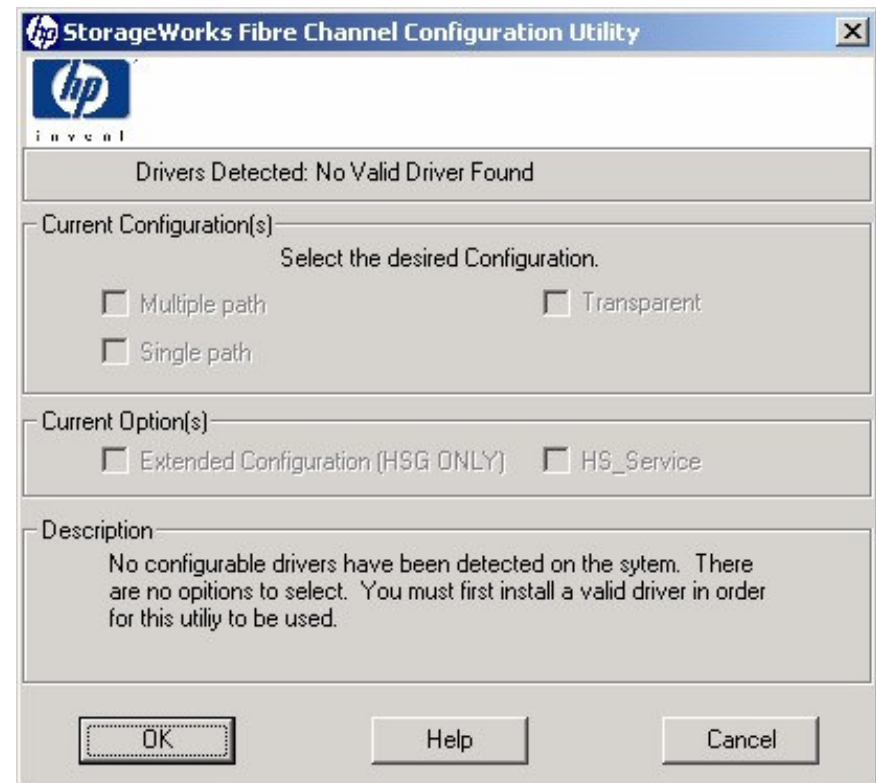
Fibre Channel Utility



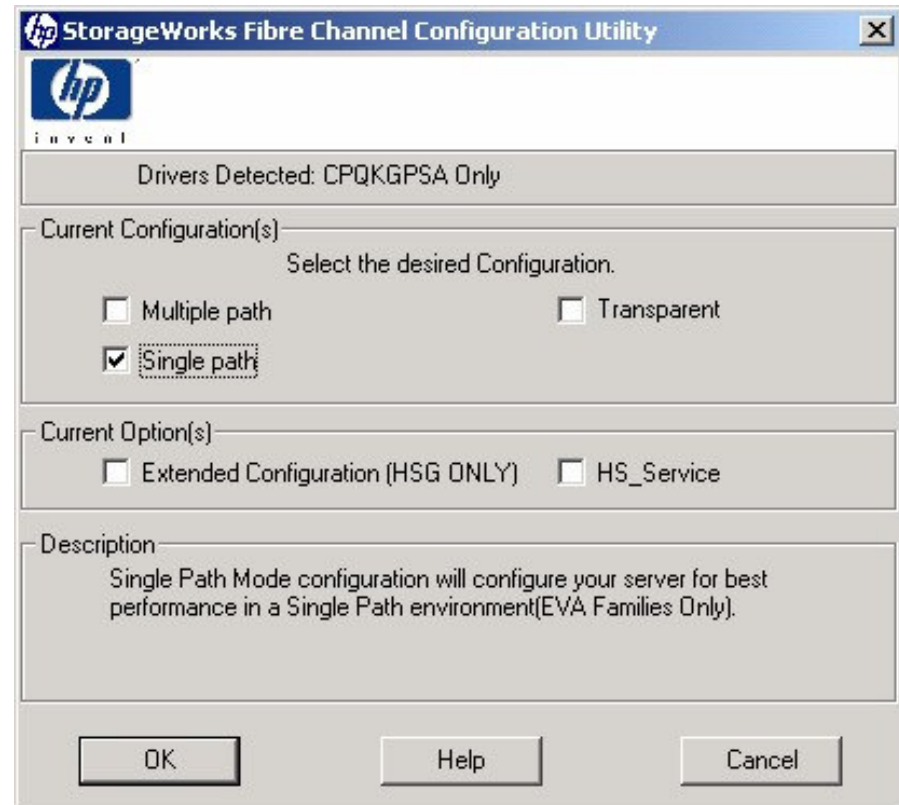
- Launched from Platform Kit
- You must reboot after running the utility in order for the new settings to take affect
- Sets registry settings



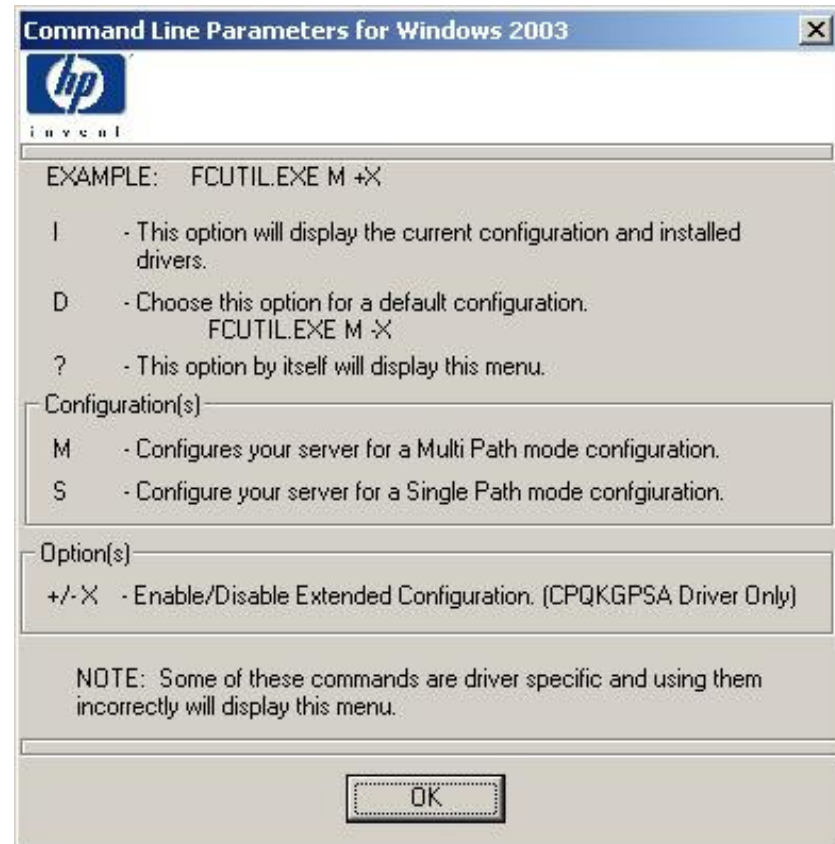
A supported
StorageWorks Fibre
Channel Adapter driver
must be installed prior to
running the utility



- The utility may be run anytime to reconfigure the server
- Remember, a reboot is required for the new settings to take affect.



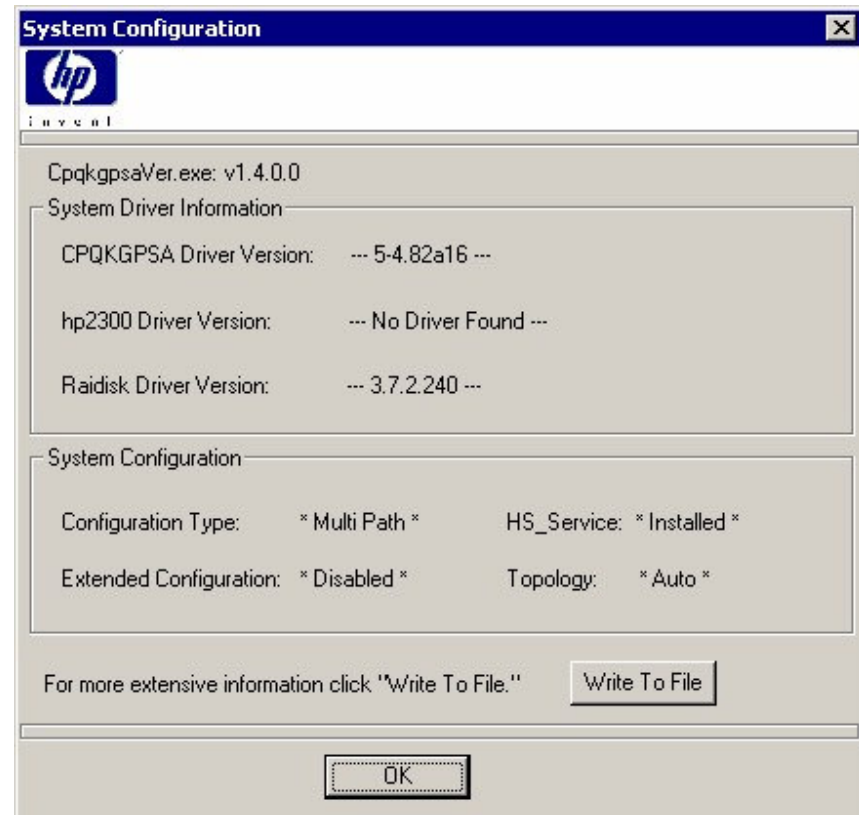
- The Utility can be run from a command line (local or RDP)



Checking the Configuration



- If you are unsure of the current configuration, the Fibre Channel Utility will not show you the current configuration before or during its changes.
- To view your current settings, run the Fibre Channel System Configuration, FibreChannelVer.exe, in the \Setups\FC Utility directory on the CD or download.

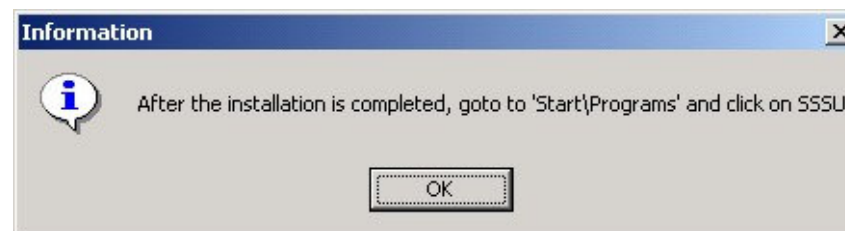
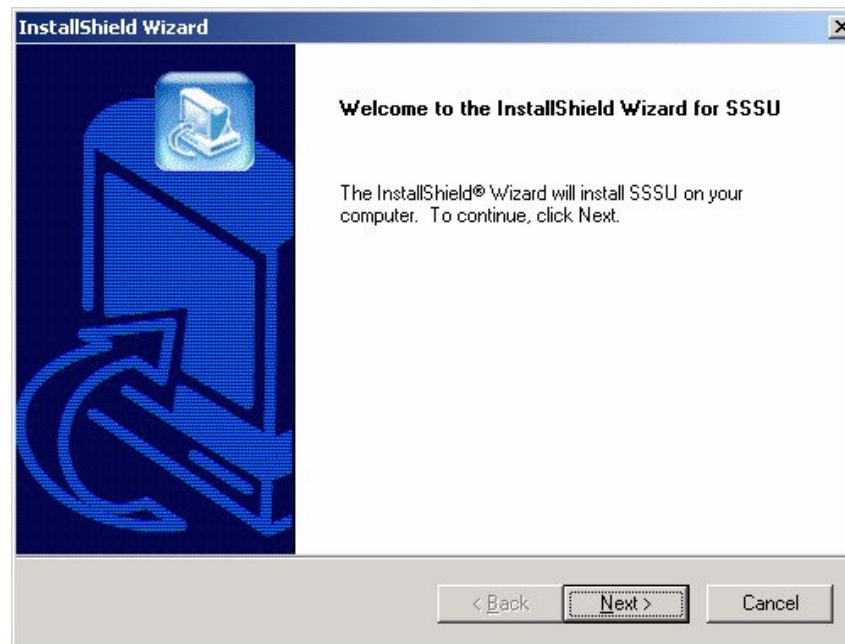


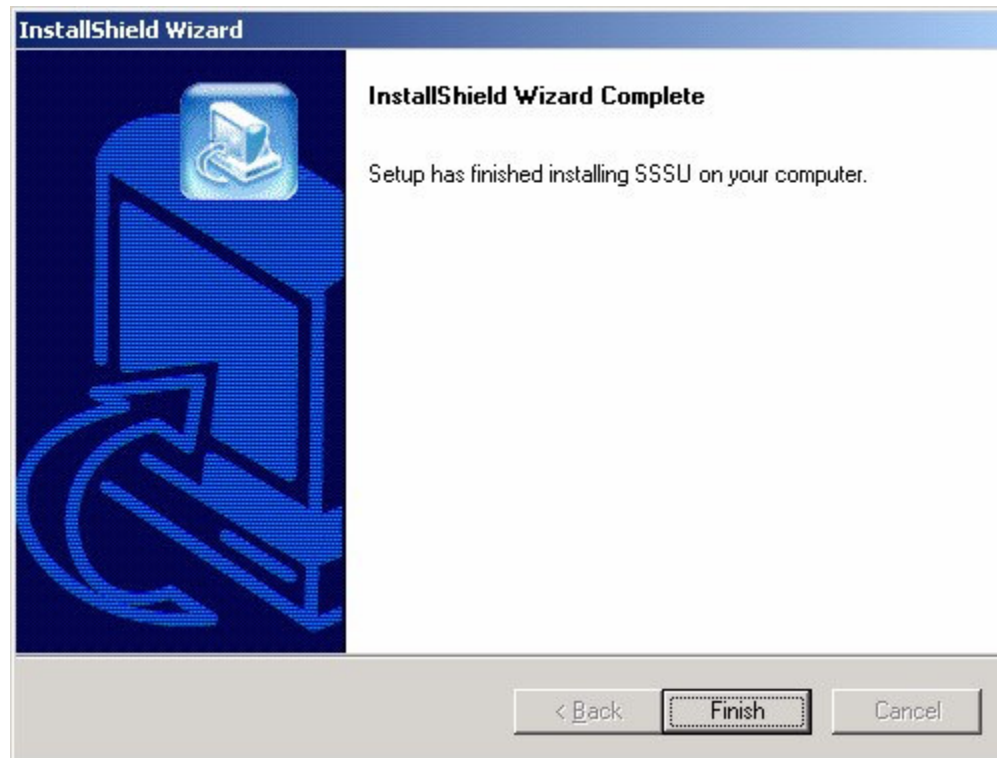
HP StorageWorks Storage System Scripting Utility (SSSU)



- Command line utility designed to allow you to configure and control EVA3000 and EVA5000 controllers (HSV1x0) manually or with a script
- Uses the SMA to communicate with the EVA
- Storage System Scripting Utility reference guide in the DOCS directory
- The CAPTURE CONFIGURATION command is the only way to capture, save, and recreate a storage system's configuration.
- Can also check the drive firmware with SSSU commands

SSSU Installation is very easy





Other Features of the Platform Kit



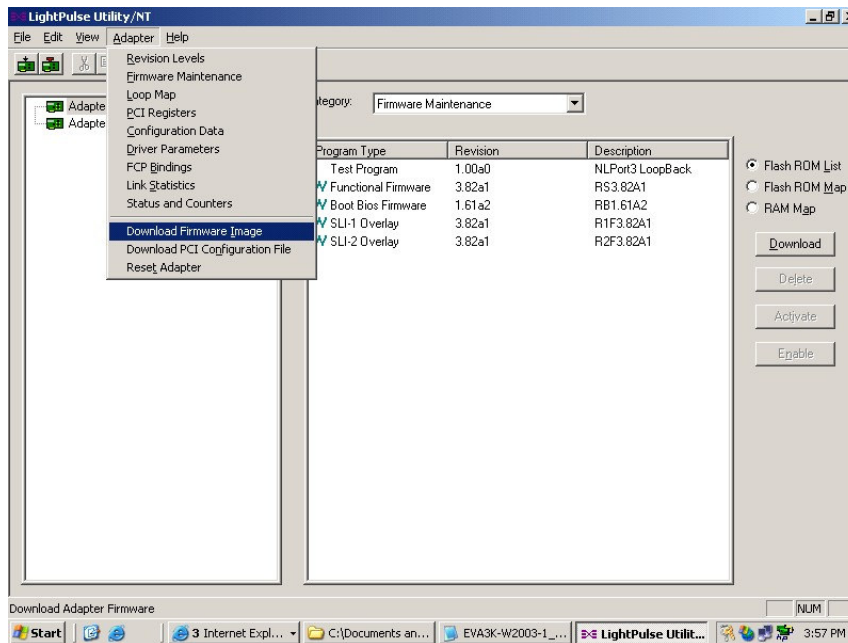
- **Solution Software Uninstall Utility is located at \Setups\uninstall directory**
 - There is also a SSSU Uninstall Utility
 - There is also a Fibre Channel Uninstall Utility
- **The Platform Kit Installation Reference guide and the Storage System Scripting Utility reference guide are in the \DOCS directory on the CD or download**
- **The Rapid Deployment Pack (RDP) Overview and Installation are in the [index.html](#) file in the \RDP directory on the CD**
 - RDP allows remote HBA driver installation, upgrades, and configuration via the FC Utility.
 - HBA Driver upgrades keep the current registry settings unless the Fibre Channel Utility is run.

HBA Utilities (Emulex)



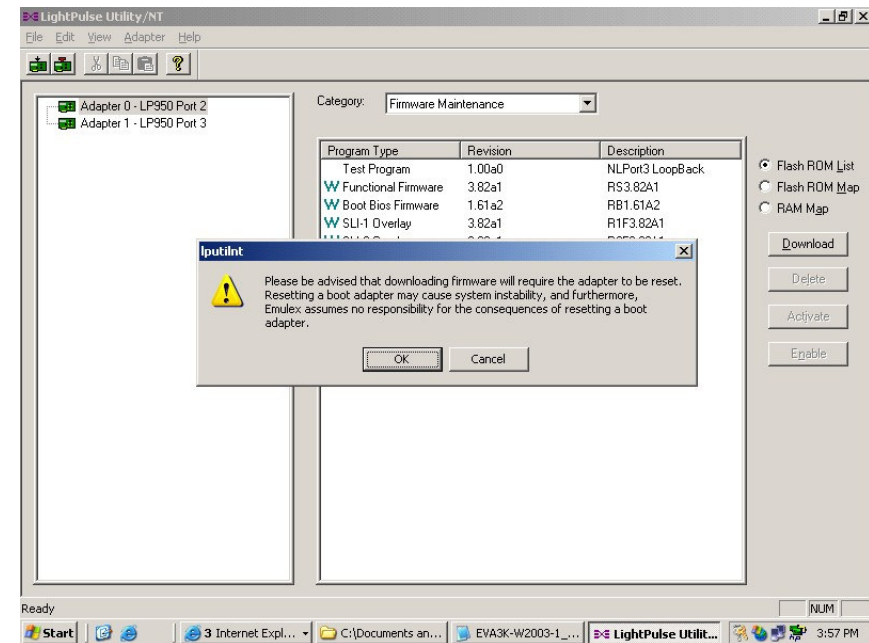
- The LightPulse Utility/NT, *LPUTILNT.exe*
 - A Windows-based graphical user interface HBA utility
 - A component of the HBA driver kit and is installed during the HBA driver installation.
 - Use version 1.70a10 or later to prevent problems
 - The utility allows you to do the following:
 - Update firmware and boot code,
 - View registry parameters
 - Perform persistent binding operations on selected targets (if needed)
 - Find the Worldwide Name (WWN) on the Adapter
 - And obtain specific information about all HBAs installed in the server such as counters, statistics, and status
 - LPUTILNT requires that the SCSI Miniport driver be installed and connected to at least one drive before it can operate properly OR the registry parameter Simulate Device=1 be set.

Firmware maintenance



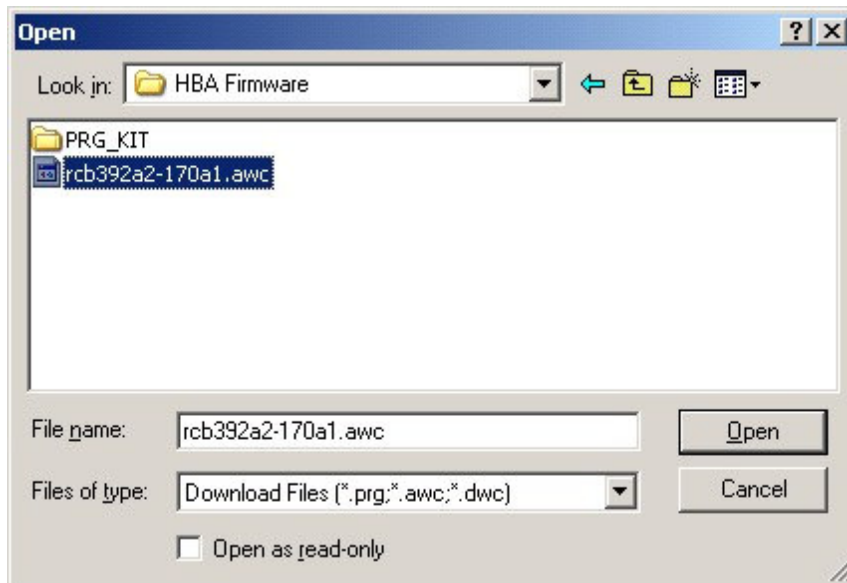
Highlight the HBA

Select Adapter, Download Firmware Image

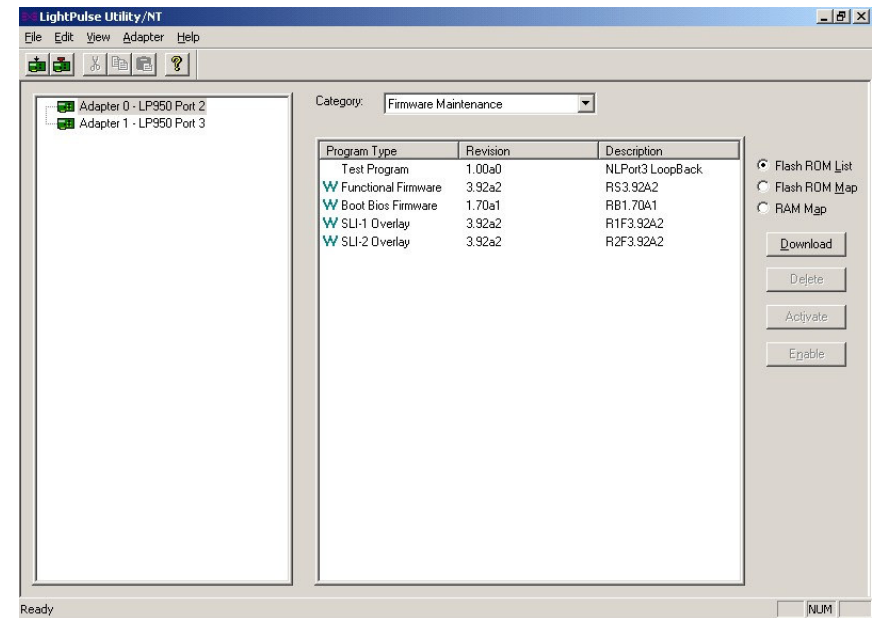


HBA Reset Warning

Firmware maintenance continued

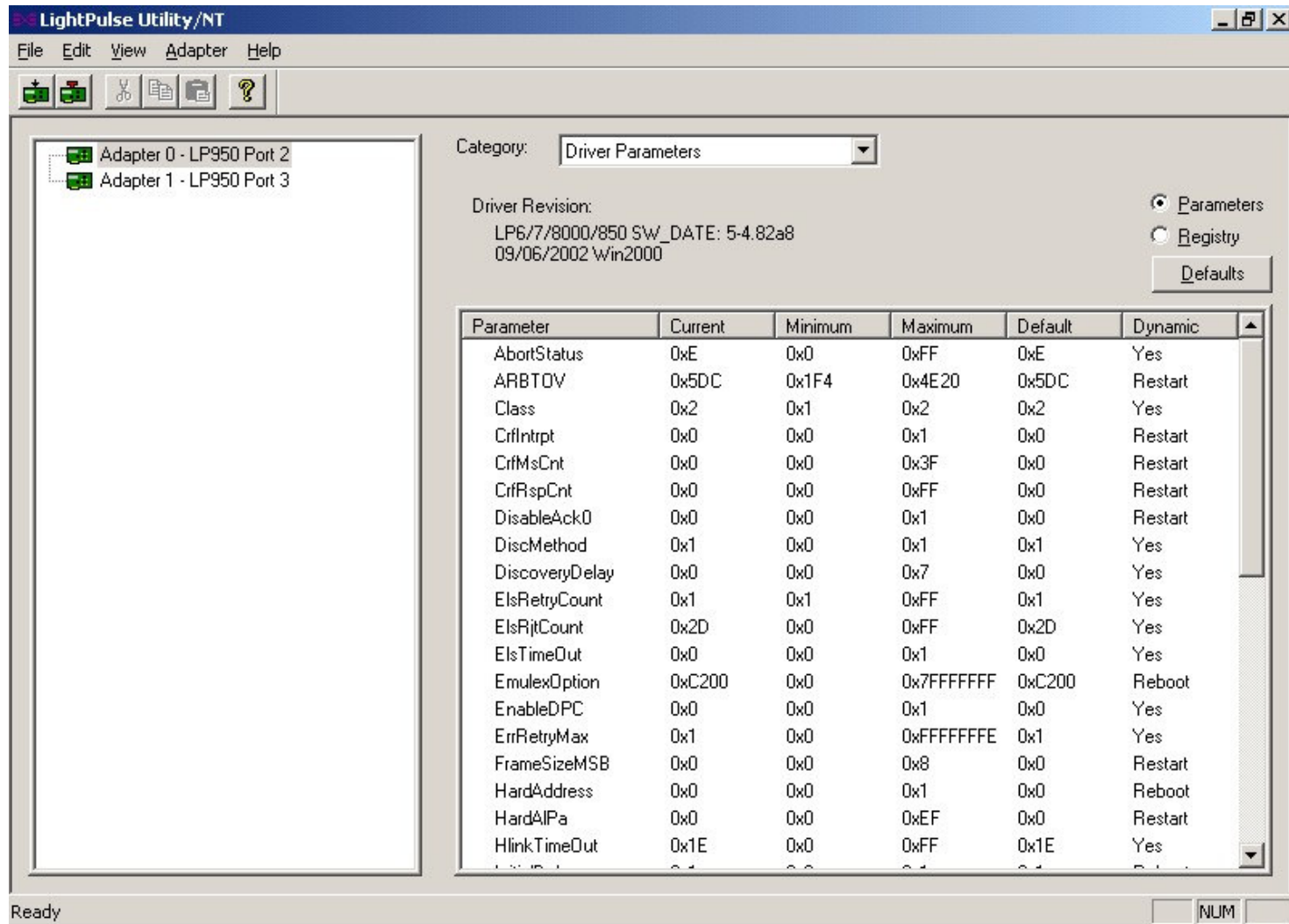


Browse to the firmware file



Verify the firmware update completion

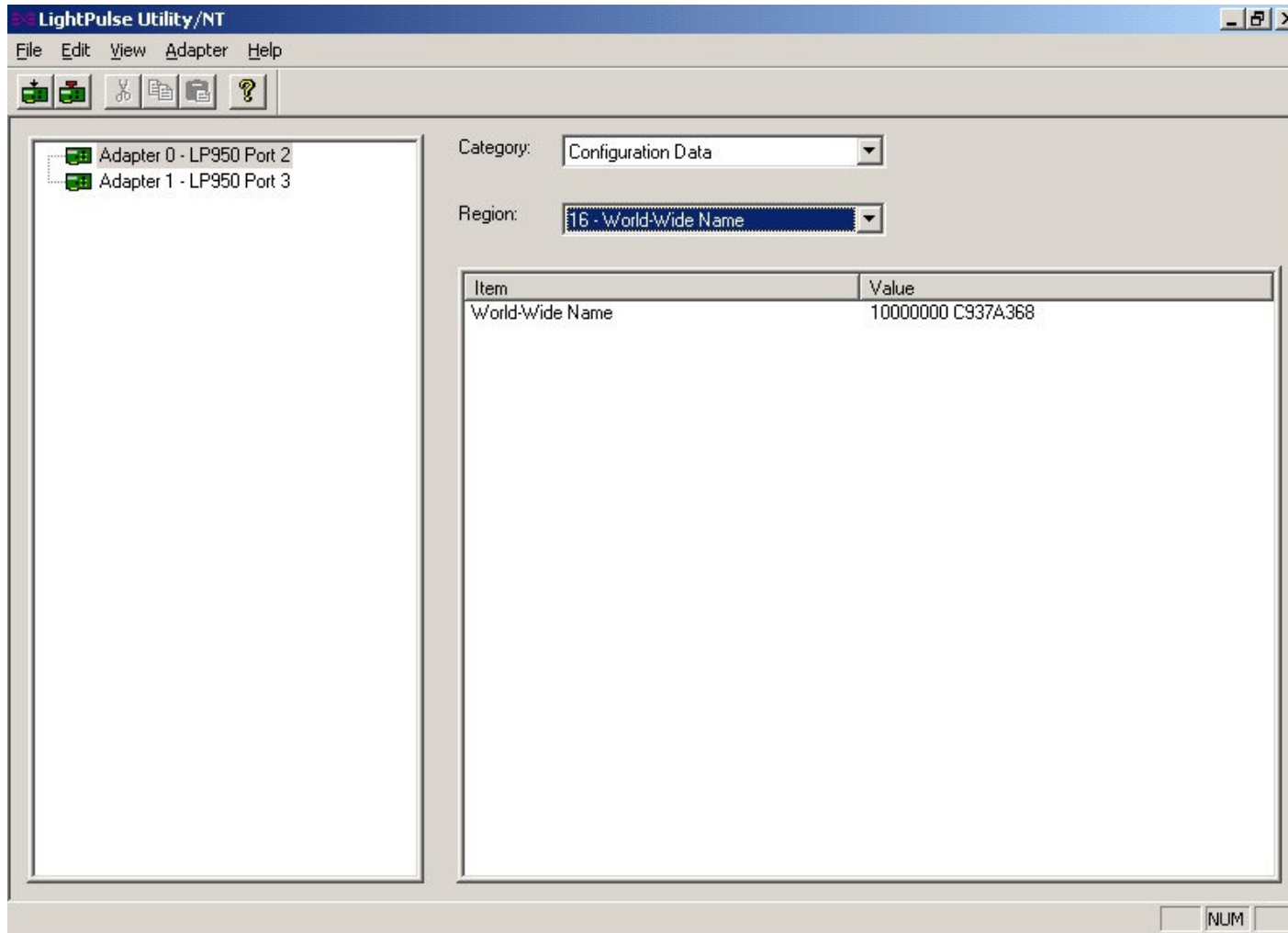
View Windows Registry Parameters



The screenshot shows the 'LightPulse Utility/NT' application window. The 'Category' dropdown is set to 'Driver Parameters'. The 'Driver Revision' is 'LP6/7/8000/850 SW_DATE: 5-4.82a8 09/06/2002 Win2000'. The 'Parameters' radio button is selected. The 'Defaults' button is visible. The table below lists the registry parameters.

Parameter	Current	Minimum	Maximum	Default	Dynamic
AbortStatus	0xE	0x0	0xFF	0xE	Yes
ARBT OV	0x5DC	0x1F4	0x4E20	0x5DC	Restart
Class	0x2	0x1	0x2	0x2	Yes
Crflntrpt	0x0	0x0	0x1	0x0	Restart
CrflMsCnt	0x0	0x0	0x3F	0x0	Restart
CrflRspCnt	0x0	0x0	0xFF	0x0	Restart
DisableAck0	0x0	0x0	0x1	0x0	Restart
DiscMethod	0x1	0x0	0x1	0x1	Yes
DiscoveryDelay	0x0	0x0	0x7	0x0	Yes
ElisRetryCount	0x1	0x1	0xFF	0x1	Yes
ElisRjtCount	0x2D	0x0	0xFF	0x2D	Yes
ElisTimeOut	0x0	0x0	0x1	0x0	Yes
EmulexOption	0xC200	0x0	0x7FFFFFFF	0xC200	Reboot
EnableDPC	0x0	0x0	0x1	0x0	Yes
ErrRetryMax	0x1	0x0	0xFFFFFEE	0x1	Yes
FrameSizeMSB	0x0	0x0	0x8	0x0	Restart
HardAddress	0x0	0x0	0x1	0x0	Reboot
HardAlPa	0x0	0x0	0xEF	0x0	Restart
HlinkTimeOut	0x1E	0x0	0xFF	0x1E	Yes

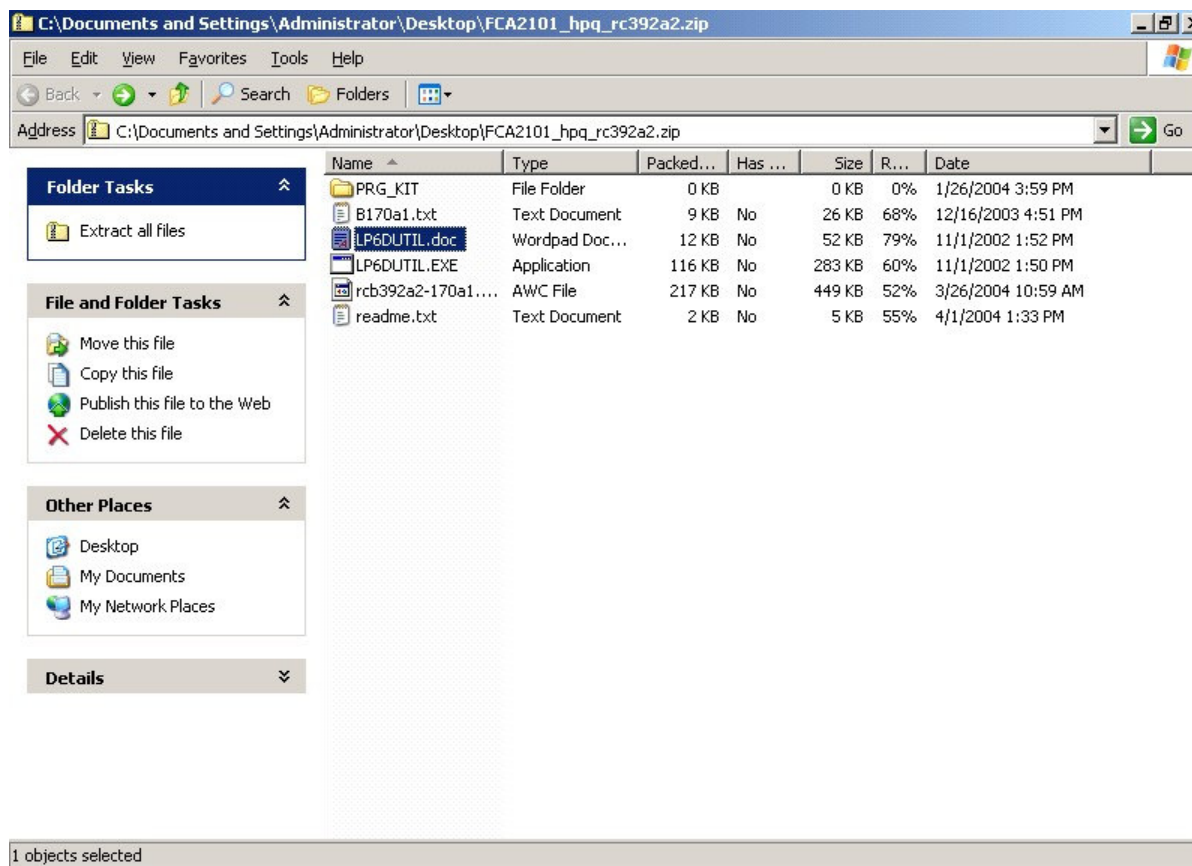
Worldwide Name (WWN)



DOS Diagnostic utility, *LP6DUTIL.exe*



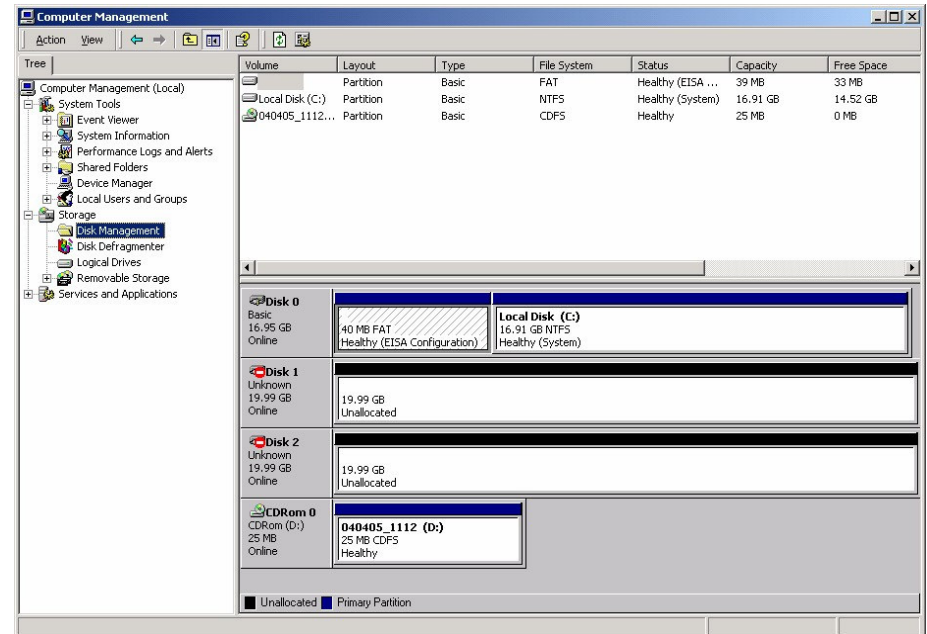
- A component of the HBA firmware kit
- Use this DOS-Based utility to upgrade firmware and boot code and to run standalone HBA Diagnostics



Secure Path Server (4.0C)



- Secure Path is a multi-pathing software that provides continuous data access from HP's RAID Arrays to host servers.
- Secure Path is required because:
 - You have more than 1 HBA installed for a high availability
 - Windows can not understand multiple paths to the same disk.



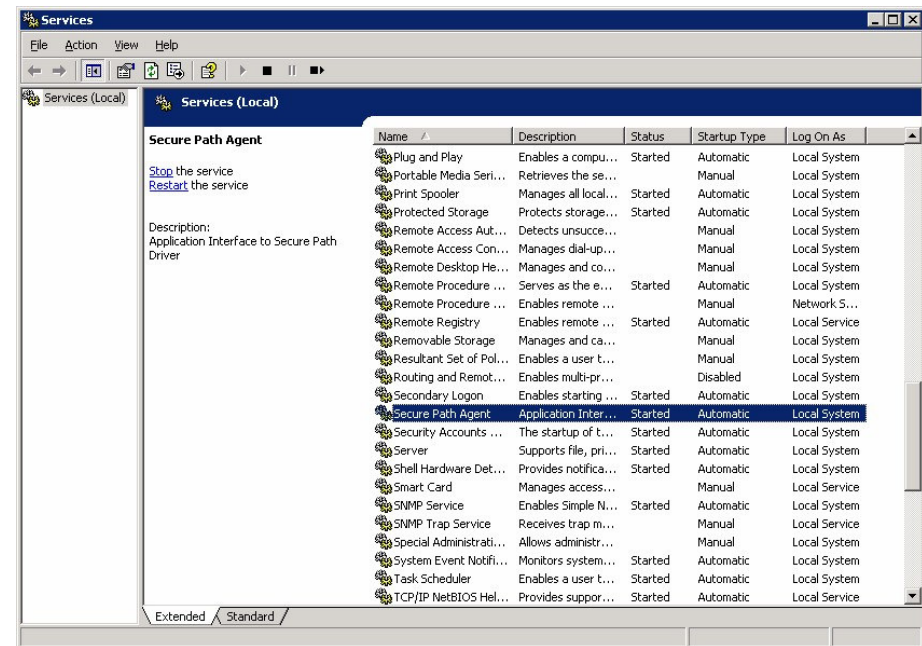
Secure Path continued



-Single Path Server Implementations are supported. There is a White Paper entitled [Single Path Implementation on the Enterprise Virtual Array Storage System](#)

-This is not considered a Highly Available configuration.

- Secure Path comes from HP on a CD.
 - It is recommended that the base installation be done from the CD directly.
 - If done from a download or FTP, verify all services start after installation
 - A service start failure after a fresh installation indicates a corrupt Secure Path download OR a corrupt Windows registry





- Service Packs and Updates can be downloaded from <http://www.hp.com/go/securepath/> as a ZIP file.
 - Install Secure Path after installing the Windows Platform kit but before connecting more than 1 HBA to the switches
 - Installation or upgrades can be scripted
-
- Secure Path installation goes as follows:



hp StorageWorks secure path

Install Secure Path

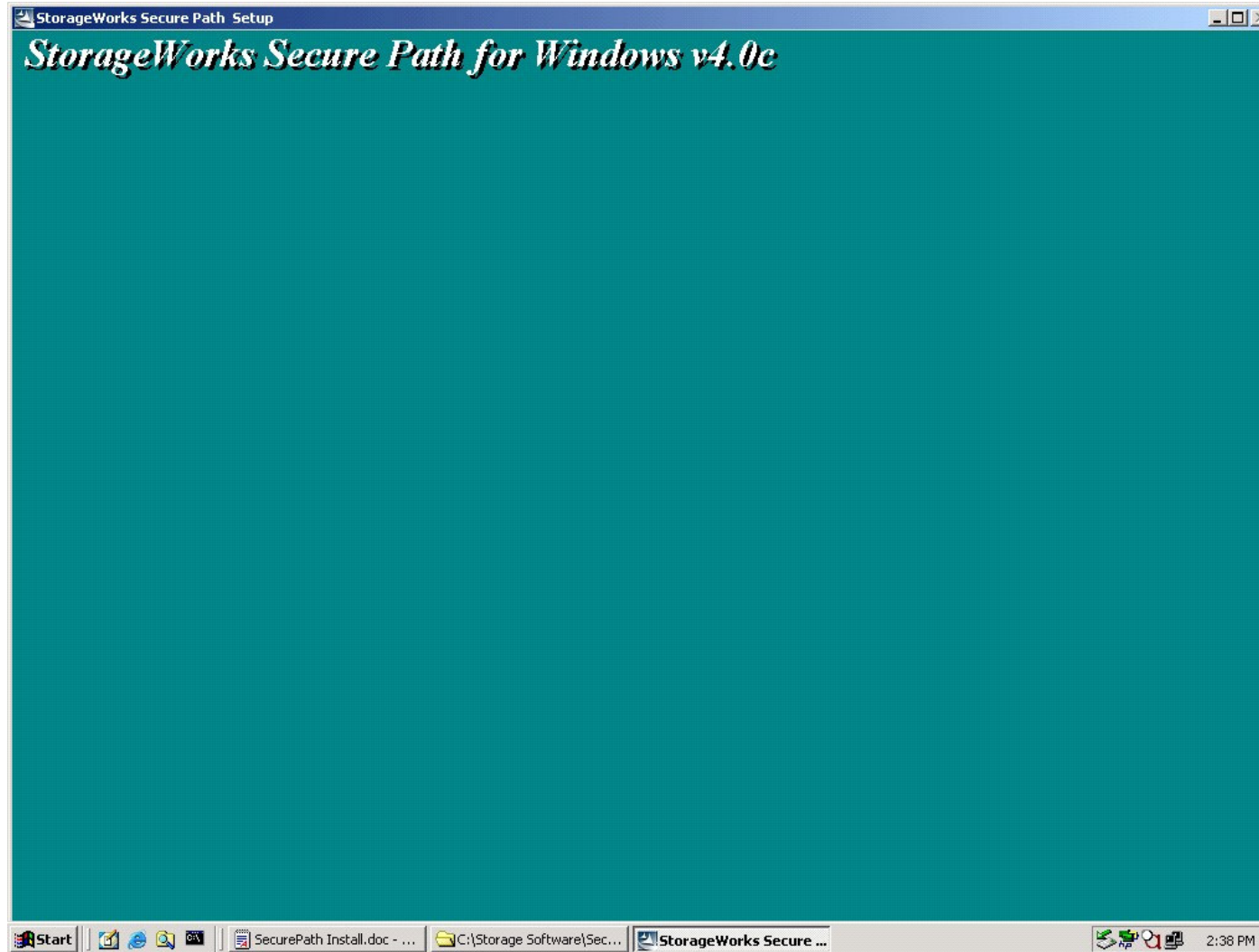
Installation Guide

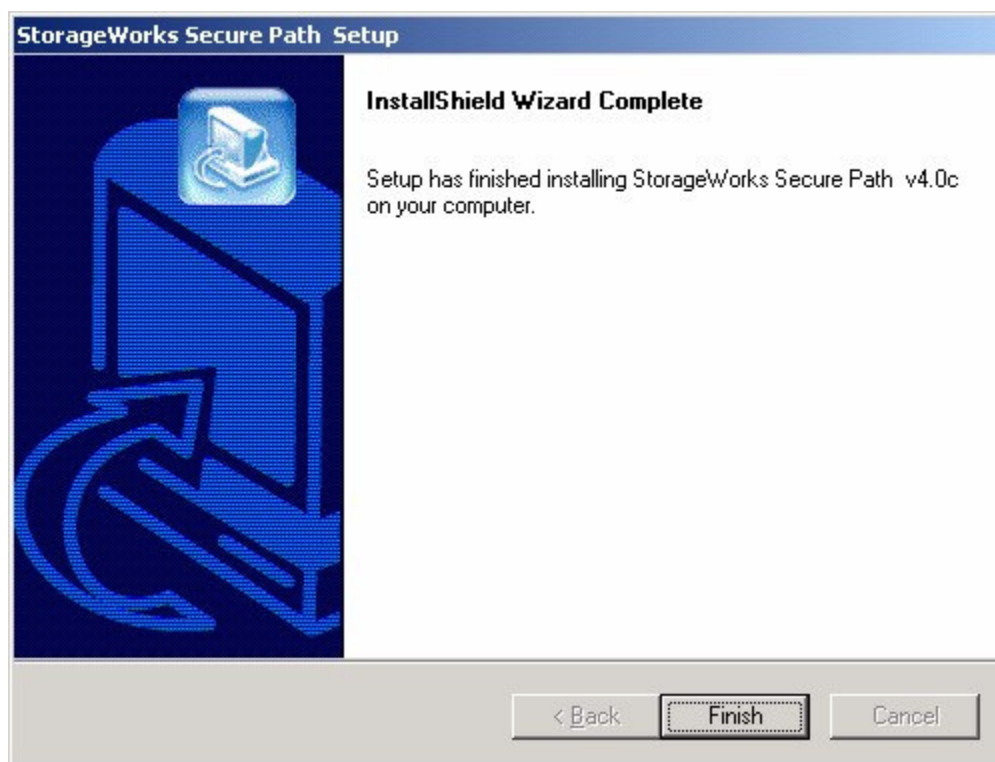
Readme

Browse CD

Exit

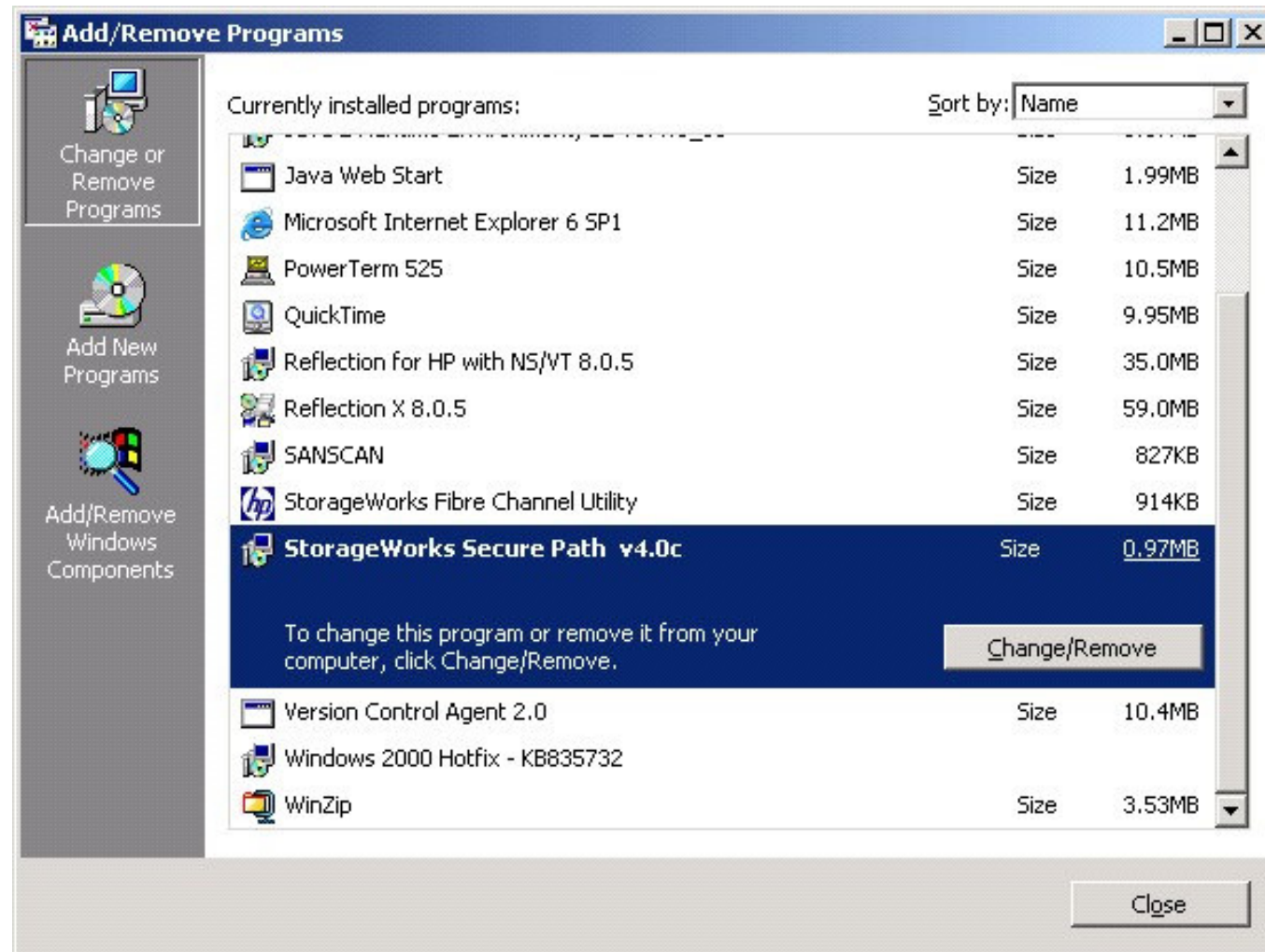
version 4.0c





After installation, the only way to easily check the Secure Path version is to look in Add/Remove Programs

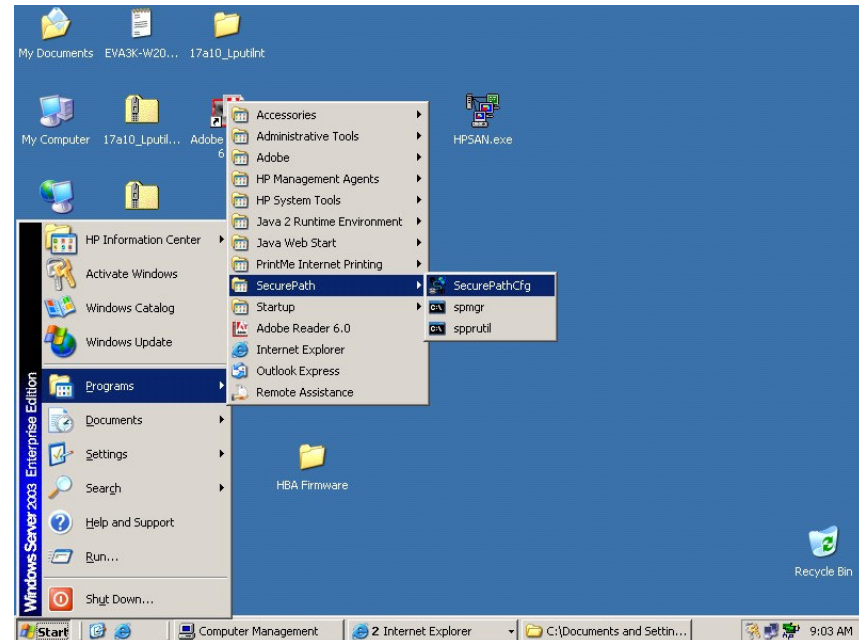
Uninstall is done through Add/Remove Programs



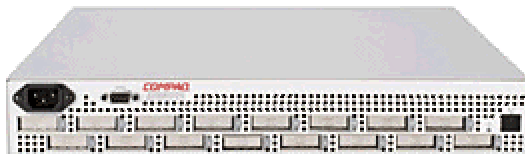
Secure Path Management



- Use Secure Path Manager (Windows GUI application) to manage server I/O paths
- There is a Command Line Interface for the Secure Path Agent on the Programs Menu after installation



Switch Configuration and Management



Switch Configuration (HP-branded Brocade)



- Use the latest approved Fabric OS version that is listed in the StorageWorks [SAN Design Reference Guide](#)
- Most of the default switch settings work fine in a Windows environment
- Redeployed switches may need to have the configuration cleared to work properly

Switch information



Switch Explorer - Microsoft Internet Explorer provided by Hewlett-Packard

File Edit View Favorites Tools Help

Address <http://16.112.139.39> Go Links >>

View by: Name

- Fabric
 - unixsansilky4
- Segmented Switches

Switch Information for unixsansilky4 **Status:** Healthy

Polled at:	07/06/04 08:42 PM	Name:	unixsansilky4
Fabric OS version:	v3.1.1c	Domain ID:	44
Ethernet IP:	16.112.139.39	Ethernet Mask:	255.255.192.0
FCnet IP:	none	FCnet Mask:	none
Gateway IP:	16.112.128.1	WWN:	10:00:00:60:69:5a:04:bb

Current Zone Config : UnixSan

Status Legend : ■ Healthy ■ Marginal ■ Critical ■ Unmonitored

Local intranet

Switch settings



– Fibre Channel Link Speed

- HP recommends setting, or hard-coding the switches to a selected speed (1Gb or 2Gb)
- Using Auto-Negotiate on the Switches can cause data transfer issues under high I/O

Switch Admin - Microsoft Internet Explorer provided by Hewlett-Packard

SwitchName: unixsanskiky4 DomainID: 44 vWWN: 10:00:00:60:69:5a:04:bb Tue Jul 6 2004, 8:47 PM

Switch Information | Network Config | Upload/Download
SNMP | License Admin | Port Setting | Routing | Extended Fabric | User Admin | Configure

Port Number	Persistent Disable	Enable Port	Port State	Current Speed	Change Speed	Port Name
0	☐	☒	Online	2G	2G	
1	☐	☒	Online	1G	Negotiate	
2	☐	☒	Online	1G	1G	
3	☐	☒	No_Light	1G	2G	
4	☐	☒	Online	2G	2G	
5	☐	☒	Online	2G	2G	
6	☐	☒	Online	1G	1G	
7	☐	☒	Online	1G	1G	
8	☐	☒	No_Light	2G	2G	
9	☐	☒	Online	2G	2G	
10	☐	☒	Online	1G	1G	
11	☐	☒	Online	N1	Negotiate	
12	☐	☒	No_Light	N2	Negotiate	
13	☐	☒	No_Light	N2	Negotiate	
14	☐	☒	Online	N2	Negotiate	
15	☐	☒	Online	N2	Negotiate	

Apply Close Reset Refresh

Switch Commit Messages

Configure Port Setting parameters

Current Zone Config : UnixSan

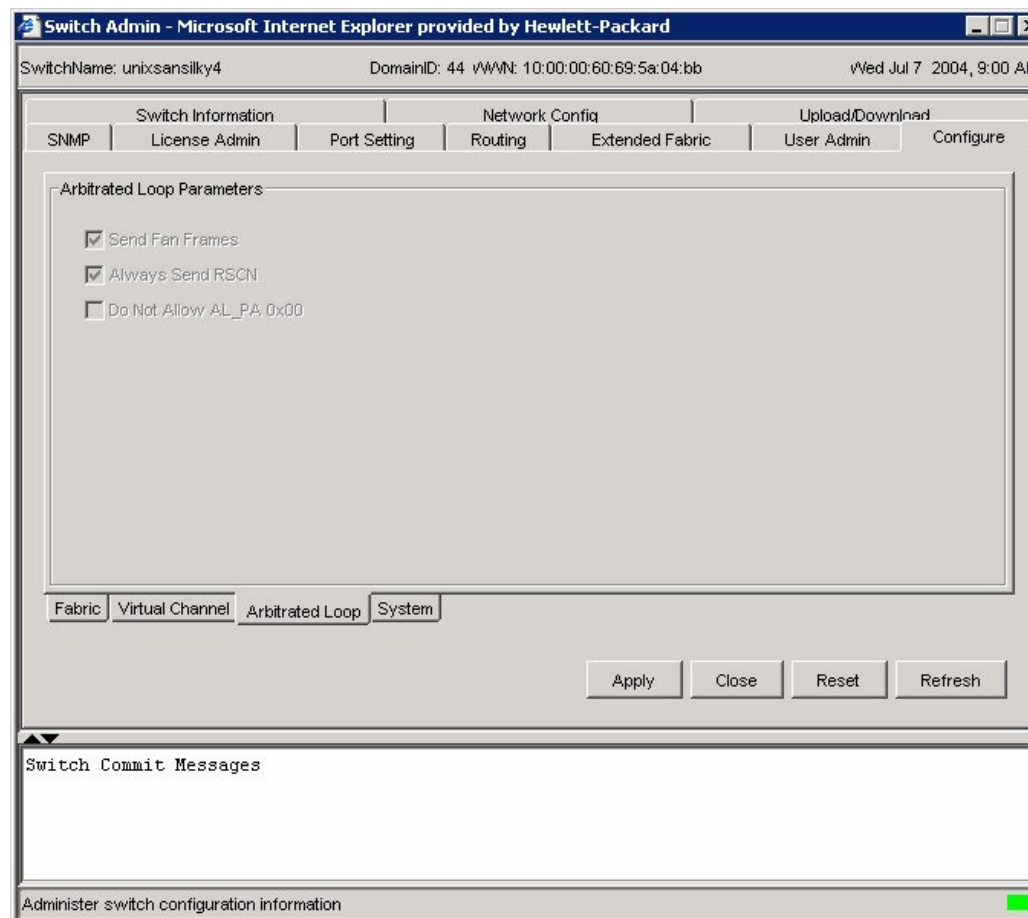
Status Legend : ■ Healthy ■ Marginal ■ Critical ■ Unmonitored

Status: Healthy

unixsanskiky4
44
255.255.192.0
none
10:00:00:60:69:5a:04:bb

– Remote State Change Notification

- The switch issues a Remote State Change notification, following the completion of device initialization, when FL_Ports detect the presence of new devices or the absence of preexisting devices
- Interpreted as Soft errors
- May need to be disabled in a mixed OS environment
- Can only be changed when the switch is disabled

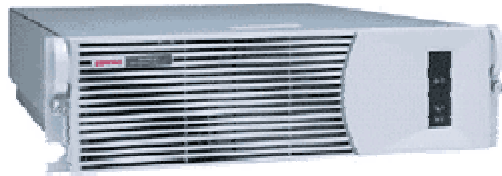


Switch Management



- 3 Management methods
 - Web Tools
 - For Windows , use Java Plug-in version 1.3.1 to manage the switches
 - Java Plug-in version 1.4.1 will work with the latest firmware versions (2nd Qtr 2004)
 - Can be disabled
 - Telnet
 - Can be disabled
 - Serial cable
 - Most secure method
- Multiple methods may be used simultaneously
- Use the highest switch firmware version to manage the fabric
- Check your switch zoning if you have problems seeing any storage disk/LUNs

HP OpenView Storage Management Appliance (SMA)



Typical SMA issues



- Most SMA issues are connection problems
- SMA requires Java Version 1.4.1 and Internet Explorer 6.0 SP1
 - Note that this is a different Java version than most of the switches
 - Multiple Java versions can co-exist on the same PC
- The SMA is vulnerable to almost all of the same viruses and worms as a Windows 2000 Server
 - The first usual symptom is that you can not connect to the SMA properly
- This website has the Security Bulletins, Software Updates, and the Quick Restore CD Ordering site,
<http://h18006.www1.hp.com/products/sanworks/softwaredrivers/managementappliance/index.html>

Approved 3rd party software



- Antivirus software can be used with the SMA
 - Using Antivirus Software [Application Note](#)
 - Application Note list the 5 supported Antivirus applications
- Backup agent software can be used with the SMA
 - Using Backup software [Application Note](#)
 - Application Note list the 6 supported Backup agents
 - Symantec Ghost is also supported to create an image
- System Management agent software
 - Using System Management software [Application Note](#)
 - Application Note list the 3 supported System Management agents
- Uninterruptible Power Supply (UPS) software
 - Using UPS software Application Note [Application Note](#)
 - Application Note list the 2 supported UPS agents

Microsoft update tool for the SMA



- Can be used by anyone but it can not be posted to the HP website due to the license agreement
- This utility installs Microsoft Hotfix updates on Storage Management Appliances running OSM version 2.1 ONLY
- This kit contains all the required hot fixes for the Storage Management Appliance running software version 2.1 as outlined in the "Microsoft Hot Fix & Security Bulletins Effects and Required Actions on the Storage Management Appliance", dated 14 June, 2004

Microsoft Hotfixes for the SMA running version 2.1 software

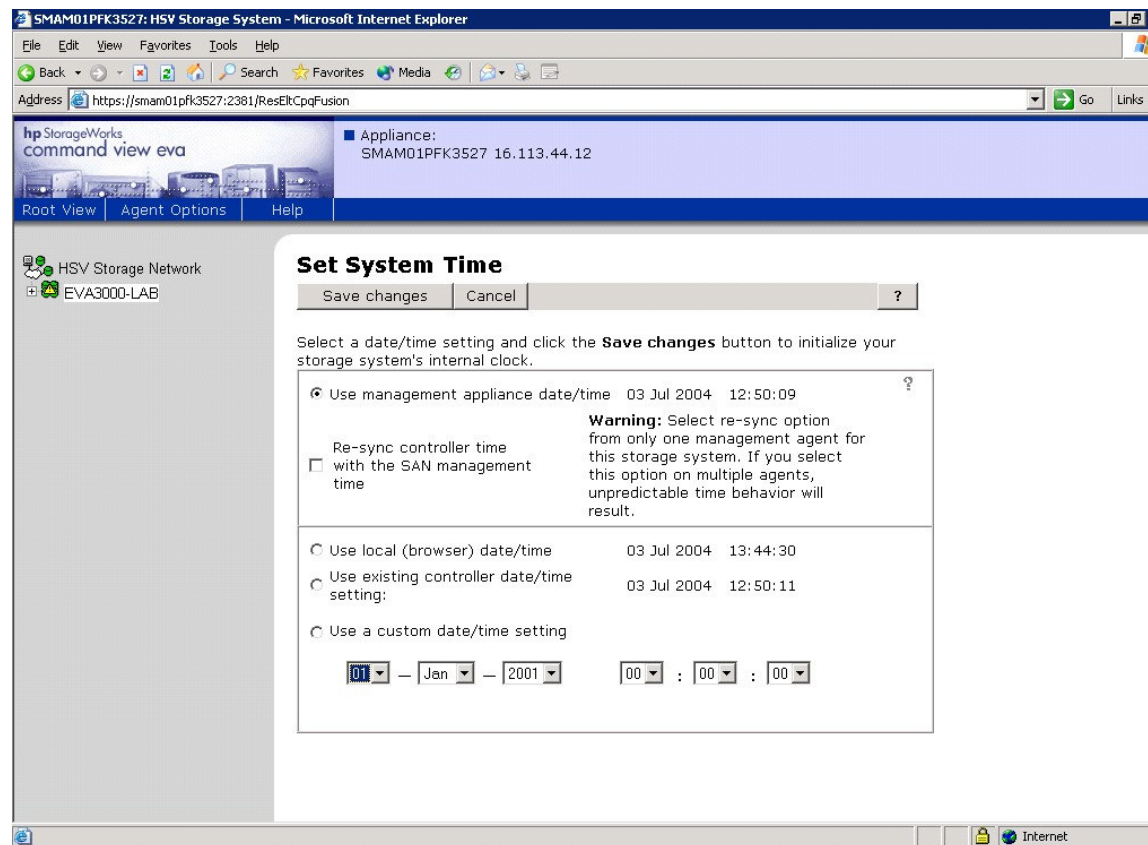


- MS03-008 (KB814078)
- MS03-041 (KB823182)
- MS03-042 (KB826232)
- MS03-043 (KB828035)
- MS03-044 (KB825119)
- MS03-045 (KB824141)
- MS03-049 (KB828749)
- MS04-003 (KB832483)
- MS04-004 (KB832894)
- MS04-006 (KB830352)
- MS04-007 (KB828028)
- MS04-011 (KB835732)
- MS04-012 (KB828741)
- MS04-013 (KB837009)
- MS04-014 (KB837001)
- MS04-015 (KB840374)
- MS04-016 (KB839643)
- MS04-017 (KB842689)

SMA Time synchronization



- It is important to synchronize the time on the HSV controllers with the time on the SMA so that event logs can be properly read and understood
- Synchronize the time in Command View EVA





Event Notification with HP Systems Insight Manager

- Application Note entitled [Using HP Systems Insight Manager with HP StorageWorks Management Software](#)
- If you are already using HP Systems Insight Manager, this will allow you to get all of the notifications from the EVA as well.
- This is different than SMI-S. Do not get them confused.

Enterprise Virtual Array (EVA) Configuration



- EVA5000
 - HSV110 Controller

- EVA3000
 - HSV100 Controller

- For the purposes of this tutorial, we are assuming that we have VCS version 3.014. However, a VCS upgrade will be shown from 3.010 to 3.014

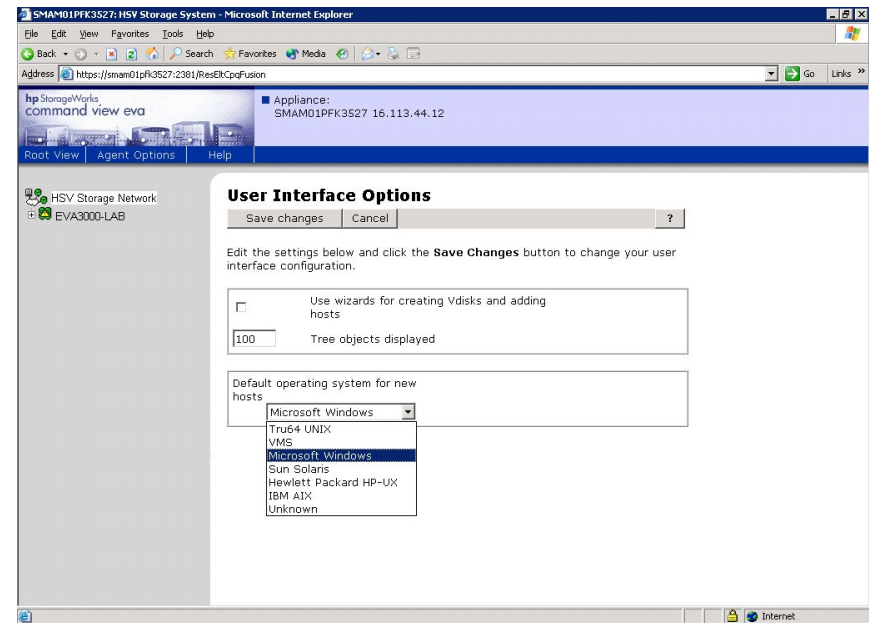
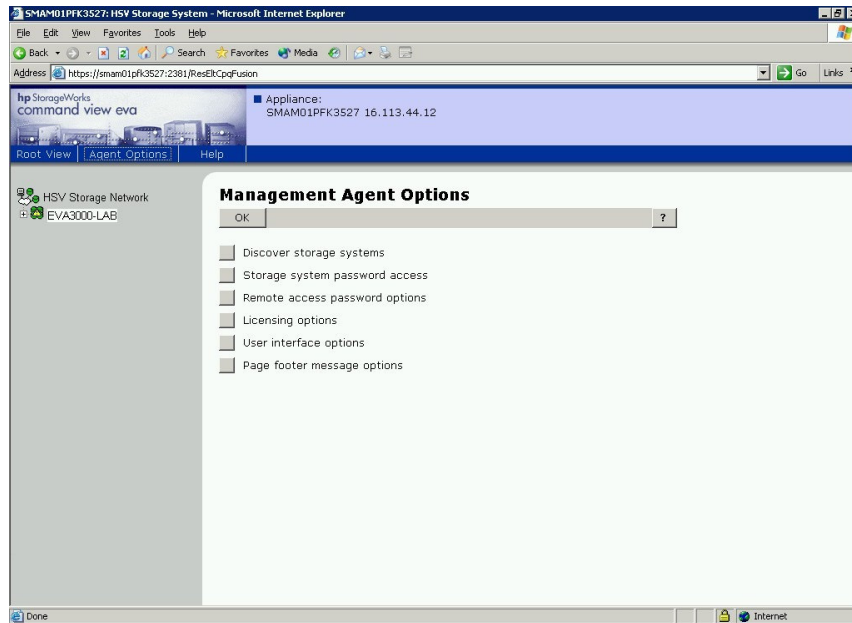




Command View EVA

- Web-Based GUI used to control and monitor the EVA
- Use the latest browser version and check your browser setting against the Command View EVA Release Notes
- Load the latest version of Command View EVA onto the SMA
- HP OpenView Storage Operations Manager contains the latest version of Command View EVA
- Command View EVA Version 3.1 is the only version that supports VCS V3.010 or higher
- We recommend setting the Default OS in Command View EVA before adding your servers into the Command View EVA configuration. To do that do as follows:

Select Agent Options, then User Interface Options



Virtual Controller Software (VCS) upgrade a.k.a. “Code Load”



- Servers can be online but EVA access should be at a minimum I/O for a “rolling upgrade”
- Command View EVA is the only way to update the VCS
- Code load may take a few minutes to perform as individual systems vary
- ALWAYS read the Release notes before updating VCS code
 - SMA software version requirements will be listed
 - HBA driver version requirements will be listed
 - VCS upgrade stepping (if required) will be listed
- We will now step through a VCS upgrade from 3.010 to 3.014

Select a controller or the storage system itself, then click “Code Load”



smam01PFK3527 - Remote Desktop

File Edit View Favorites Tools Help

Address: https://localhost:2381/ResEltCpqFusion

hp StorageWorks command view eva

Appliance: SMAM01PFK3527 16.113.44.12

Root View Agent Options Help

Hosts

- Windows 2003
- Disk Groups
- Data Replication
- Hardware
 - Rack 1
 - Controller Enclosure
 - Controller B
 - Controller A
 - Disk Enclosure 2
 - Bay 1 (Leftmost)
 - Bay 2
 - Bay 3
 - Bay 4
 - Bay 5
 - Bay 6
 - Bay 7
 - Bay 8
 - Bay 9
 - Bay 10
 - Bay 11
 - Bay 12

Controller Properties

Locate Shut down Code load ?

General Host Ports Device Ports Enclosure

Port 1:

World Wide Name:	50001FE1 50032DD9
Address:	01-11-00
Operational State:	Good
Connection state:	Logged into fabric
Speed:	1Gb/s

Port 2:

World Wide Name:	50001FE1 50032DD8
Address:	Not Available
Operational State:	Failed
Connection state:	Link to switch failed
Speed:	1Gb/s

Done

Start hp OpenView storage ma... SMAM01PFK3527: HSV... 10:34 AM

Both controllers will be updated at once



smam01PFK3527 - Remote Desktop

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print

Address <https://localhost:2381/ResEltCpqFusion> Go Links

hp StorageWorks
command view eva

Appliance:
SMAM01PFK3527 16.113.44.12

Root View Agent Options Help

Hosts
Windows 2003
Disk Groups
Data Replication
Hardware
Rack 1
Controller Enclosure
Controller B
Controller A
Disk Enclosure 2
Bay 1 (Leftmost)
Bay 2
Bay 3
Bay 4
Bay 5
Bay 6
Bay 7
Bay 8
Bay 9
Bay 10
Bay 11
Bay 12

Controller Properties

Locate Shut down Code load ?

General Host Ports Device Ports Enclosure

Port 1:

World Wide Name: 50001FE1 50032DD9

Address: 16.113.44.12

Operational State: ☐ OK

Connection state: ☐ Link to switch failed

Speed: 1Gb/s

Port 2:

World Wide Name: Not Available

Address: Not Available

Operational State: ☒ Failed

Connection state: ☒ Link to switch failed

Speed: 1Gb/s

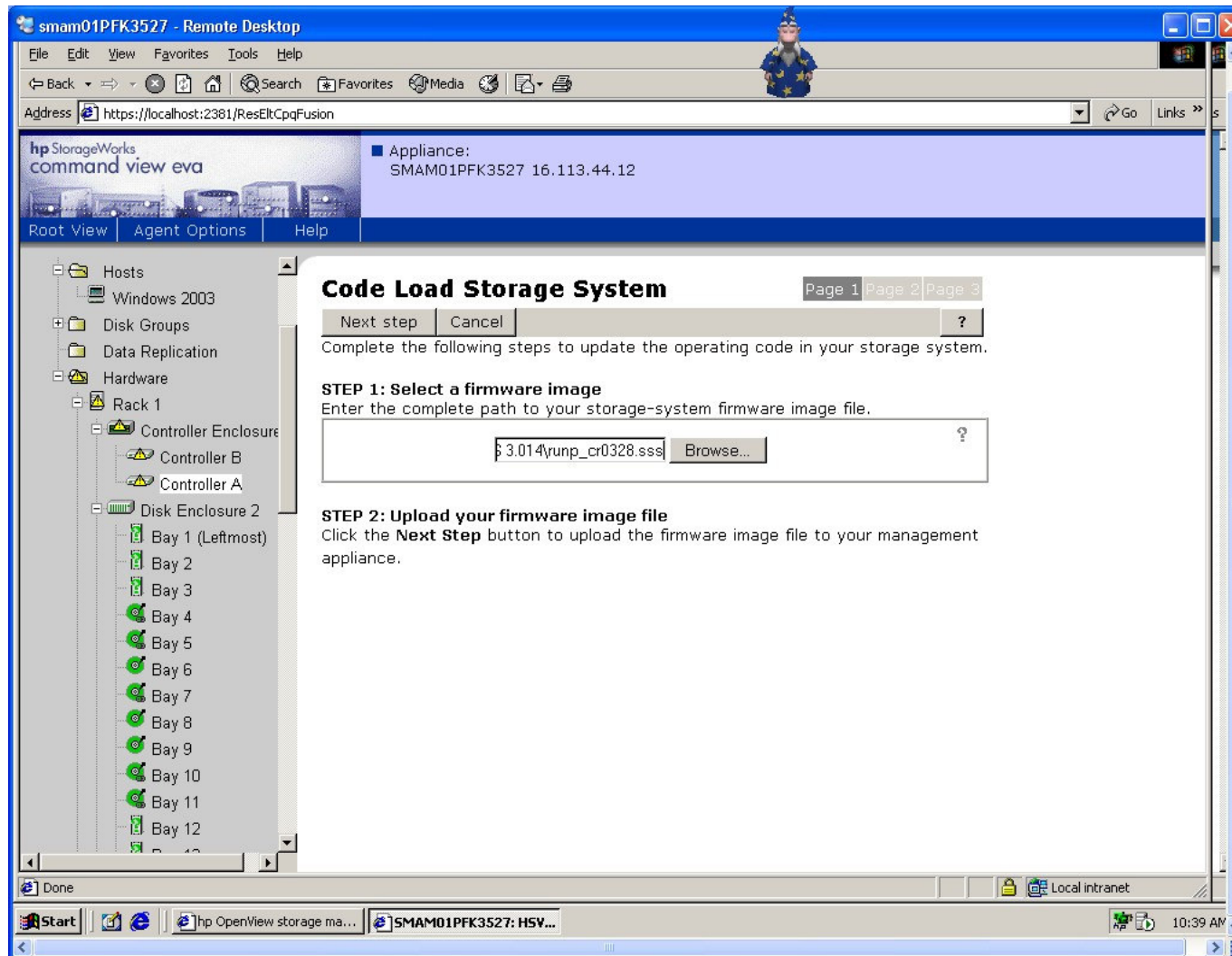
Microsoft Internet Explorer

This action will update the firmware in BOTH of your controllers.
Are you sure you wish to continue?

OK Cancel

Start hp OpenView storage ma... SMAM01PFK3527: HSV... 10:37 AM

Locate firmware image file



Are you sure?



smam01PFK3527 - Remote Desktop

File Edit View Favorites Tools Help

Address <https://localhost:2381/ResEltCpqFusion>

hp StorageWorks
command view eva

Appliance:
SMAM01PFK3527 16.113.44.12

Root View Agent Options Help

Hosts
Windows 2003
Disk Groups
Data Replication
Hardware
Rack 1
Controller Enclosure
Controller B
Controller A
Disk Enclosure 2
Bay 1 (Leftmost)
Bay 2
Bay 3
Bay 4
Bay 5
Bay 6
Bay 7
Bay 8
Bay 9
Bay 10
Bay 11
Bay 12

Code Load Storage System

Page 1 Page 2 Page 3

Previous step Next step Cancel ?

STEP 3: Read the pre-update application notes
Read the pre-update application notes associated with your firmware image. The notes offer important cautions applicable to code update process. If you wish to cancel the code load operation after reading the notes, click the **Cancel** button.

STEP 4: Code Load Your Storage System Firmware
Click the **Next Step** button to update your storage system's firmware using the image file you uploaded to your management appliance.

Pre-Update Application Notes

This code load procedure will bring all components in the HP StorageWorks Enterprise Virtual Array 3000 to Version 3.014.

Microsoft Internet Explorer

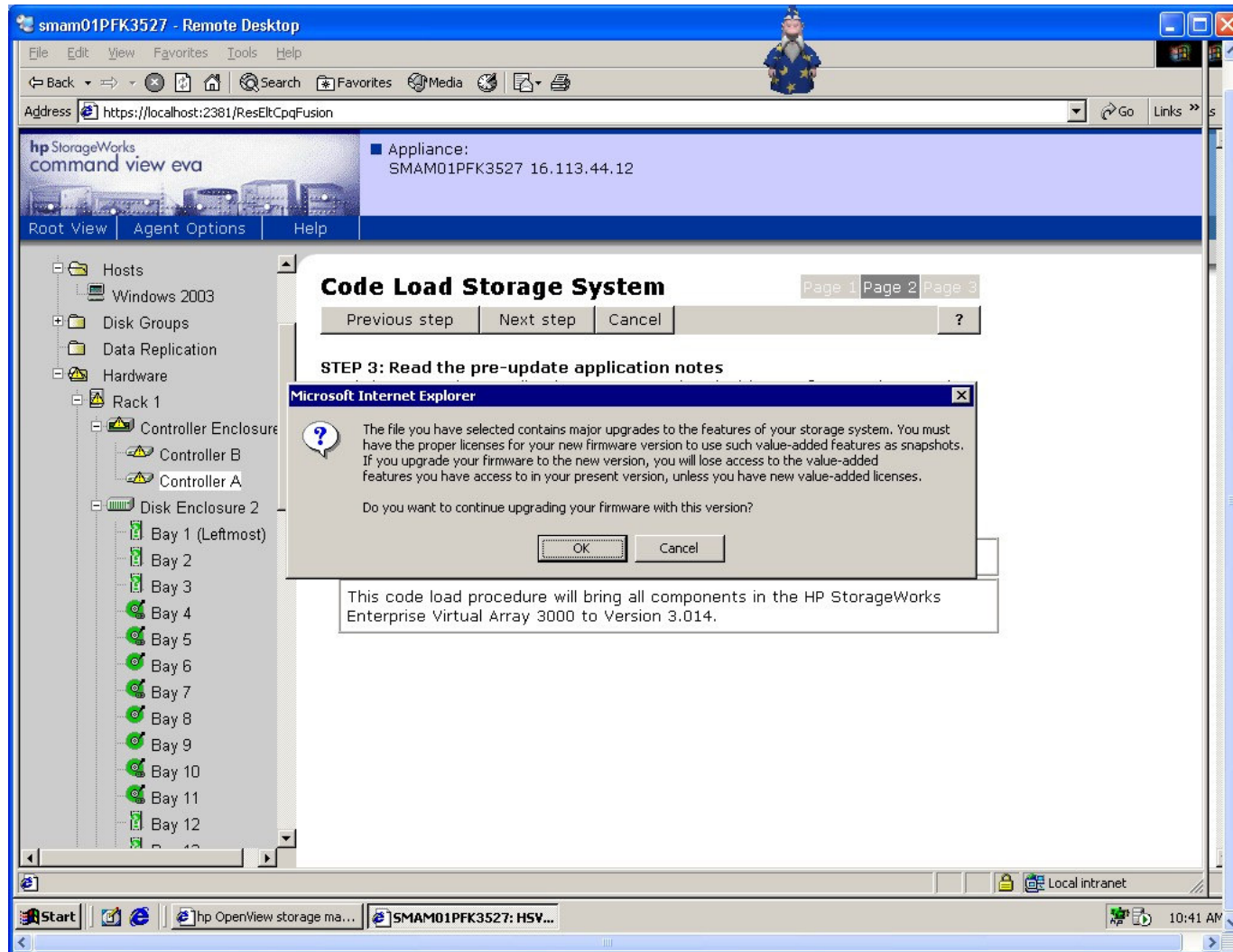
Are you sure...

- the file you have selected is a firmware image file?
- the version of the image file is newer than your existing firmware?
- you wish to continue to upgrade your storage system's firmware?

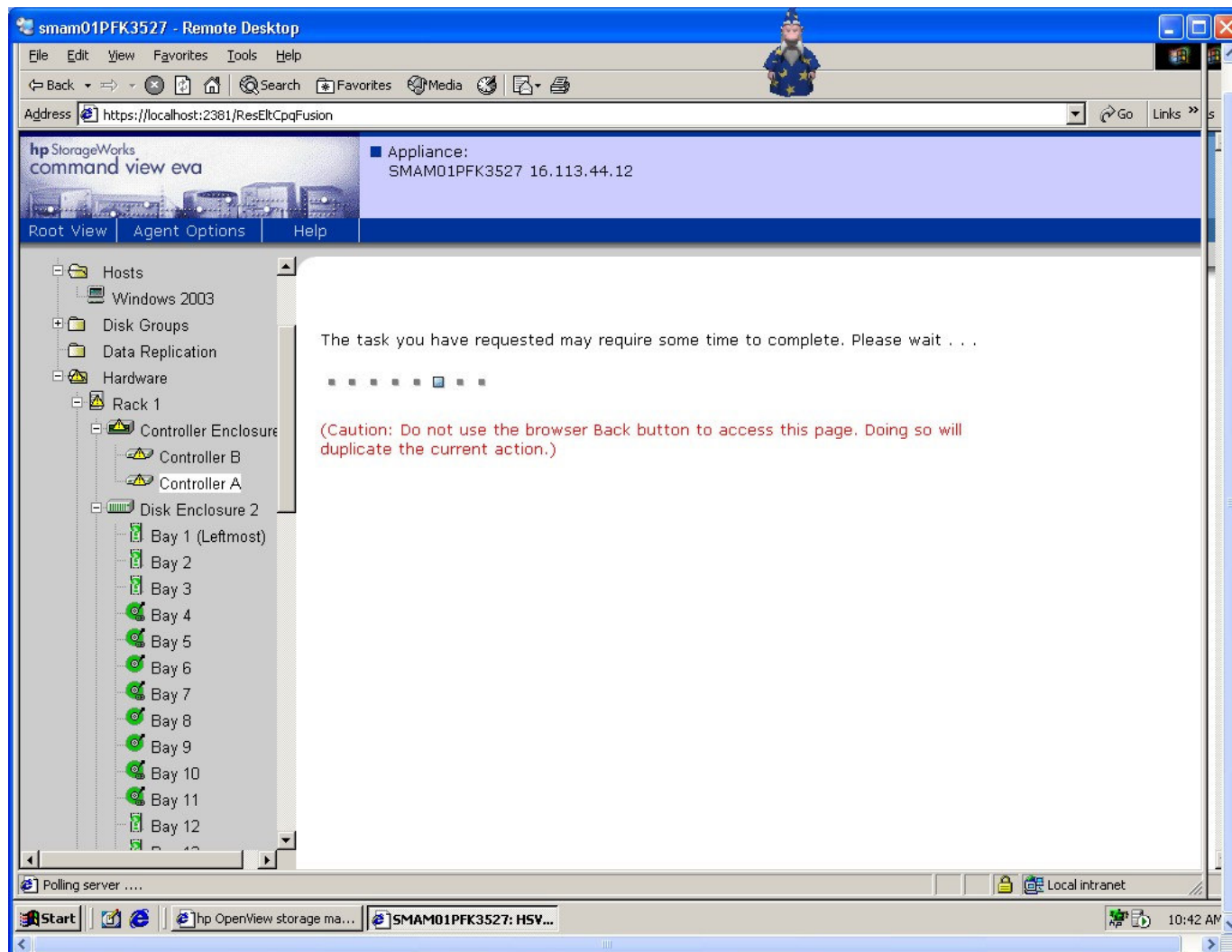
OK Cancel

Start hp OpenView storage ma... SMAM01PFK3527: HSV... 10:41 AM

Make sure you have the proper licenses (CA EVA, BC EVA, etc) for the code you are installing



Please wait.....



Do not reboot the EVA until other parts of the upgrade have completed!



Adding Hosts example



smam01PFK3527 - Remote Desktop

SMAM01PFK3527: HSV Storage System - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <https://localhost:2381/ResEltCpqFusion> Go Links

hp StorageWorks
command view eva

Appliance:
SMAM01PFK3527 16.113.44.12

Root View Agent Options Help

HSV Storage Network

- EVA3000-LAB
 - Virtual Disks
 - Vdisk001
 - ACTIVE
 - Hosts
 - Disk Groups
 - Data Replication
 - Hardware

Host Folder Properties

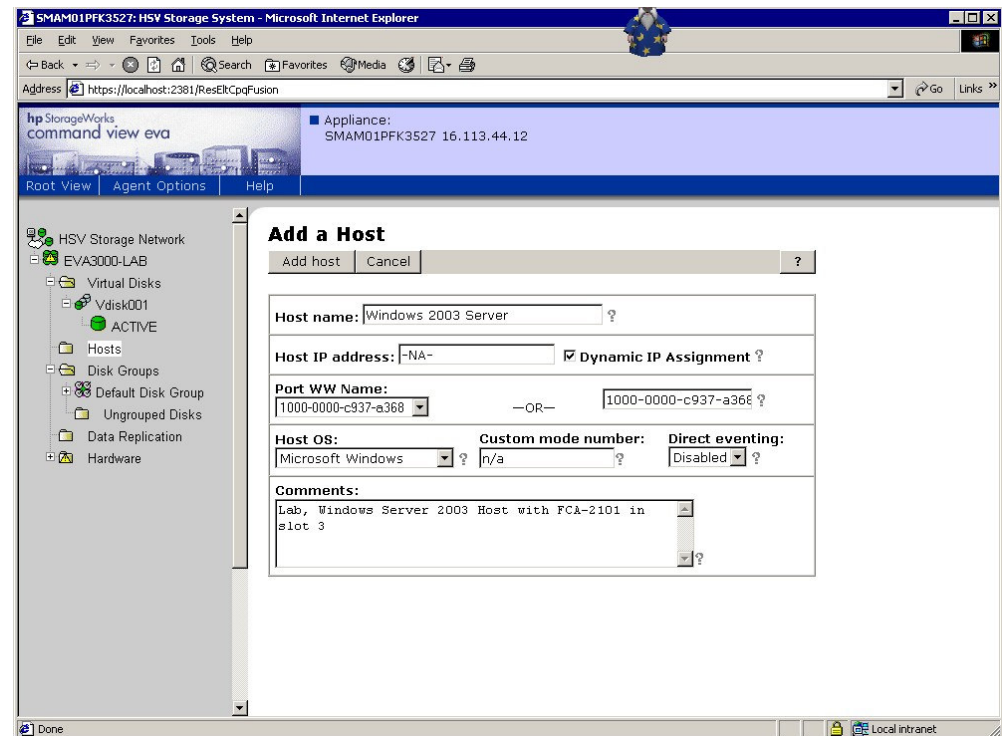
Create folder Add host ?

Host Folder Properties	
Name:	Hosts
Total hosts: (including subfolders)	0
Total host folders: (including subfolders)	0

Done Local intranet

Host Details

- Host Name
- Host IP address (not required)
- Port WW Name (need to use LPUTILNT to find this)
- Host OS (Set default to your primary OS in Command View EVA)
- Custom mode number (used only for Linux right now)
- Direct eventing (only for Advanced Troubleshooting)
- Comments for user information



SMAM01PFK3527: HSV Storage System - Microsoft Internet Explorer

Address: https://localhost:2381/ResEltCpqFusion

hp StorageWorks command view eva

Appliance: SMAM01PFK3527 16.113.44.12

Root View | Agent Options | Help

HSV Storage Network

- EVA3000-LAB
 - Virtual Disks
 - Vdisk001
 - ACTIVE
 - Hosts
 - Disk Groups
 - Default Disk Group
 - Ungrouped Disks
 - Data Replication
 - Hardware

Add a Host

Add host Cancel ?

Host name: Windows 2003 Server ?

Host IP address: -NA- ? ☒ Dynamic IP Assignment ?

Port WW Name: 1000-0000-c937-a368 ? —OR— 1000-0000-c937-a368 ?

Host OS: Microsoft Windows ? Custom mode number: n/a ? Direct eventing: Disabled ?

Comments: Lab, Windows Server 2003 Host with FCA-2101 in slot 3 ?

Done Local intranet

For hosts with multiple HBAs installed, use the Add Port option, not Add Host



The screenshot shows the HP StorageWorks command view interface in a Microsoft Internet Explorer browser window. The address bar shows the URL `https://localhost:2381/ResEltCpqFusion`. The interface has a blue header with the HP logo and the text "hp StorageWorks command view eva". Below the header, there are tabs for "Root View", "Agent Options", and "Help". The main content area is titled "Host Properties" and shows the configuration for a host named "Windows 2003 Server". The "Ports" tab is selected, showing a table of FC Adapter Port WWNs. The table has one row with the value "1000-0000-c937-a368".

SMAM01PFK3527: HSV Storage System - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print

Address `https://localhost:2381/ResEltCpqFusion` Go Links

hp StorageWorks
command view eva

Appliance: SMAM01PFK3527 16.113.44.12

Root View Agent Options Help

HSV Storage Network

- EVA3000-LAB
 - Virtual Disks
 - Vdisk001
 - ACTIVE
 - Hosts
 - Windows 2003 Server
 - Disk Groups
 - Data Replication
 - Hardware

Host Properties

Add port Delete port ?

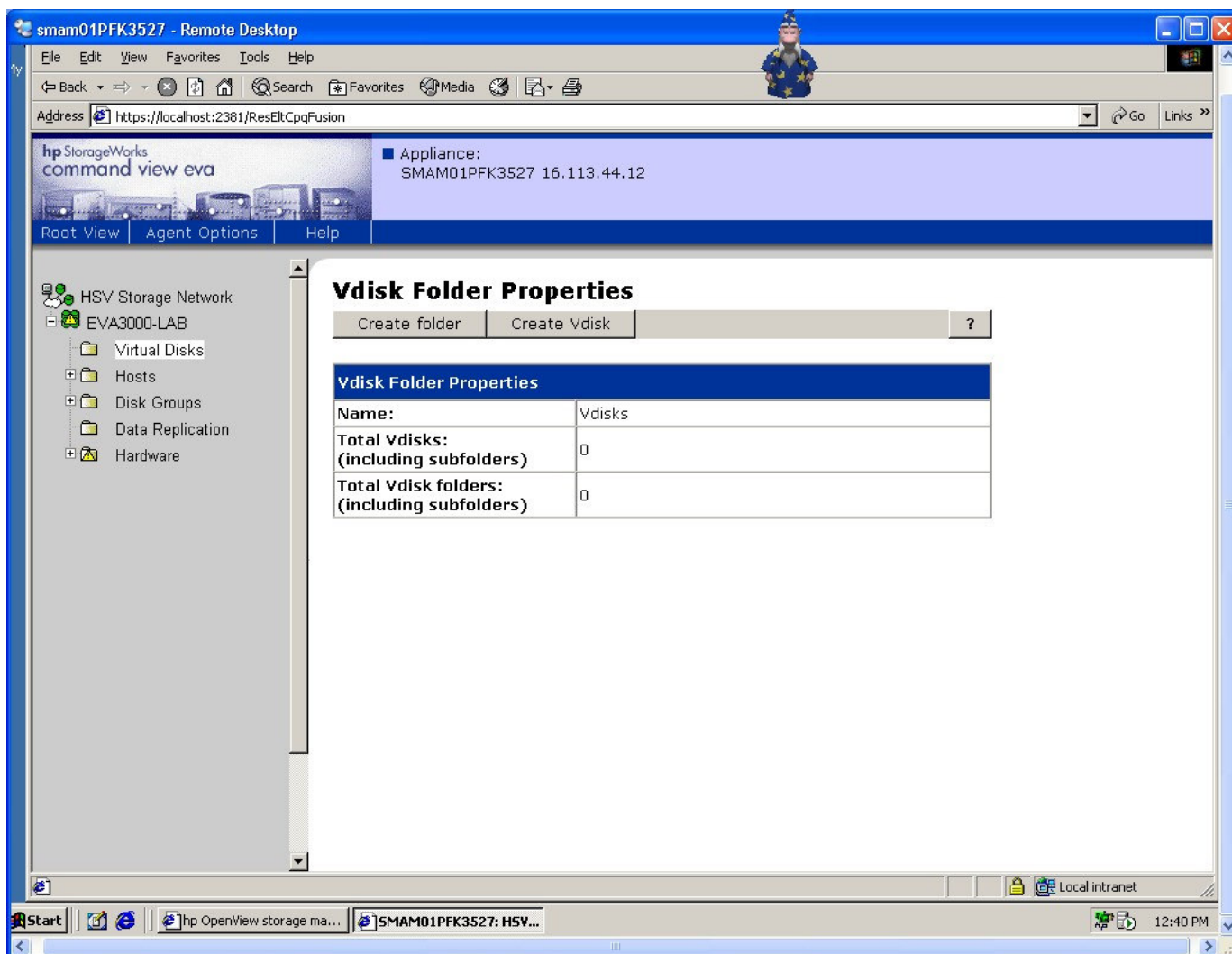
General Presentation Ports

Total adapter ports: 1

FC Adapter Port WWN
1000-0000-c937-a368

Local intranet

Virtual Disk Creation



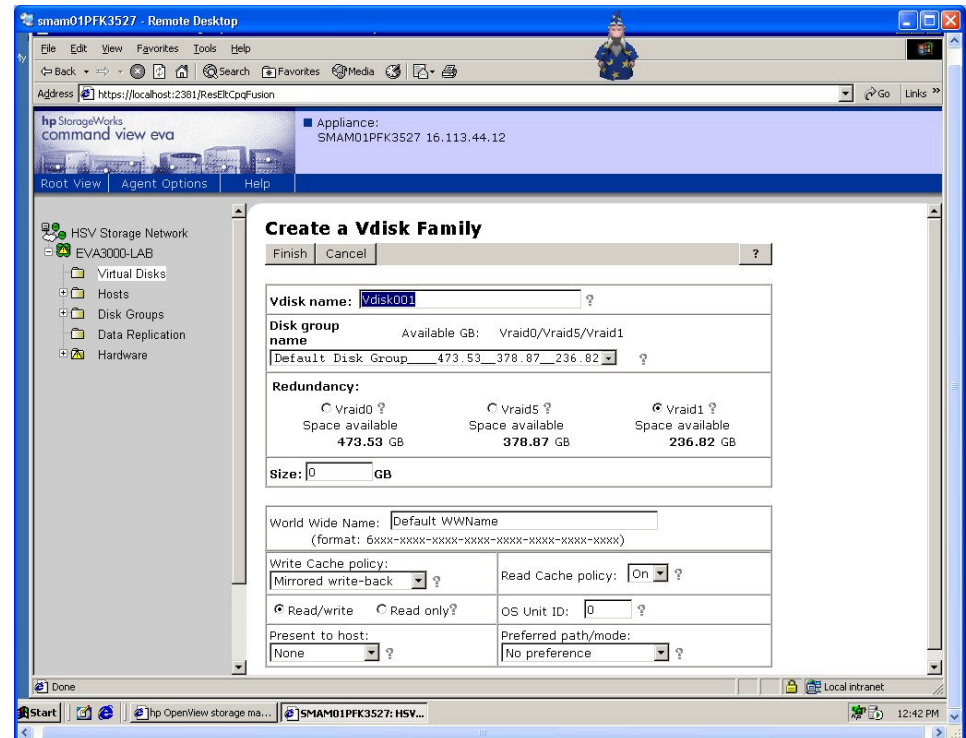
The screenshot shows a web browser window titled "smam01PFK3527 - Remote Desktop". The address bar shows "https://localhost:2381/ResElt:CpqFusion". The page header includes the HP StorageWorks logo and the text "command view eva". Below the header, there is a navigation bar with "Root View", "Agent Options", and "Help". The main content area is titled "Vdisk Folder Properties" and contains a table with the following data:

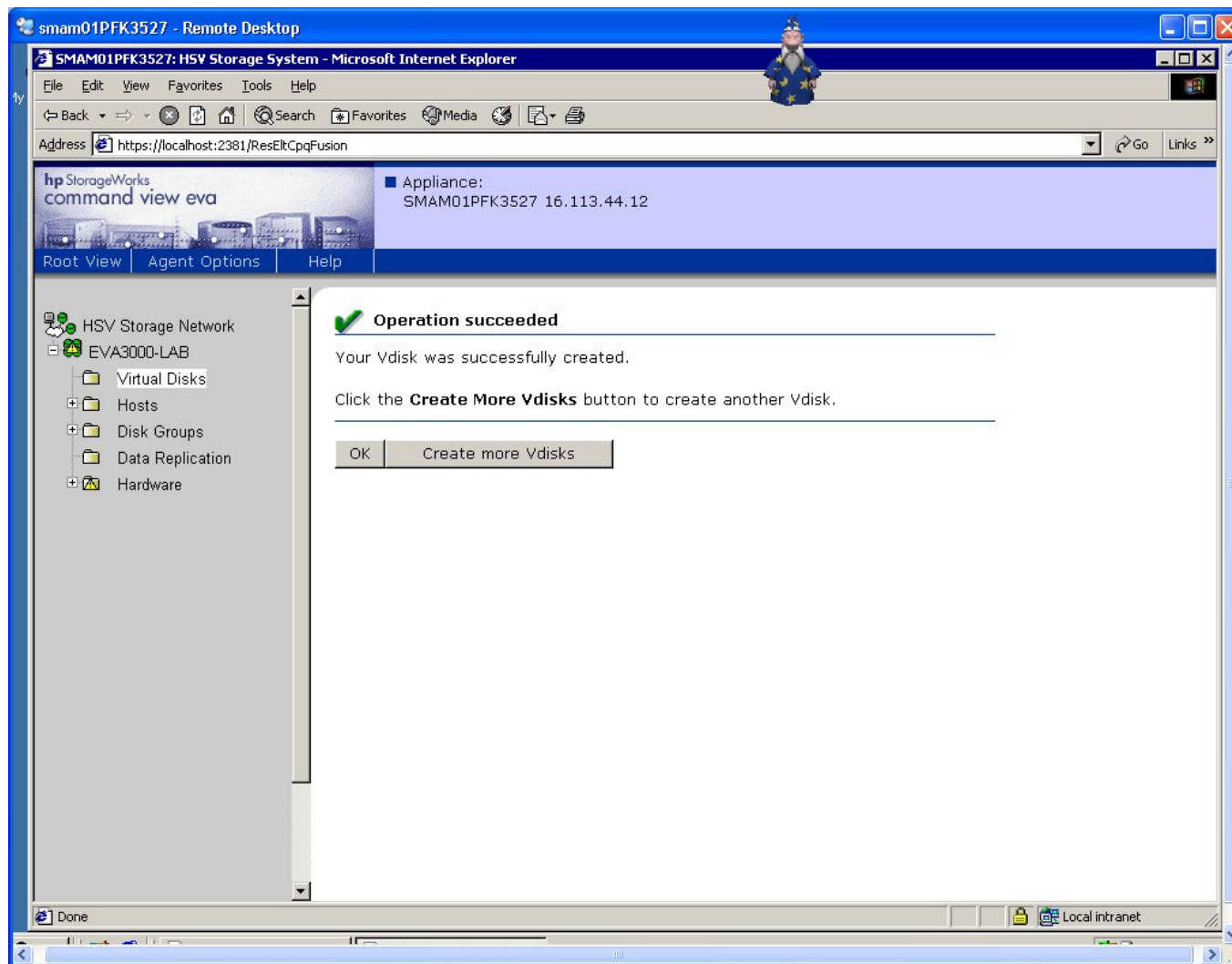
Vdisk Folder Properties	
Name:	Vdisks
Total Vdisks: (including subfolders)	0
Total Vdisk folders: (including subfolders)	0

The left sidebar shows a tree view of the storage network, including "HSV Storage Network", "EVA3000-LAB", "Virtual Disks", "Hosts", "Disk Groups", "Data Replication", and "Hardware". The bottom status bar shows the time as 12:40 PM and the text "Local intranet".

Virtual Disk Details

- **VDISK name**
- **Redundancy**
- **VDISK size**
- **Write Cache policy**
- **Read Cache policy**
- **Write Protection can be enabled after a data load**
- **Host Presentation**
- **Preferred path/mode**
 - **Set this to load balance VDISKS on the EVA**
 - **Path A is Controller A**
 - **Path B is Controller B**





Rescan your disks and the disk will appear without a reboot.

Section 3: Basic Error Troubleshooting

- Disk Appearance
- Server Event Decoding
- SMA Event Decoding



What to do if the disk does not appear



- Start with the server
 - Verify all cables are connected on both ends and that you have link LEDs on the Switches, HBAs, and EVA
 - Verify the correct drivers are loaded on the HBA
 - Use Device Manager to verify the correct driver is loaded
 - If the server is being redeployed, perform a complete uninstall, reboot, and reinstall of the driver via the Platform Kit
 - Verify that the Secure Path Agent started (if applicable)
 - If you are using a Windows cluster, increase the Disk Resource timeout when you have more than 8 VDISKS presented
 - If other disks are already presented and working then the problem is not on the server

Next, check the EVA configuration on the SMA



- Verify you presented the disk to the correct host
 - Presentations use WWID, not the server name
 - Verify the HBA WWID from the host using LPUTILNT
 - If the SMA does not see the HBA WWID, then check the switch zoning
- If this is the first disk to this host, check the Host OS type for that host
 - You can dynamically change the OS type
- If you have more than one HBA, make sure both HBA ports are listed for that host
 - In a default configuration, only one HBA can see the disks at a time (Secure Path)



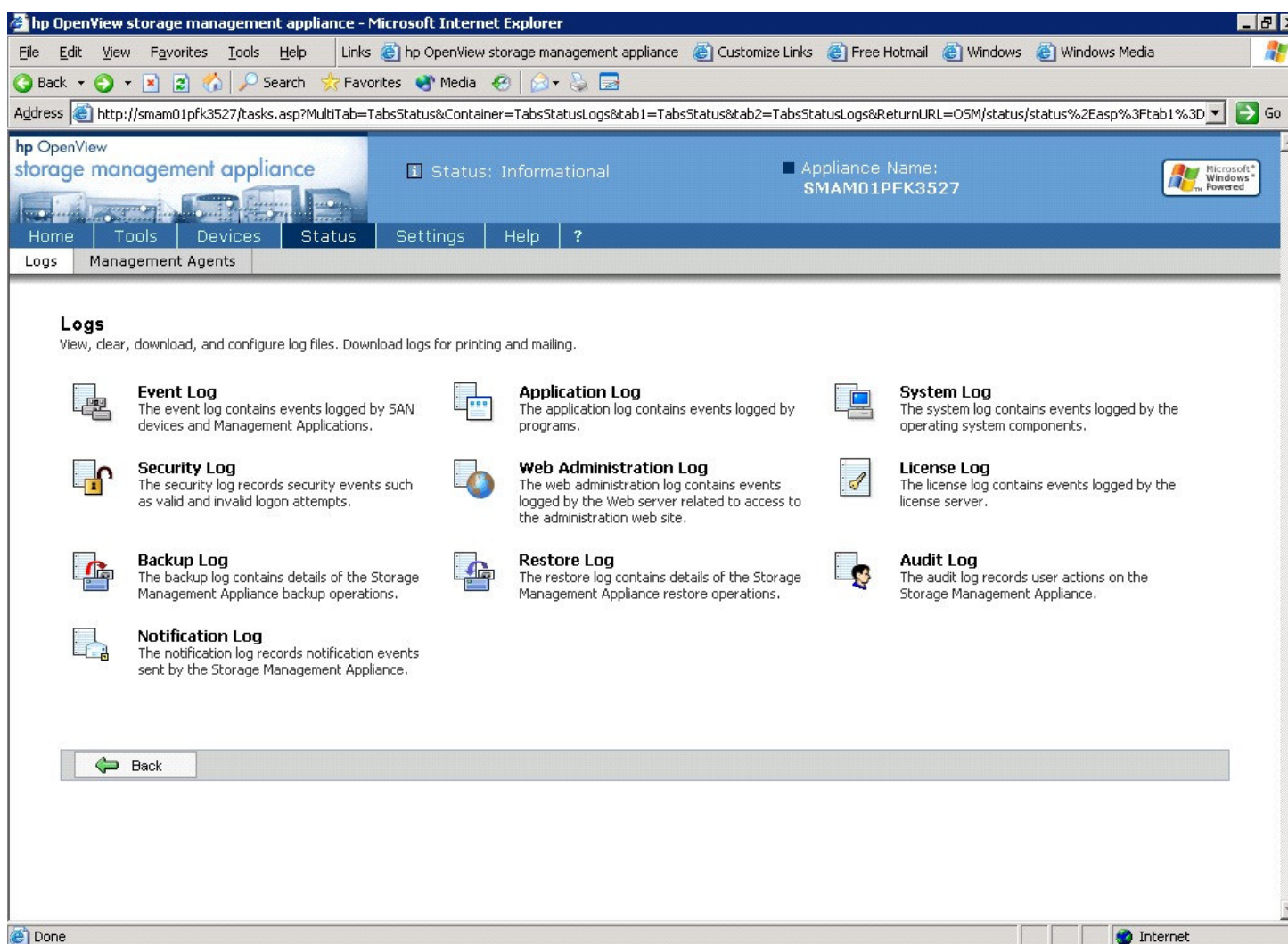
Decoding errors in Windows Event Viewer

- SAN-related events are only reported Event ID 9 or 11
- Source: CPQKGPSA
- Events can be decoded. Review the Installation Guide for your specific HBA to help you decode the events.
- Windows disk related events usually indicate a bad configuration or bug in the OS.

Decoding Event Logs from the SMA

- There is an application note entitled [HP OpenView Storage Management Appliance Software Event code definitions](#)
- This document will list and describe the event codes displayed by the Storage Management Appliance
 - Management Appliance Event Codes
 - McData Switch Event Codes
 - Brocade Switch Event Codes
 - Management Appliance Audit Codes
 - Command View EVA Event Codes

From the SMA home page, click on Status/Logs



hp OpenView storage management appliance - Microsoft Internet Explorer

File Edit View Favorites Tools Help Links hp OpenView storage management appliance Customize Links Free Hotmail Windows Windows Media

Back Forward Stop Search Favorites Media Go

Address http://smam01pfk3527/tasks.asp?MultiTab=TabsStatus&Container=TabsStatusLogs&tab1=TabsStatus&tab2=TabsStatusLogs&ReturnURL=OSM/status/status%2Easp%3Ftab1%3D Go

hp OpenView storage management appliance

Status: Informational Appliance Name: SMAM01PFK3527

Microsoft Windows Powered

Home Tools Devices Status Settings Help ?

Logs Management Agents

Logs

View, clear, download, and configure log files. Download logs for printing and mailing.

 Event Log The event log contains events logged by SAN devices and Management Applications.	 Application Log The application log contains events logged by programs.	 System Log The system log contains events logged by the operating system components.
 Security Log The security log records security events such as valid and invalid logon attempts.	 Web Administration Log The web administration log contains events logged by the Web server related to access to the administration web site.	 License Log The license log contains events logged by the license server.
 Backup Log The backup log contains details of the Storage Management Appliance backup operations.	 Restore Log The restore log contains details of the Storage Management Appliance restore operations.	 Audit Log The audit log records user actions on the Storage Management Appliance.
 Notification Log The notification log records notification events sent by the Storage Management Appliance.		

Back

Done Internet

SMA Event Log



Event Log - Microsoft Internet Explorer

File Edit View Favorites Tools Help Links hp OpenView storage management appliance Customize Links Free Hotmail Windows Windows Media

Back Forward Stop Search Favorites Media Go

Address http://smam01pfk3527/OSM/management/logs/eventlog.asp?Tab1=TabsStatus&Tab2=TabsStatusLogs&ReturnURL=tasks%2Easp%3FMultiTab%3DTabsStatus%26Container%3DTz Go

hp OpenView
storage management appliance

Status: Informational Appliance Name: SMAM01PFK3527

Microsoft Windows Powered

Home Tools Devices Status Settings Help ?

Logs Management Agents

Event Log

Select 'Download Log', 'Log Properties', 'Clear Log', 'Acknowledge' or 'Acknowledge All' to perform tasks on the entire log. To view the details of a specific log entry, select an entry and then choose 'Event Details'.

Search: Type Go

☐ Type	Date	Time	Source	Device	Ack	Event Code	Tasks
☐ Information	07/01/2004	9:07:59 AM	Management Appliance	169.254.143.24	No	880A03F6 ...	Event Details...
☐ Information	06/30/2004	7:30:05 AM	Management Appliance	SMAM01PFK3527	No	880A00CB ...	Download Log...
☐ Information	06/30/2004	7:30:03 AM	Management Appliance	SMAM01PFK3527	No	880A00CA ...	Log Properties...
☐ Information	06/30/2004	7:29:14 AM	Management Appliance	ovsmaili	No	880A03F6 ...	Clear Log
☐ Information	06/30/2004	7:29:10 AM	Management Appliance	ovsmaili	No	880A03F6 ...	Acknowledge
☐ Information	06/30/2004	7:29:03 AM	Management Appliance	ovsmaili	No	880A03F6 ...	Acknowledge All
☐ Information	06/30/2004	7:29:01 AM	Management Appliance	ovsmaili	No	880A03F6 ...	

Back

Done Internet



If all else fails,

- Call HP support
- Or purchase a support contract

Hear more about our service offerings by visiting us in the **Solutions Showcase!**



- HP Web Support Tools
- HP Active Savings Tool
- HP Education
- HP Business Continuity & Availability Solutions
- HP Adaptive Enterprise Agility Assessment
- HP Financial Services
- HP IT Consolidation Solutions
- HP Radio Frequency Identification (RFID)



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HP Certified Professional

