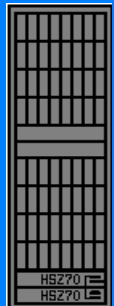


EVA Setup and Configuration



General HSV Licensing

- ↓ License keys are stored on SWMA hard drive and on each Management Logical Disk (MLD)
 - Keep Record
- ↓ Loss of appliance does not lose licensing state
- ↓ VCS software on controller is full featured
- ↓ Basic license required to initialize storage cell
- ↓ Feature licenses are tied to a specific subsystem (WWN) and cannot be moved
- ↓ Feature License validated whenever a feature is requested :
 - By HSV Element Manager
 - SANscript
- ↓ Basic license is never revalidated on an initialized storage cell
- ↓ HSV Element Manager blocks access to VCS features which do not have a corresponding license
- ↓ FLEXlm 7.0 is underlying product managing and creating licenses



General HSV Licensing

- ↓ License enforcement is based on VCS version number
- ↓ VCS versions are changed with a SuperImage load
- ↓ 1.xy to 1.xz change does not require any new license keys
- ↓ 1.x to 1.y change requires new license keys
- ↓ SuperImage update which contains a VCS level which is not licensed will require a license in order to complete

HSV Licensing Flow

Licensing Agreement

Authorization ID

Instruction Sheet

HSV

Node WWN

HP License Fulfillment Website

email

License Key

Cut-paste

OR

Manual entry

HSV Element Manager

Obtaining Licenses



License Fulfillment

Order Information

Order No:	OW6	Version:	1.0
Product Name:	QM-6RNAA-AA1.0	Type:	prod
Option:	VCS PKG V1.0 DUAL HSV CNTLR		
Quantity Ordered:	1	Quantity Created:	0

Enter the information below, then press the 'Generate License' button

There are 1 items remaining of the original 1

Quantity: 1

Host ID of the machine where you will run the application: HSVWWN=5000-1

Generate_License



Sample License—Base License

➤Compaq Computer Corporation

➤Version 3.5b GTLicensing Fulfillment System.

➤The lines of software instructions denoted below are your LICENSE KEY.

➤To avoid typographical errors, COPY the License Key from this message

➤using a text editor and PASTE into your license file. Refer to your FLEXlm

➤End User's Manual for more information on license files.

➤>>> LICENSE KEY begins AFTER THIS LINE <<< Start your copy there.

➤INCREMENT HSV110-BASIC Compaq 1.0 permanent uncounted 92ACB0BDABC7 \

➤HOSTID=HSVWWN=5000-1FE1-0011-0000 NOTICE="Authorization \

➤=xxxxxxxxxxxxxxxxxxxxxx, Qty 1, QM-6RNAA-AA1.0, VCS PKG V1.0 \

➤DUAL HSV CNTLR" ck=100

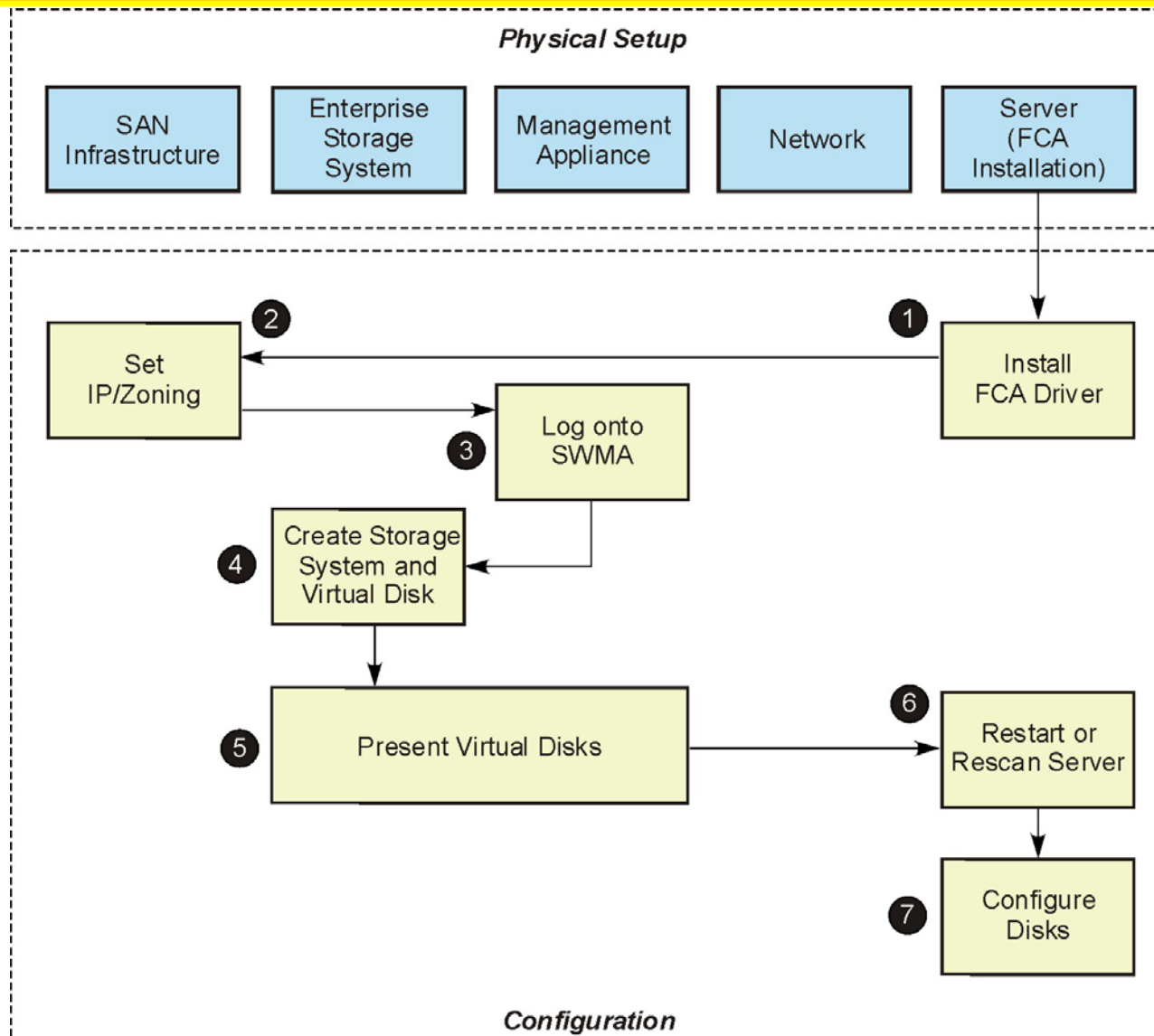
➤>>> LICENSE KEY ends BEFORE THIS LINE <<< End your selection on the PREVIOUS line

➤to complete your COPY.

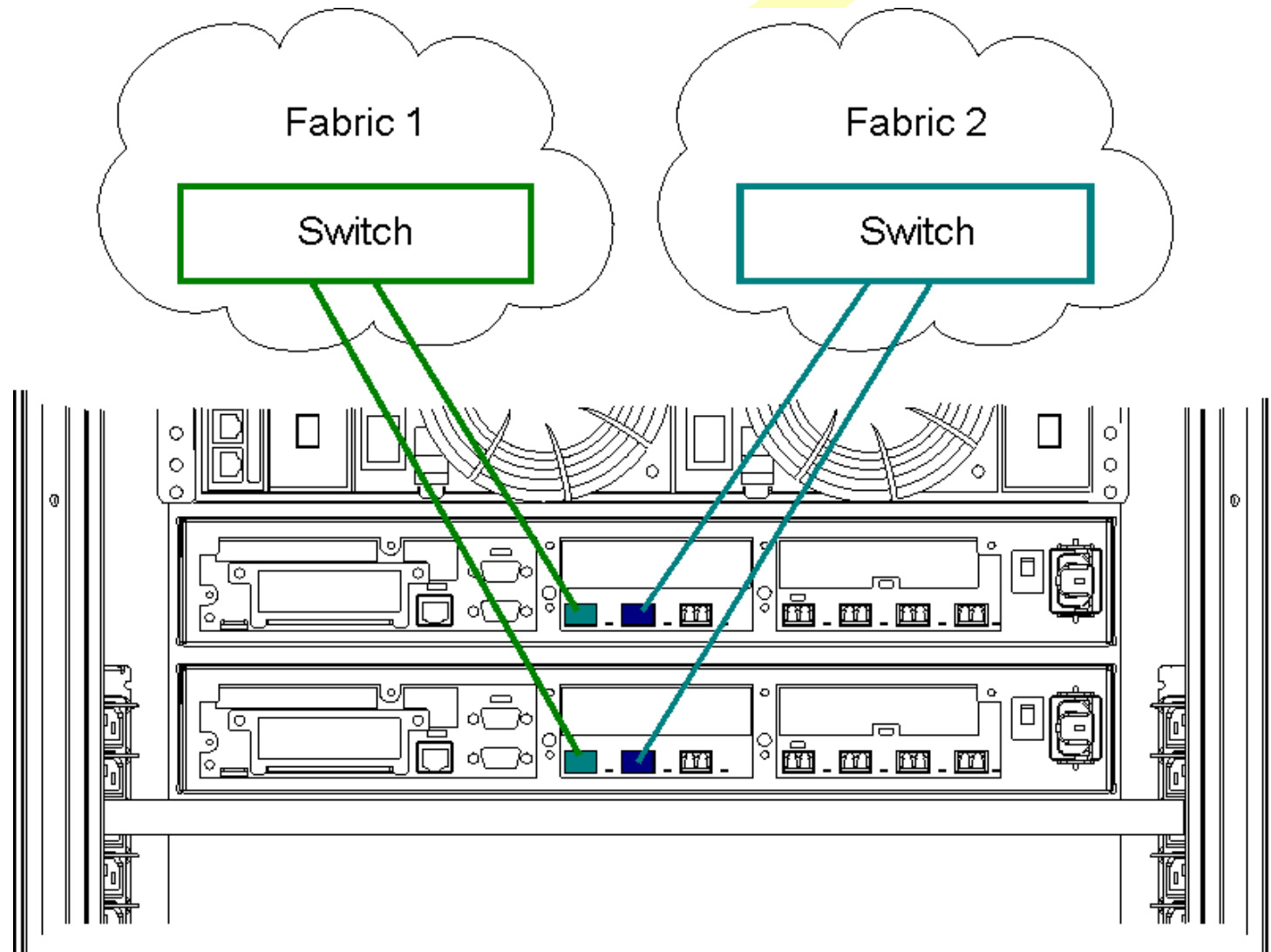
➤If you have any problems installing this license key, contact the parties listed on the

➤associated license documentation or web site.

Configuring the Enterprise Virtual Array



HSV110 Fabric Cabling





Step 1—Before Launching the HSV Element Manager

- ↓ Fabric ports (FP1, FP2) remain disabled until WWN is configured
- ↓ Use the Operator Control Panel (OCP) to enter in WWN and Checksum
 - Located on front of rack adjacent to HSV110 controllers
 - Successful configuration displays the WWN on LCD of both controllers
- ↓ Verify FP1 and FP2 have a link into the fabric, LED adjacent to each port
 - Green LED indicates link is up
 - Amber LED indicates link is down

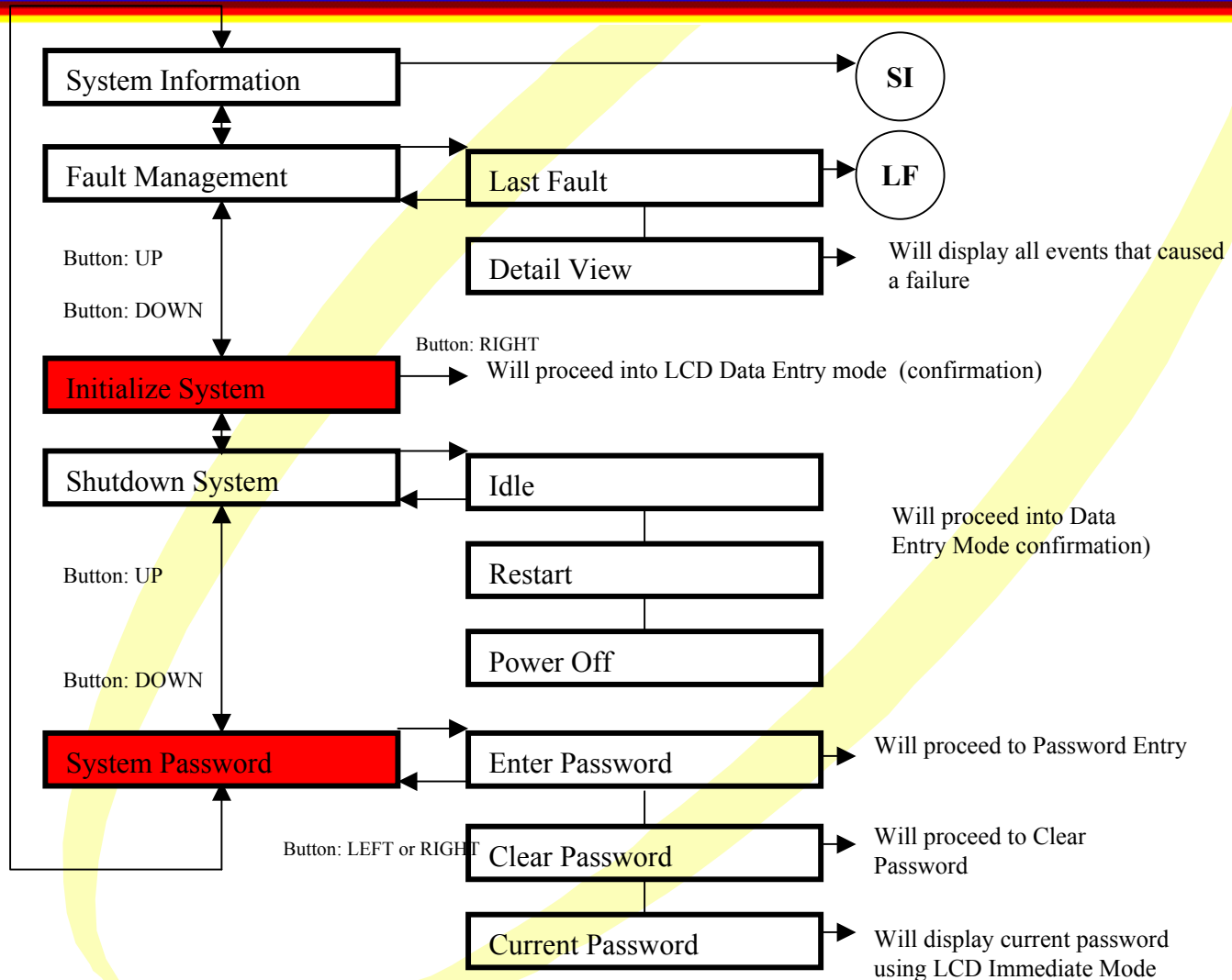
LCD WWN Programming

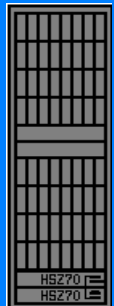
- At the "Enter Node" display
 - ▼ Up-Down keys select hexadecimal number
 - ▶ Right key moves position to right
 - ◀ Left key enters the number and moves to checksum step
- At the "Enter Checksum" display
 - ↓ Up-Down keys select Letter/Number
 - Full alphabet
 - ↓ Right key moves to the right
 - ↓ **Left key completes operation**

Unidirectional



LCD Front Panel Menu Structure





LCD Front Panel Menu structure (continued)

LF

Term Code

Will display the last event that caused a failure using
“termination code” format

TC: 0412001F
LTEA [5]

FESC

Will display the last event that caused a
failure using “fatal error state code” format

FESC: 82010000

SI

Configuration

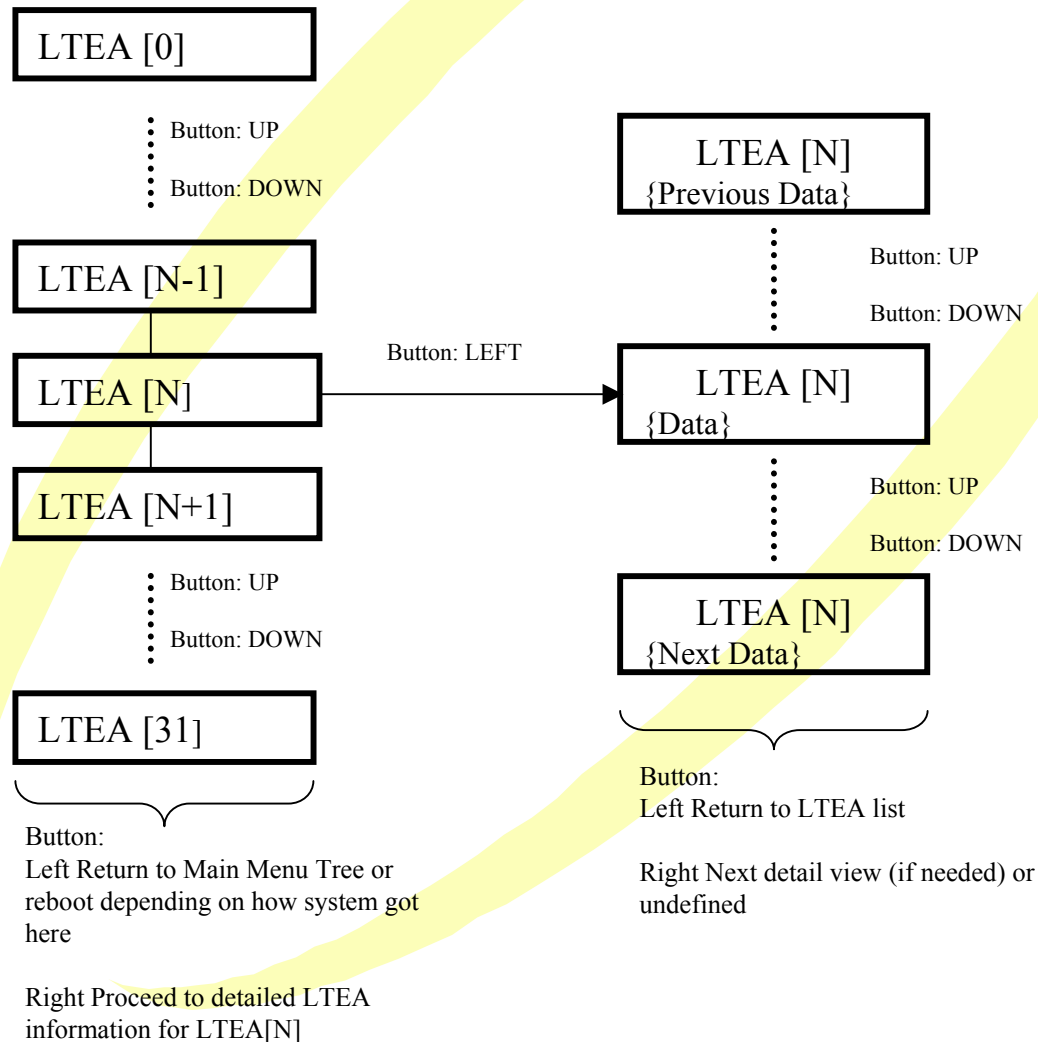
Hosts:194

Versions

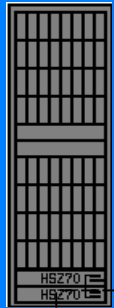
Array Size:1.3Pb

Disks:15314

LCD Front Panel Fault Menu Tree



LCD Front Panel Display Messages



Initialization Confirmation

REALLY INIT SYSTEM?
NO



DATA WILL BE LOST!
NO

Password Confirmation

CHANGE PASSWORD?
NO

OR

CLEAR PASSWORD?
NO

Shutdown Confirmation

POWER OFF SYSTEM?
NO

OR

RESTART SYSTEM?
NO

OR

IDLE SYSTEM?
NO

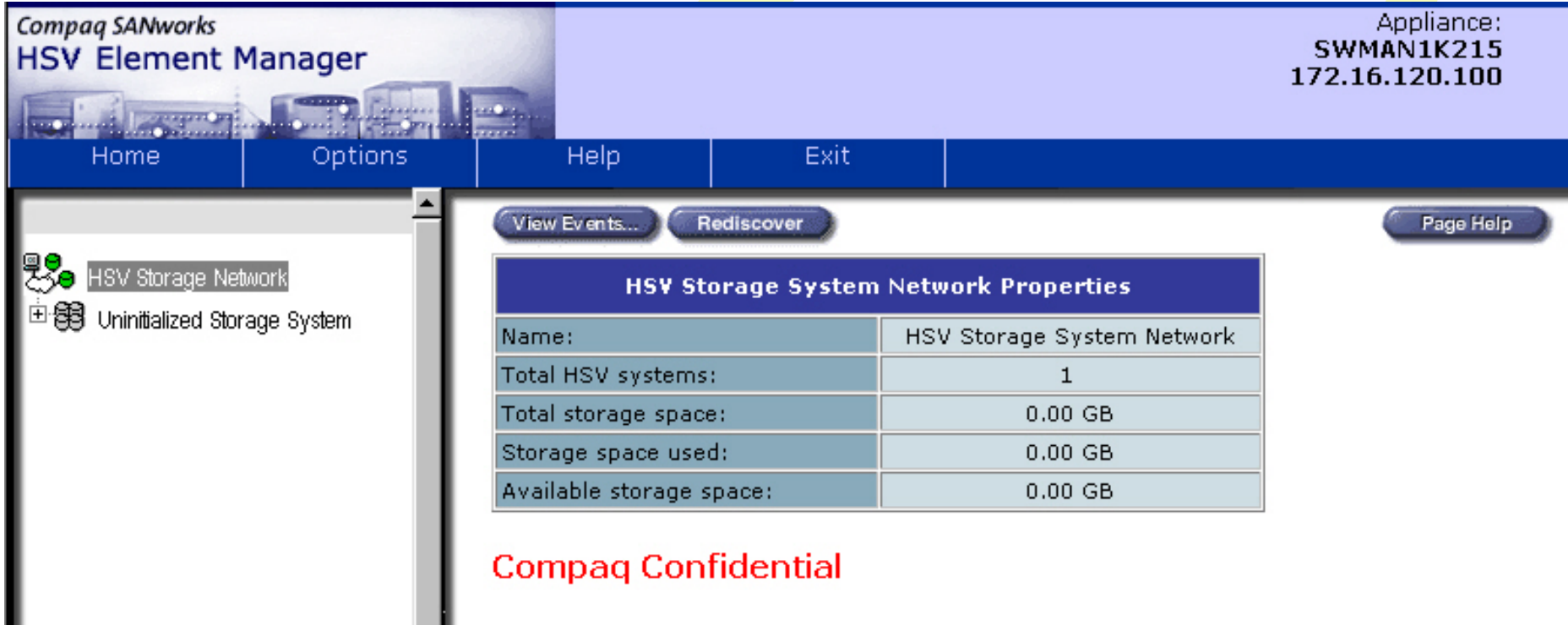
WWID Entry

Enter World Wide ID:
0000-0000-0000-0000



Enter WWID Checksum:
00

The Very First Time - Uninitialized Storage System



The screenshot displays the Compaq SANworks HSV Element Manager interface. The title bar reads "Compaq SANworks HSV Element Manager". In the top right corner, the appliance information is shown: "Appliance: SWMAN1K215 172.16.120.100". The main menu bar includes "Home", "Options", "Help", and "Exit". On the left sidebar, under "HSV Storage Network", there is a sub-entry "Uninitialized Storage System". Above the main content area are buttons for "View Events...", "Rediscover", and "Page Help". The central panel displays the "HSV Storage System Network Properties" table.

HSV Storage System Network Properties	
Name:	HSV Storage System Network
Total HSV systems:	1
Total storage space:	0.00 GB
Storage space used:	0.00 GB
Available storage space:	0.00 GB

Compaq Confidential

Uninitialized Storage Cell



Compaq SANworks
HSV Element Manager

Appliance:
SWMAN1K215
172.16.120.100

Home Options Help Exit

Initialize... Set Time... View Events... Code Load... Page Help

HSV Storage Network
Uninitialized Storage System
Hardware

Uninitialized HSV Storage System Properties	
Name:	Uninitialized Storage System
Operational State:	Uninitialized - Good
Total storage space:	0.00 GB
Controller time:	05 Jul 2001 16:18:38
***** THIS SYSTEM IS UNINITIALIZED ***** Click the Initialize button to prepare the system for data storage.	

Compaq Confidential

Storage Cell Initialization

(Page 1 of 4) (8 disks min)



Enter the name of
the Storage Cell

Enter Number of
disk drives in Disk
Group **MIN 8 disks**

Finish Adv Options... Cancel Page Help

Initialize an HSV Storage System

Page 1 Page 2 Page 3 Page 4

Complete this step and click **Finish** to initialize your HSV storage system in the simplest way possible. If you'd like more control over the initialization of your HSV storage system, complete the step and click **Adv Options** instead.

STEP 1: Enter a Name
Enter a name for your HSV storage system.

→ NCC1701 ?

STEP 2: Enter the number of disks
Enter a number of disks between 4 and 40. (You can add more disks later, if you wish.)

→ 8 ?

Finish Adv Options... Cancel

Compaq Confidential

Storage Cell Initialization

(Page 2 of 4)



Use the SWMA time

Enter the Identifier
of LUN 0 (SACD)

Previous Step Next Step Cancel Page Help

Initialize an Enterprise System Page 1 Page 2 Page 3 Page 4

Continue with this step to initialize your Enterprise system using advanced options. Click the **Next Step** button to move to the next page.

STEP 3: Set the system date/time

☐ Use Compaq SAN management date/time: 28 Jan 1900 00:01:17 GMT ?

☒ Use local date/time and convert to GMT: 29 Mar 2001 21:17:41 GMT

☐ Use existing controller date/time setting: 29 Mar 2001 21:17:29

☐ Use a custom date/time setting:

01 Jan 2000 00:00:00

STEP 4: Enter the VMS Console LUN ID

100 ?

Previous Step Next Step Cancel

Compaq Confidential

Storage Cell Initialization

(Page 3 of 4)



Select Disk Group
protection level

Previous Step Next Step Cancel Page Help

Initialize an Enterprise System Page 1 Page 2 Page 3 Page 4

When you initialize your Enterprise system, a default disk group is created. Continue with these steps to specify the attributes of the default disk group. Click the **Next Step** button to move to the next pages.

STEP 5: Select the disk failure protection level

Single ?

Single
Double
None

Previous Step Next Step

Compaq Confidential



Storage Cell Initialization (Page 4 of 4)

You may want to
enter some
comment in here.

Previous Step Finish Cancel Page Help

Initialize an HSV Storage System Page 1 Page 2 Page 3 Page 4

Continue with these steps to create the default disk group and initialize your HSV storage system using advanced options.

STEP 6: Enter your comments

STEP 8: Initialize your HSV storage system
Click the **Finish** button to initialize your HSV storage system.

Previous Step Finish Cancel

Compaq Confidential

Storage Cell Initialized

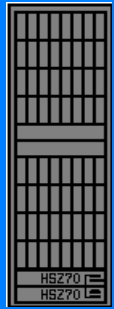


HSV Storage Network
+ NCC1701

Save Changes Options... View Events... Uninitialize Code Load... Page Help
Get Config File

Initialized Storage System Properties	
Name:	NCC1701
Operational State:	Initialized - Good
Total storage space:	50.48 GB
Storage space used:	0.00 GB
Available storage space:	50.48 GB
Device addition policy:	Manual
Disk replacement delay:	1 mins
Console LUN ID:	100
Controller time:	30 Jan 1900 00:35:19
Comments:	
<input type="text"/>	

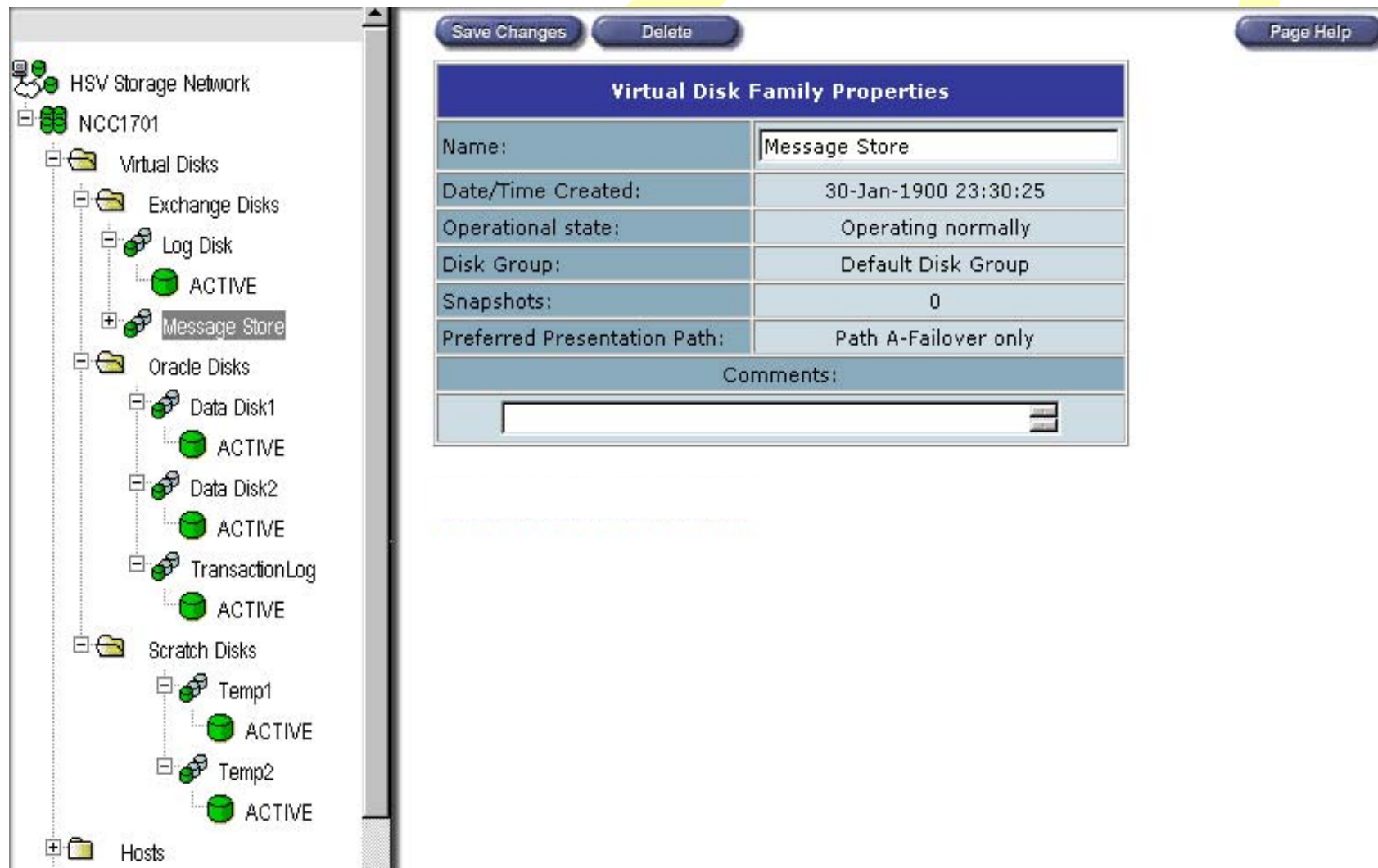
Compaq Confidential



Initialize Storage Cell via SANscript

```
select manager <ApplianceName> user=administrator -  
                                pass=administrator  
  
show cell  
  
select cell UninitializedStoragePool1  
  
add cell <StorageCellName> device_count=<8..240> -  
                                vms_console_id=<1..(32K-1)> -  
                                spare_policy=[None|Single|Double]  
  
select cell <StorageCellName>  
show cell full  
show group full
```

Multiple Virtual Disks created



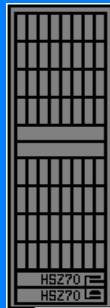
The screenshot displays the HSV Storage Network interface. On the left, a tree view shows the hierarchy: HSV Storage Network > NCC1701 > Virtual Disks. Under Virtual Disks, there are Exchange Disks (Log Disk, Message Store) and Oracle Disks (Data Disk1, Data Disk2, TransactionLog). Below these are Scratch Disks (Temp1, Temp2). The Message Store disk is highlighted. On the right, the 'Virtual Disk Family Properties' window is open, showing details for the Message Store disk.

Virtual Disk Family Properties

Name:	Message Store
Date/Time Created:	30-Jan-1900 23:30:25
Operational state:	Operating normally
Disk Group:	Default Disk Group
Snapshots:	0
Preferred Presentation Path:	Path A-Failover only
Comments:	

Buttons at the top: Save Changes, Delete, Page Help.

Enterprise Online Help



Contents

[Index](#)[Search](#)

- [-] Controlling and Monitoring
 - [-] System-level operations
 - System Control Overview
 - Setting System Options
 - [-] Working with Virtual Disks
 - Virtual Disk (VD) Control Overview
 - Creating a Virtual Disk
 - Creating a Snapshot of a VD
 - Creating a Copy of a VD
 - Modifying a Virtual Disk
 - Deleting a VD Family
 - [-] Working with Hosts
 - Host Control Overview
 - Adding a Host
 - Modifying a Host
 - [-] Working with Disk Groups
 - Disk Group Control Overview
 - [-] Assigning and Unassigning Virtual Disks to Hosts
 - Presenting a Virtual Disk to a Host
 - Unpresenting a Virtual Disk to a Host
 - [-] Updating Software (Loading Code)
 - Code Loading Overview
 - Updating Controller Code
 - Updating Physical Disk Drive Code
 - Updating EMU Code

[About](#)[SyncToc](#)

About HSV Element Manager Software

HSV element manager offers a graphical user interface for configuration, management, and monitoring of StorageWorks HSV-series storage systems.

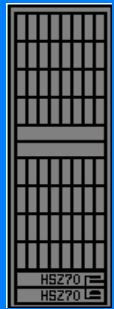
[Version and build information.](#)

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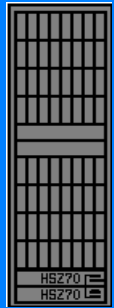
Redundant Storage Sets (RSS)

- ↓ Reduces chance of data loss in large (> 12 physical disks) disk groups
- ↓ Not visible to user through Interface
- ↓ Complete managed by the HSV controllers
- ↓ Typical size for disk group: 8 - 12 physical disks
- ↓ If RSS equals 12 physical disks, it splits into 2 RSS of 6 disks each
- ↓ Failed disk drive recovery restricted to affected RSS only
 - Reduces access to number of disks, more efficient

➤ Example: Disk Group with 28 disks

- ↓ # of disks - 6, repeat until the remainder is 12 or less
 - $28 - 6 = 22$, $22 - 6 = 16$, $16 - 6 = 10$ stop
 - RSS configured as $6 + 6 + 6 + 10$

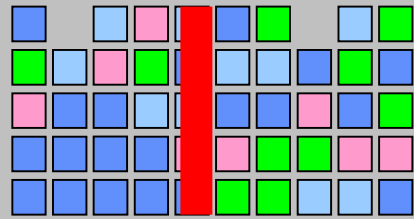
HSV110 Virtualization : Redundant Storage Sets



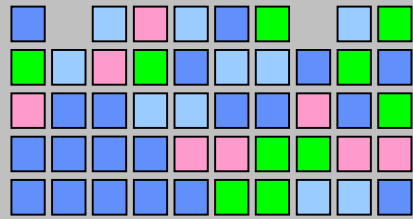
Disk Group

Virtual Disks

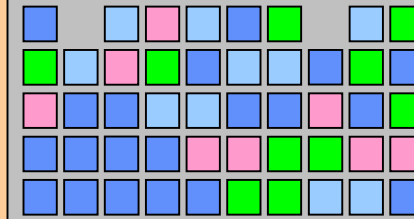
Redundant
Storage Set



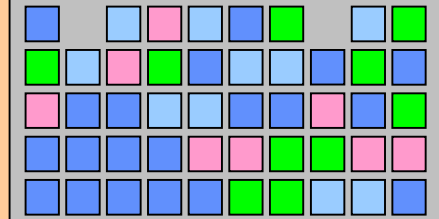
Redundant
Storage Set

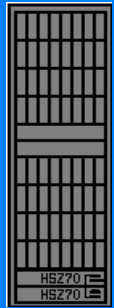


Redundant
Storage Set



Redundant
Storage Set

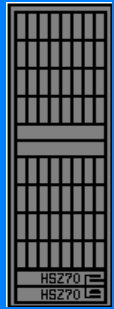




Sizing HSV Disk Groups — Considerations

➤ Considerations:

- Hardware versus software capacities
- System metadata overhead
- Vraid overhead
- Snapshot working space
- Spare capacity
- Room for growth



Sizing HSV Disk Groups — Considerations

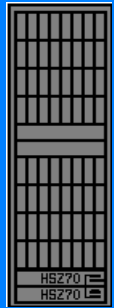
- ↓ Hardware versus software capacities
 - Physical 1000 000 000Bytes = 1GB
 - Software 1073 741 824Bytes = 1.07GB Physical (2^{30})
 - ~ 7% Variance → 1GB Physical = 0.93GB Software
- ↓ System metadata overhead — 0.2%
 - System metadata
 - MLD—HSV Element Manager metadata
 - Virtual Disk metadata
- ↓ Vraid overhead
 - Vraid0 — 0% (1 block for every 1 block usable)
 - Vraid1 — 50% (2 blocks for every 1 block usable)
 - Vraid5 — 20% (1.25 blocks for every 1 block usable)
- ↓ Snapshot working space
 - Snap — depends on rate of change of original data
 - Snapclone — same physical capacity as virtual disk
- ↓ Spare capacity
 - 2 X physical capacity of the largest physical disk X protection selected



Sizing HSV Disk Groups—Formula

$$\text{Disk Count} \simeq \frac{((\text{UsableV0} * 538) + (\text{UsableV5} * 673) + (\text{UsableV1} * 1076))}{(\text{DiskCap} * 476)} + (\text{ProtLevel} * 2)$$

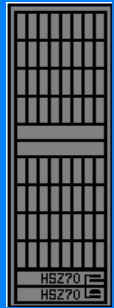
- ◆ DiskCap: Disk drive capacity in hardware GB
- ◆ DiskCount: Integer number of disk drives
- ◆ ProtLevel: 0 for None, 1 for Single, 2 for Double
- ◆ UsableV0 Desired usable Vraid0 capacity in software GB
- ◆ UsableV1 Desired usable Vraid1 capacity in software GB
- ◆ UsableV5 Desired usable Vraid5 capacity in software GB
- ◆ VFactorx: 538 for Vraid0, 673 for Vraid5, 1076 for Vraid1



Sizing HSV Disk Groups—Summary of Steps

1. Determine:
 - a. physical disk capacity
 - b. disk failure protection level required for the disk group
2. Determine:
 - a. number of virtual disks in the disk group
 - b. usable capacity required for each virtual disk
 - c. Vraid type for each virtual disk
3. Determine:
 - a. amount usable capacity for snapshot working space for each virtual disk that will have snapshots
 - b. Vraid type of the snapshots will match the original
4. Sum the total usable capacity required for each Vraid type
5. Solve for the number of disks using Formula

Sizing HSV Disk Groups—Example



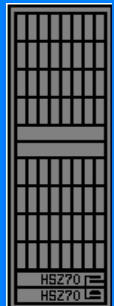
$$((\text{UsableV0} * 538) + (\text{UsableV5} * 673) + (\text{UsableV1} * 1076))$$

$$\text{Disk Count} \approx \frac{\quad}{(\text{DiskCap} * 476)} + (\text{ProtLevel} * 2)$$

$$((0 * 538) + (500 * 673) + (50 * 1076))$$

$$26.78 \approx \frac{\quad}{(36 * 476)} + (2 * 2)$$

- ◆ DiskCap: 36GB
- ◆ DiskCount: Integer number of disk drives
- ◆ ProtLevel: 2 for Double
- ◆ UsableV0 0GB
- ◆ UsableV1 50GB
- ◆ UsableV5 500GB
- ◆ VFactorx: 538 for Vraid0, 673 for Vraid5, 1076 for Vraid1



Storage System Scripting Utility (SSSU)

➤ Commonly referred to as SANscript

- ↓ Tool to issue commands through a shell UI and execute scripts
- ↓ Scripts to create/modify a configuration
- ↓ Interactive mode as a command prompt
- ↓ Configuration commands to add, set, and delete
- ↓ Capture of a configuration into a script file
- ↓ Show command to display configuration

```
C:\Sanscript\SANscript.exe

SANscript _DEBUG version 2.0 Build 80 on Jun 19 2001 at 18:26:20
EMClientAPI Version 1.5 BETA, Build date: Jun 19 2001

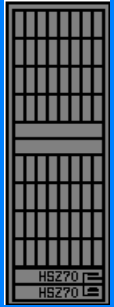
NoCellSelected> select manager fraggle user=administrator passw=administrator
NoCellSelected> show cell

Cells available on this Manager:
  HSU Storage System
NoCellSelected> select cell "HSU Storage System"

HSU Storage System> add storage Accounting size=12
HSU Storage System> show storage

Storage available on this Cell:
  \Virtual Disks\Accounting\ACTIVE
HSU Storage System>
```


Trouble Shooting



Best Practices

- ↓ Synchronize HSV110 system date / time to same as SWMA
- ↓ Helps correlate events when trouble shooting

The screenshot shows the 'Initialize an HSV Storage System' wizard. The left pane shows a tree view with 'HSV Storage Network', 'Uninitialized Storage System', and 'Hardware'. The main pane is titled 'Initialize an HSV Storage System' and includes navigation buttons: 'Previous Step', 'Next Step', 'Cancel', and 'Page Help'. Below the title bar, there are tabs for 'Page 1', 'Page 2', 'Page 3', and 'Page 4'. The main text says: 'Continue with this step to initialize your HSV storage system using advanced options. Click the **Next Step** button to move to the next page.'

STEP 3: Set the system date/time

Four radio button options are available for setting the date/time:

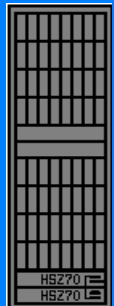
- ☒ Use Compaq SAN management date/time: 19 Jul 2001 08:42:22 GMT
- ☐ Use local date/time and convert to GMT: 19 Jul 2001 20:42:56 GMT
- ☐ Use existing controller date/time setting: 19 Jul 2001 08:42:22
- ☐ Use a custom date/time setting:

Below the custom date/time setting, there are dropdown menus for date and time: 01 (month) - Jan - 2001 (year), 00 (hour) : 00 (minute) : 00 (second).

STEP 4: Enter the Console LUN ID

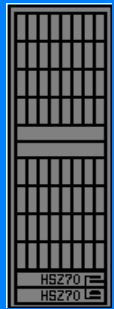
Below the title bar for Step 4, there is a text input field and a question mark icon.

At the bottom, there are navigation buttons: 'Previous Step', 'Next Step', and 'Cancel'.



Configuration Remarks

- Disk Groups can be created in 2 ways:
 - ↓ Vertically, so one disk drive per shelf
 - Pro:
 - ◆ 100% guarantee that it will survive a shelf meltdown failure
 - Con:
 - ◆ Limited number of disk drives per Disk Group
 - ◆ Performance (less spindles)
 - ◆ Cannot use full capacity due to loss in space reservation for (space efficient) snapshots

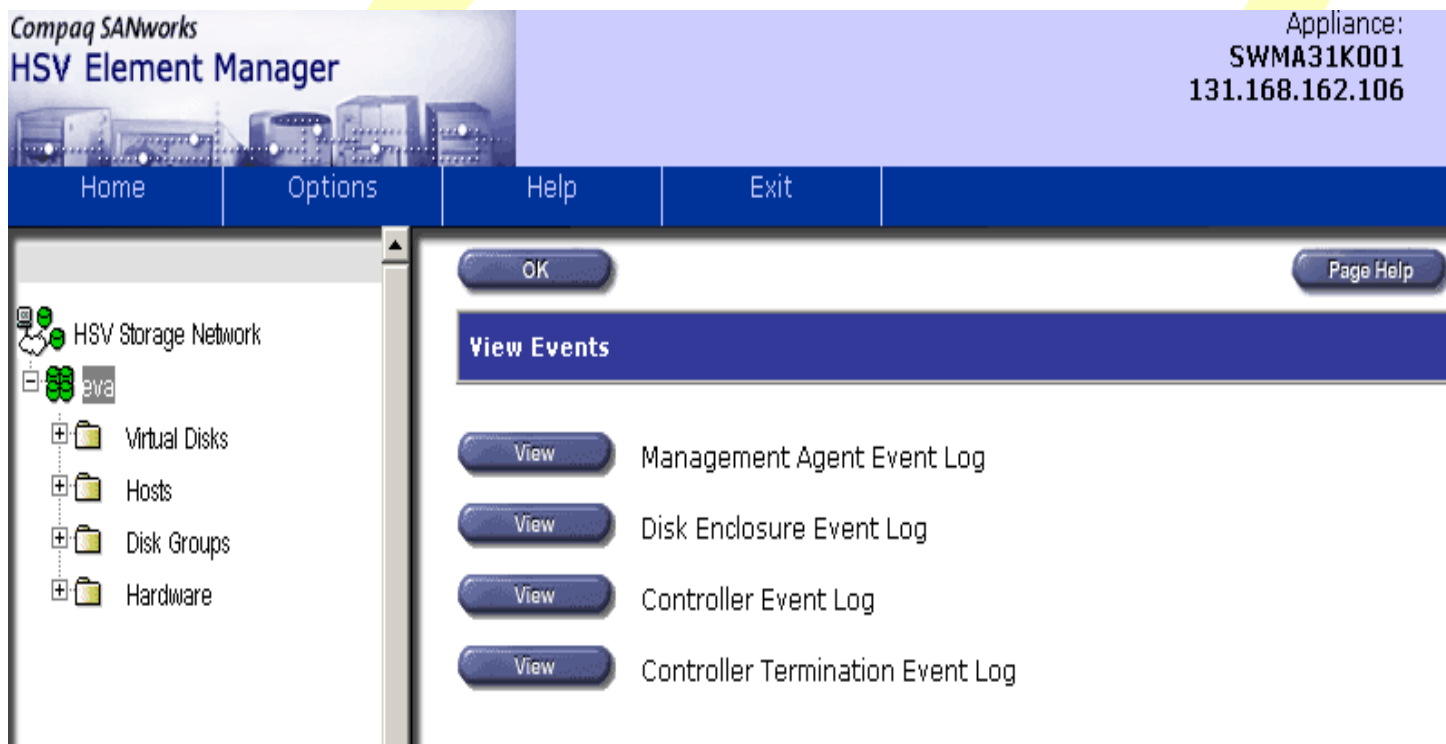


Configuration Remarks

- Disk Groups can be created in 2 ways (continued):
 - ↓ Multiple disk drives per shelf
 - Pro:
 - ◆ Unlimited performance due to large number of disk drives in disk group
 - ◆ No loss in space reservation for snapshots or snapclones
 - Con:
 - ◆ Isn't guaranteed to survive a shelf meltdown failure

Troubleshooting Tools—Log Files

- Management Agent Event Log
- Disk Shelf Event Log
- Controller Event Log
- Controller Termination Event Log
- Error Log(s) in Operating System



Log Files

↓ Management Agent Event Log

Management Agent Event Log - Microsoft Internet Explorer provided by Compaq Computer Corporation

OK Filter Events... Get Log File Clear Log Page Help

Management Agent Events						
	Date	Time	Appliance	Code	Alarm	Description
✓	13-Nov-2001	10:49:44	SWMA31K001	1014	No	The state of an object in the system has changed. View adjacent events for more detail.
✓	13-Nov-2001	10:49:24	SWMA31K001	2048	No	Virtual Disk Family: Copy of vdisk-vraid1-01 - deleted successfully
✓	13-Nov-2001	10:47:02	SWMA31K001	2042	No	Virtual Disk Copy of VD vdisk-vraid1-01/ACTIVE - Completed
✓	13-Nov-2001	10:45:50	SWMA31K001	1014	No	The state of an object in the system has changed. View adjacent events for more detail.
✓	13-Nov-2001	10:45:16	SWMA31K001	2048	No	Snapshot Virtual Disk: Allocate Completely Snapshot - deleted successfully
✓	13-Nov-2001	10:43:38	SWMA31K001	2041	No	Virtual Disk Snapshot of VD - Completed
✓	13-Nov-2001	10:42:44	SWMA31K001	1014	No	The state of an object in the system has changed. View adjacent events for more detail.
✓	13-Nov-2001	10:42:08	SWMA31K001	2048	No	Snapshot Virtual Disk: Allocate on Demand Snapshot - deleted successfully

Log Files

↓ Disk Shelf Event Log

Disk Enclosure Event Log - Microsoft Internet Explorer provided by Compaq Computer Corporation

OK Get Log File Page Help

Disk Enclosure Events						
Encl ID	Date Time	Elmnt Type	Elmnt No	Error Code	Severity	Description
10	7-Nov-2001 14:51:37	Amp Sensor	4	2	C	Current sensor 4 high current error; replace supply now.
10	7-Nov-2001 14:51:31	GBIC	4	2	C	Transceiver 4 lost signal; check cabling.
10	7-Nov-2001 14:51:25	Pwr Supply	2	1	N	Power supply 2 no AC input; check AC power to the supply.
10	6-Nov-2001 13:37:00	GBIC	4	2	C	Transceiver 4 lost signal; check cabling.
10	6-Nov-2001 13:37:00	GBIC	3	2	C	Transceiver 3 lost signal; check cabling.
10	6-Nov-2001 13:37:00	GBIC	2	2	C	Transceiver 2 lost signal; check cabling.
10	6-Nov-2001 13:37:00	GBIC	1	2	C	Transceiver 1 lost signal; check cabling.
10	6-Nov-2001 13:31:26	GBIC	4	2	C	Transceiver 4 lost signal; check cabling.
10	6-Nov-2001 13:31:26	GBIC	3	2	C	Transceiver 3 lost signal; check cabling.

Log Files

↓ Controller Event Log

Controller Event Log - Microsoft Internet Explorer provided by Compaq Computer Corporation

OK Get Log File Send Parse File... Page Help

Controller Events						
Date	Time	SWC ID	Evt No	CAC	EIP Type	Description
13-Nov-2001	10:49:26:335	9	3c	0	e	The Logical Disk identified in the handle field was deleted. Corrective action: No action necessary. Download more details
13-Nov-2001	10:49:24:595	9	40	0	e	The Storage System Host path identified in the handle field was deleted. Corrective action: No action necessary. Download more details
13-Nov-2001	10:49:24:487	9	3b	0	e	The Derived Unit identified in the handle field was deleted. Corrective action: No action necessary. Download more details
13-Nov-2001	10:49:24:428	9	3f	0	e	The Presented Unit identified in the handle field was deleted. Corrective action: No action necessary. Download more details
13-Nov-2001	10:47:57:584	9	c	0	5	The Snapclone Logical Disk identified in the handle field has completed the unsharing operation. Corrective action: No action necessary. Download more details

Log Files

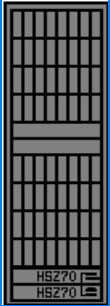
↓ Controller Termination Event Log

Controller Termination Event Log - Microsoft Internet Explorer provided by Compaq Computer Corporation

OK Get Log File Send Parse File... Page Help

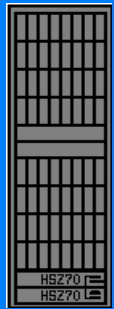
Termination Events—Controller						
Date	Time	SWC ID	Evt No	CAC	Code Flag	Description
6-Nov-2001	14:35:34:814	4	24	9	01100000	Power failed. Corrective action: Determine power failure cause and take appropriate action to ensure power is maintained. Download more details
6-Nov-2001	14:30:00:578	4	24	9	01100000	Power failed. Corrective action: Determine power failure cause and take appropriate action to ensure power is maintained. Download more details
6-Nov-2001	13:36:39:259	4	24	9	01100000	Power failed. Corrective action: Determine power failure cause and take appropriate action to ensure power is maintained. Download more details
2-Nov-2001	15:19:17:884	3	66	0	01100000	This HSV110 was requested to terminate operation and then power off. Corrective action: No action necessary. Download more details
1-Nov-2001	12:12:45:966	4	24	9	01100000	Power failed. Corrective action: Determine power failure cause and take appropriate action to ensure power is maintained. Download more details

Enterprise System Behavior



- ↓ Unconfigured (un-initialized)
HSV110 will not enable Host Ports
until the WWN is configured with
the OCP
 - LEDs adjacent to FP1 and FP2
are initially off
 - ◆ Green when enabled
 - ◆ Link symbol LED on HSV110 front
panel
- ↓ Check port LEDs on:
 - FC-Switches → Green
 - Rear of HSV110 → Green
- ↓ If Host Ports (FP1, FP2) are off,
no communication path





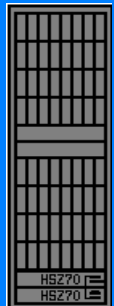
EMU error code

➤ Current Errors

- ↓ Audible—beeping
- ↓ Code available on EMU display
- ↓ 3 part error code xx-xx-xx
- ↓ May have multiple errors available

➤ Error log

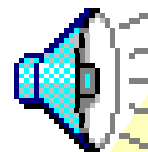
- ↓ Available through HSV Element Manager event page
- ↓ 62 entries per EMU (enclosure)



Error Codes—Audible Beeps

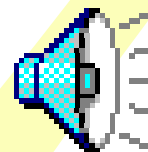
↓ Loss of power to HSV110 controller ----
--

- EMU code



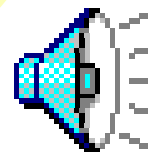
↓ Loss of power to one side of the PDU--
--

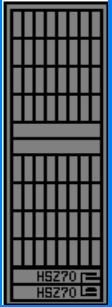
- EMU code



↓ Unplugged hard drive-----

- EMU code





Audible Alarm Sound Patterns

- ↓ Most severe alarm controls the alarm pattern
- ↓ Sounds until errors are cleared

Condition Type	Cycle 1						Cycle 2					
Unrecoverable	Alarm On	Alarm On	Alarm On	Alarm On	Alarm On	Alarm On	Alarm On	Alarm On	Alarm On	Alarm On	Alarm On	Alarm On
Critical	Alarm On	Alarm Off	Alarm On	Alarm Off	Alarm On	Alarm Off	Alarm On	Alarm Off	Alarm On	Alarm Off	Alarm On	Alarm Off
Non critical	Alarm On	Alarm Off	Alarm On	Alarm Off	Alarm Off	Alarm Off	Alarm On	Alarm Off	Alarm On	Alarm Off	Alarm Off	Alarm Off
Information	Alarm On	Alarm Off	Alarm Off	Alarm Off	Alarm Off	Alarm Off	Alarm On	Alarm Off	Alarm Off	Alarm Off	Alarm Off	Alarm Off

Legend

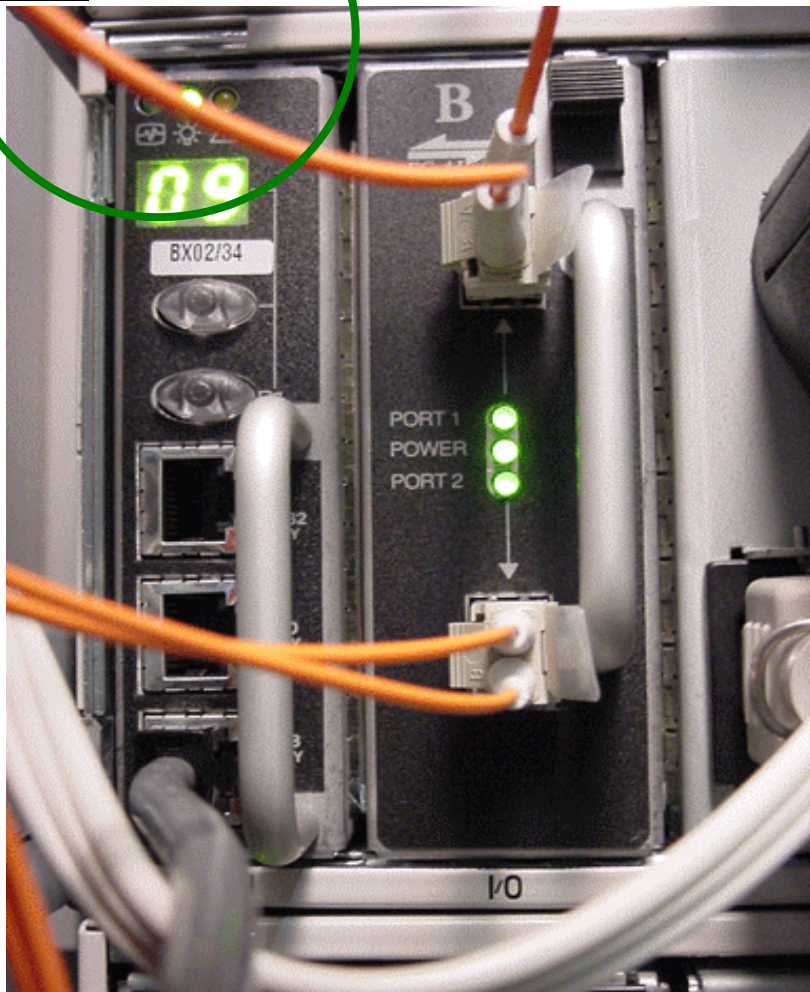


Alarm On



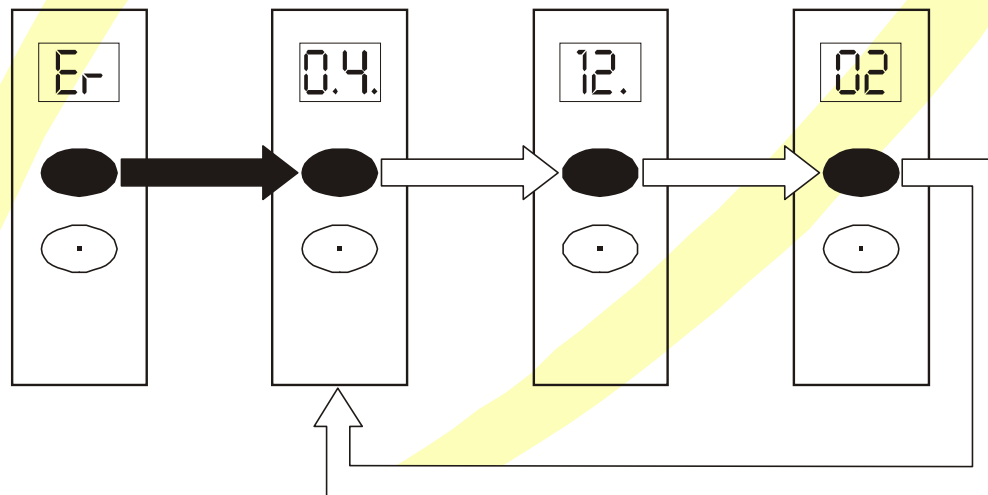
Alarm Off

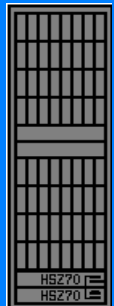
EMU error code



EMU error code

- Current error code collection
 1. Press and hold top button (~2 seconds)
 2. Record 2 digit number
 3. Press and release top button
 4. Record second 2 digit number
 5. Press and release top button
 6. Record third 2 digit number
- Repeat if error light still lit—Multiple errors





Audit / Event Logs

➤ Management Event Log:

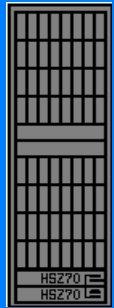
- ↓ Contains events created by HSV Element Manager
- ↓ Used to report configuration changes
- ↓ Filterable based on category for viewing, SNMP forwarding and posting to NT event log of SAN Appliance
- ↓ Round robin buffer
 - 1000 entries per Storage Cell
 - Entry size: 512 bytes
- ↓ Timestamps based on SAN Appliance time
- ↓ Sometimes referred to as "Audit Log"



Audit / Event Logs

➤ Disk Shelf Event Log

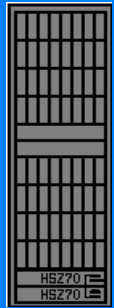
- ↓ Contains events created by the EMUs
- ↓ Used to report disk drive, EMU, power, and cooling problems
- ↓ Round robin mechanism per EMU
 - 62 entries per EMU
 - Entry size: 512 bytes
- ↓ No filtering capability for SNMP forwarding or posting in NT event log of SAN Appliance
- ↓ SMART advisories (drives which are about to fail)
- ↓ Timestamps on events are elapsed since EMU startup



Audit / Event Logs

➤ System Event Log

- ↓ Contains events created by HSV controllers
- ↓ Used to report Storage Cell state changes
 - Configuration changes
 - Storage Cell state changes
 - Software detected Inconsistencies
- ↓ Round robin buffer of 2MB
 - No fixed entry size, so variable number of event
- ↓ Filterable on importance level and category for forwarding to SNMP and posting in NT event log of SAN Appliance
- ↓ Timestamps based on HSV controller time



Audit / Event Logs

➤ Termination Event Log

- ↓ Used to record HSV shutdown messages
 - Fatal errors (so firmware problems)
 - Graceful shutdowns
- ↓ Controlled by the HSV controllers
- ↓ Controller crash event logs
- ↓ No crash dump (separate file)
- ↓ Timestamps based on HSV controller time.
- ↓ No forwarding capability to SNMP or posting into NT event log of SAN Appliance
- ↓ Round robin buffer
 - 32 entries
 - Entry size: 10KB



Audit / Event Logs

➤ Management Logical Disk (MLD)

- ↓ Acts as database for HSV Element Manager
- ↓ Created on Storage Cell to save controller state
- ↓ Includes any Storage Cell centric data from HSV Element Manager
- ↓ File is always current, and mirrored
- ↓ MLD is striped across the metadata part of all Disk Groups
- ↓ Logs are read at the moment this is requested via the Web browser

View Events

The screenshot displays the HSV Storage Network management interface. On the left is a tree view showing the hierarchy: HSV Storage Network > NCC1701 > Virtual Disks, Hosts, Disk Groups, and Hardware. The main window has a menu bar with buttons: Save Changes, Options..., View Events... (circled in yellow), Uninitialize, Code Load..., and Page Help. Below the menu bar is a 'Get Config File' button. The central area shows the 'Initialized Storage System Properties' for NCC1701. A yellow arrow points from the 'View Events...' button to the 'View Events' dialog box at the bottom.

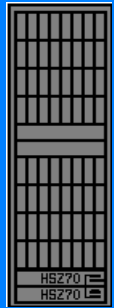
Initialized Storage System Properties

Name:	NCC1701
Operational State:	Initialized - Good
Total storage space:	364.75 GB
Storage space used:	255.34 GB
Available storage space:	109.41 GB
Device addition policy:	Manual
Disk replacement delay:	1 mins
Console LUN ID:	100
Controller time:	02 Feb 1900 17:31:57
Comments:	

View Events

- [View](#) Management Agent Event Log
- [View](#) Disk Shelf Event Log
- [View](#) Controller Event Log
- [View](#) Controller Termination Event Log

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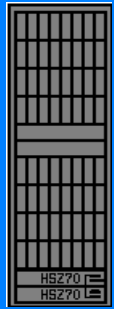
Event Data and Collection

- The HSV controllers have 2 Event Logs:
 - ↓ Termination events
 - ↓ Spontaneous events (all controller events that are not termination events) that occur within the Storage Cell
- The termination events are stored in NVRAM in each controller AND on a logical disk in the storage cell



Event Data and Collection

- Be careful on time stamps
 - ↓ HSV controller time may be different than server time, which may be different than SAN Appliance time
 - ↓ More difficult to correlate different product timestamps
- Disk shelf logs do not contain timestamps, but "elapsed time as of last [EMU !!] reboot"



HSV Element Manager Events

- The Parse file is released with VCS build
 - ↓ Contains bit-to-text translation of VCS codes
 - ↓ HSV110_event_nxxxxxxxxx_xxxxxx.txt

HSV Element Manager Events

- Click on cell, select options in title bar
 - ↓ Event notification: System options
 - Select which events are sent as traps
 - ↓ Event notification: Host options
 - Add the host to receive the SNMP trap of events
 - Need MIB to decode

OK Modify List... Get List File Page Help

Set Event Host Options

The Host Notification List displays the hosts you have configured to receive event notifications directly via the network. You can modify the list directly by clicking the **Modify List** button. You can also get a file representing the list by clicking the **Get List File** button. After editing the file, you can replace the list by sending it back to the server, as described below.

Host Notification List	
Host Name	Notify Port
128.100.100.86:2301	SNMP

To replace the host notification list:
You can replace the host notification list above by sending a properly formatted host notification file to the server. Enter the complete file path or browse to the host notification file of your choice and click the **Send List File** button to send the file.

Browse... Send List File

Management Event Log

- OK
- View Events**
- View** Management Agent Event Log
 - View** Disk Shelf Event Log
 - View** Controller Event Log
 - View** Controller Termination Event Log

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Management Agent Events						
	Date	Time	Server	Code	Alarm	Description
✓	9-Jul-2001	16:41:06	SWMAN1K 215	2052	No	Object modification for Disk Shelf - Complete
✓	9-Jul-2001	16:40:49	SWMAN1K 215	2052	No	Object modification for Disk Shelf - Complete
✓	7-Jul-2001	00:24:14	SWMAN1K 215	1014	No	The state of an object in the system has changed. View adjacent events for more detail.
✓	7-Jul-2001	00:22:31	SWMAN1K 215	2042	No	Virtual Disk Copy of VD Data Disk1/ACTIVE - Completed
✓	6-Jul-2001	23:46:34	SWMAN1K 215	2041	No	Virtual Disk Snapshot of VD - Completed
✓	6-Jul-2001	23:13:58	SWMAN1K 215	1014	No	The state of an object in the system has changed. View adjacent events for more detail.
✓	6-Jul-2001	23:13:58	SWMAN1K 215	1014	No	The state of an object in the system has changed. View adjacent events for more detail.
✓	6-Jul-2001	23:13:43	SWMAN1K 215	2023	No	Virtual Disk: Temp2 - Created
✓	6-Jul-2001	23:11:08	SWMAN1K 215	2023	No	Virtual Disk: Temp1 - Created
✓	6-Jul-2001	23:10:07	SWMAN1K 215	1014	No	The state of an object in the system has changed. View adjacent events for more detail.
✓	6-Jul-2001	23:09:35	SWMAN1K 215	2023	No	Virtual Disk: Log Disk - Created
✓	6-Jul-2001	23:08:21	SWMAN1K 215	1014	No	The state of an object in the system has changed. View adjacent events for more detail.
✓	6-Jul-2001	23:08:19	SWMAN1K 215	2023	No	Virtual Disk: Message Store - Created
✓	6-Jul-2001	23:06:01	SWMAN1K 215	2026	No	8.7.16.1610942644.65713.77824.65536E~n~d170907102000002085d465370000000000000000E~n~d
✓	6-Jul-2001	23:06:01	SWMAN1K 215	2034	No	Change Device Usage Complete
✓	6-Jul-2001	23:05:56	SWMAN1K 215	2034	No	Change Device Usage Complete
✓	6-Jul-2001	23:05:54	SWMAN1K 215	2034	No	Change Device Usage Complete
✓	6-Jul-2001	23:05:51	SWMAN1K 215	2034	No	Change Device Usage Complete
✓	6-Jul-2001	23:05:49	SWMAN1K 215	2034	No	Change Device Usage Complete

Filtering Management Events

SWMAN1K215: Filter Events - Microsoft Internet Explorer provided by Compaq Computer Corporation

View Events Cancel Page Help

Filter Events

You can change the way your event log is displayed using the filter parameters below. To filter your event log, change any parameter's default value to the value of your choice. To refine your event display, you may use as many filter parameters as you wish. To display the filtered log, click the **View Events** button.

Filter by date	Filter by time
<input checked="" type="radio"/> Show events occurring on all dates	<input checked="" type="radio"/> Show events occurring at all times
<input type="radio"/> Show only events occurring:	<input type="radio"/> Show only events occurring:
from <input type="text"/> / <input type="text"/> / <input type="text"/>	from <input type="text"/> : <input type="text"/>
to <input type="text"/> / <input type="text"/> / <input type="text"/>	to <input type="text"/> : <input type="text"/>
(mm/dd/yyyy)	(hh:mm, 24-hr format)

Filter by severity	Filter by event code
Show only events with severity code:	Show only events with event code:
All <input type="button" value="v"/>	All <input type="text"/> (Enter 4/5-digit number)

Filter by status	Filter by server
Show only events with an alarm status of	Show only events occurring at server:
All <input type="button" value="v"/>	All <input type="text"/> (Enter server name)

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Disk Shelf Event Log



OK

View Events

View

Management Agent Event Log

View

Disk Shelf Event Log

View

Controller Event Log

View

Controller Termination Event Log

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- In sequence within the shelf
- Shelves are in random order

OK

Get Log File

Page Help

Disk Enclosure Events

Encl ID	Elapsed Time	Elmnt Type	Elmnt No	Error Code	Severity	Description
10	15d 08:10:21	Pwr Supply	1	1	N	Power supply 1 no AC input; check AC power to the supply.
10	7d 03:25:18	GBIC	4	2	C	Transceiver 4 lost signal; check cabling.
10	7d 03:25:04	GBIC	4	2	C	Transceiver 4 lost signal; check cabling.
10	7d 03:24:31	GBIC	4	2	C	Transceiver 4 lost signal; check cabling.
10	7d 03:24:15	GBIC	4	2	C	Transceiver 4 lost signal; check cabling.
10	7d 03:23:18	GBIC	4	2	C	Transceiver 4 lost signal; check cabling.
10	7d 03:23:10	GBIC	4	2	C	Transceiver 4 lost signal; check cabling.
10	7d 03:20:12	GBIC	4	2	C	Transceiver 4 lost signal; check cabling.
10	7d 03:20:07	Pwr Supply	2	1	N	Power supply 2 no AC input; check AC power to the supply.
10	3d 00:24:20	GBIC	3	2	C	Transceiver 3 lost signal; check cabling.
10	3d 00:24:20	GBIC	1	2	C	Transceiver 1 lost signal; check cabling.
10	3d 00:24:18	GBIC	4	2	C	Transceiver 4 lost signal; check cabling.
10	2d 22:15:53	GBIC	3	2	C	Transceiver 3 lost signal; check cabling.
10	2d 22:15:53	GBIC	1	2	C	Transceiver 1 lost signal; check cabling.
10	2d 22:09:39	GBIC	2	2	C	Transceiver 2 lost signal; check cabling.
10	2d 21:37:33	GBIC	2	2	C	Transceiver 2 lost signal; check cabling.
10	2d 21:34:54	GBIC	2	2	C	Transceiver 2 lost signal; check cabling.
10	2d 18:16:37	Pwr Supply	2	1	N	Power supply 2 no AC input; check AC power to the supply.
10	2d 16:40:15	Temp Sensor	2	1	N	Temperature sensor 2 high temp alert; check for empty bay or air temperature.
10	2d 15:10:03	Temp Sensor	3	1	N	Temperature sensor 3 high temp alert; check for empty bay or air temperature.
10	2d 13:54:10	Blower	1	3	U	Fan 1 failure; replace fan now.
10	2d 13:52:17	Blower	1	3	U	Fan 1 failure; replace fan now.
10	2d 13:47:55	Blower	1	3	U	Fan 1 failure; replace fan now.
10	2d 13:47:40	Blower	1	3	U	Fan 1 failure; replace fan now.
10	2d 13:44:04	Blower	1	3	U	Fan 1 failure; replace fan now.
10	2d 13:42:34	Blower	1	3	U	Fan 1 failure; replace fan now.

Controller Event Log



OK

Get Log File

Send Parse File...

Page Help

OK

View Events

View

Management Agent Event Log

View

Disk Shelf Event Log

View

Controller Event Log

View

Controller Termination Event Log

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090C0005:

The Snapclone logical disk is done with the unsharing operation. The handle field contains the associated Logical Disk handle.

0937000E:

The Presented Unit object was created. The handle field contains the created Presented Unit handle. The add_handle field contains the associated DU handle.

System Events—

Date	Time	SWC ID	Evt No	CAC	EIP Type	Description
30-Mar-2001	2:20:59:605	9	c	0	5	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
30-Mar-2001	2:10:49:813	9	37	0	e	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
30-Mar-2001	2:10:49:295	9	6e	0	f	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
30-Mar-2001	2:10:49:247	9	33	0	e	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
30-Mar-2001	2:10:49:106	9	6a	0	f	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
30-Mar-2001	2:10:49:33	9	6b	0	f	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
30-Mar-2001	1:51:30:376	9	37	0	e	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
30-Mar-2001	1:51:29:620	9	6e	0	f	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
30-Mar-2001	1:51:29:572	9	33	0	e	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details

Controller Termination Event Log



OK Get Log File Send Parse File...

Page Help

OK

View Events

View Management Agent Event Log

View Disk Shelf Event Log

View Controller Event Log

View Controller Termination Event Log

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04240960:
Power failure

011F01A0:
Console requested restart
without dump (coupled).

03010104:
Logic inconsistency detected;
one controller is suspect

0408039F:
A last gasp message was
received from the other NSC
with the coupled crash flag set.

Termination Events—Controller

Date	Time	SWC ID	Evt No	CAC	Code Flag	Description
29-Mar-2001	18:36:43:913	4	24	9	01100000	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
29-Mar-2001	17:38:42:361	4	24	9	01100000	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
28-Mar-2001	18:26:3:171	1	1f	1	10100000	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
27-Mar-2001	20:32:42:461	4	24	9	01100000	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
27-Mar-2001	18:41:35:704	4	24	9	01100000	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
27-Mar-2001	18:37:46:919	4	24	9	01100000	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
26-Mar-2001	23:8:45:428	3	1	1	00000100	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
23-Mar-2001	17:33:42:376	4	24	9	01100000	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details
22-Mar-2001	0:50:0:682	4	8	3	10011111	Description Unavailable - need file: HSV100_event_D010317_0001.txt Download more details



NT Event Log—HSV Element Manager Detail

Event Detail

Date: 6/19/2001 Event ID: 60000
Time: 9:35:24 AM Source: HSV
User: N/A Type: Information
Computer: PROWLER2 Category: HSV EMU

Description:

[-Moongazer Emu Event-]

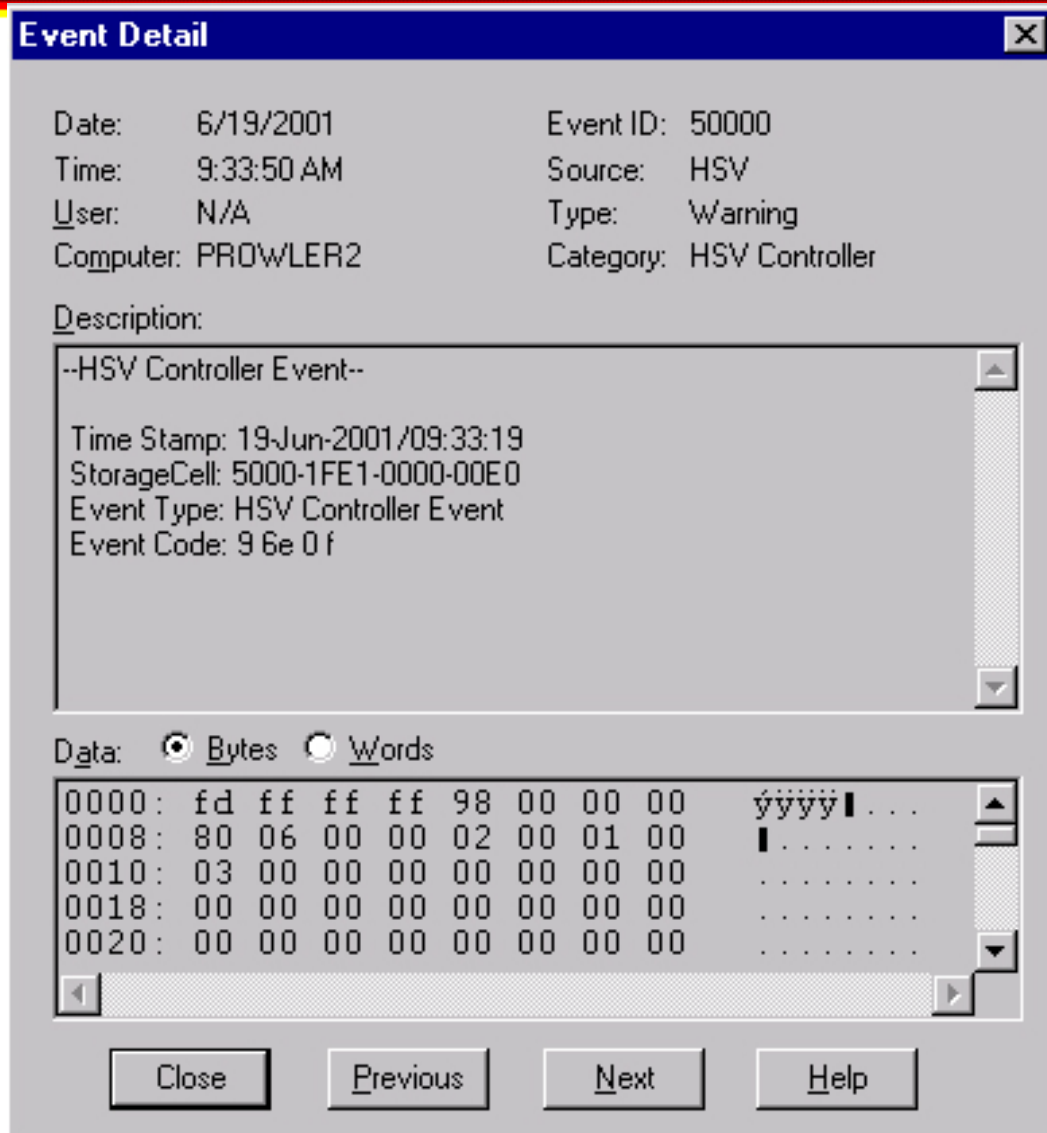
Time Stamp: 6/19/2001 09:35:24
StorageCell: 5000-1FE1-0000-00E0
Event Desc: ShelfId: 3 elemType: 2 elemNum: 2 code: 1 : Power supply 2 no AC input; check AC power to the supply.
Shelf: 3

Data: ☒ Bytes ☐ Words

0000:	fd	ff	ff	ff	98	00	00	00	yyy	...
0008:	98	00	00	00	02	00	01	00	...	
0010:	03	00	00	00	00	00	00	00	...	
0018:	00	00	00	00	00	00	00	00	...	
0020:	00	00	00	00	00	00	00	00	...	

Close Previous Next Help

NT Event Log—Controller Detail



The image shows a screenshot of the 'Event Detail' window from the Windows NT Event Viewer. The window has a blue title bar with the text 'Event Detail' and a close button. The main content area is divided into two columns for event metadata and a larger section for the description. The metadata includes Date (6/19/2001), Time (9:33:50 AM), User (N/A), Computer (PROWLER2), Event ID (50000), Source (HSV), Type (Warning), and Category (HSV Controller). The description section is titled 'Description:' and contains a text box with the following text: '--HSV Controller Event--', 'Time Stamp: 19-Jun-2001/09:33:19', 'StorageCell: 5000-1FE1-0000-00E0', 'Event Type: HSV Controller Event', and 'Event Code: 9 6e 0 f'. Below the description is a 'Data:' section with radio buttons for 'Bytes' (selected) and 'Words'. It displays a hex dump of the event data, with addresses 0000 through 0020 and corresponding hexadecimal values. The right side of the hex dump shows the ASCII representation of the data, which includes 'yyyy' and several dots. At the bottom of the window are four buttons: 'Close', 'Previous', 'Next', and 'Help'.

Event Detail

Date: 6/19/2001 Event ID: 50000
Time: 9:33:50 AM Source: HSV
User: N/A Type: Warning
Computer: PROWLER2 Category: HSV Controller

Description:

--HSV Controller Event--

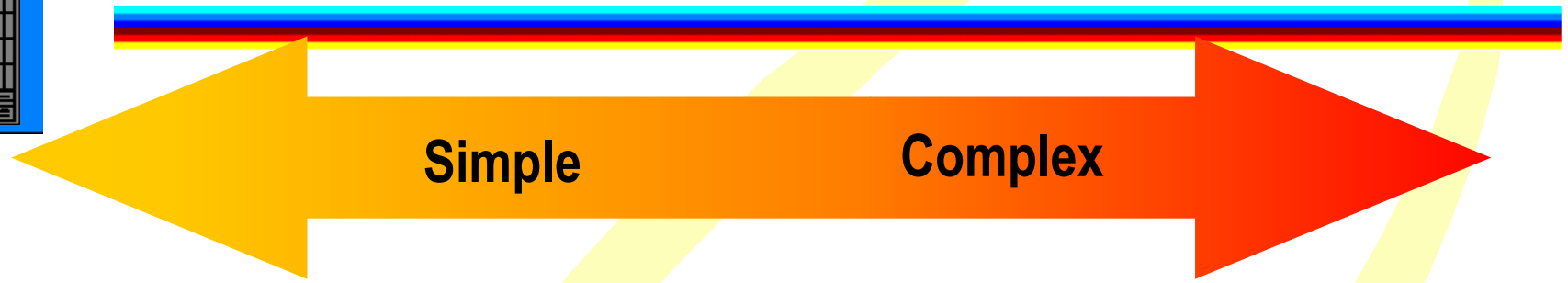
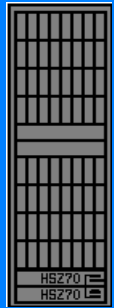
Time Stamp: 19-Jun-2001/09:33:19
StorageCell: 5000-1FE1-0000-00E0
Event Type: HSV Controller Event
Event Code: 9 6e 0 f

Data: ☒ Bytes ☐ Words

0000:	fd ff ff ff 98 00 00 00	yyyy ...
0008:	80 06 00 00 02 00 01 00	...
0010:	03 00 00 00 00 00 00 00
0018:	00 00 00 00 00 00 00 00
0020:	00 00 00 00 00 00 00 00

Close Previous Next Help

HSV—Errors



- ↓ Hardware failures
- ↓ Cable connectivity
- ↓ Versions of software/firmware
- ↓ Topology
- ↓ Cabling

- ↓ Intermittent
 - Drive connectivity
 - FC-AL LIPs
- ↓ Software incompatibility
- ↓ Zoning

HSV—Error Indication

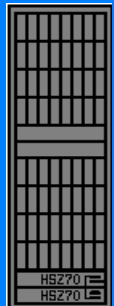


Simple

Complex

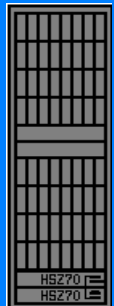
- ↓ LEDs
- ↓ Error Codes
- ↓ Audible
- ↓ Event logs

- ↓ None
- ↓ SWMA hangs
- ↓ No communication between SWMA and EVA
- ↓ Intermittent devices errors



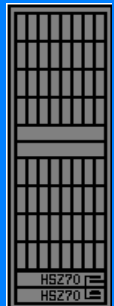
Best Practices

- ↓ Ensure drives are properly seated
 - Gently apply pressure with thumb
- ↓ Check all cabling
 - Fibre Channel
 - Power—PDUs, PDMs
 - CAN Bus
- ↓ Use dust covers on cables and transceivers
- ↓ Don't touch end of cables
- ↓ Use care when removing Fibre Channel Cables—fragile



Symptom—No Enterprise in HSV Element Manager

- ↓ Installation check list
- ↓ Fabric connectivity
 - Check Fabric Name Server table
 - Are devices logged in?
 - ◆ Check cabling
 - ◆ Check HSV110 LCD—alternating System Name and WWN
 - Did you activate the HSV110 Controller password?
 - ◆ Does the password match with HSV Element Manager?
 - ◆ Default system password: **AAAAAAAAA**
- ↓ HSV Element Manager (EM) is installed but not visible
 - HSV EM has stopped
 - ◆ Check Appliance Manager → Services
 - Check required software and firmware
 - ◆ For example, SAN switch firmware v2.1.9m



Symptom—No Enterprise in HSV Element Manager

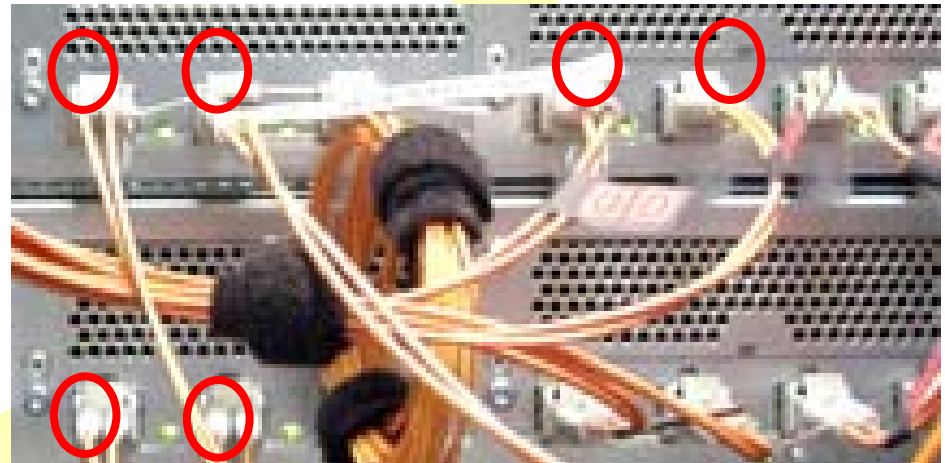
- ↓ Device port (1A, 1B, 2A, 2B) Loop errors
 - Unstable system
 - Intermittent to no communication
 - Troubleshooting is challenging
- ↓ Need to reduce the bus configuration to isolate the failing component
 - Requires re-cabling/bus isolation
 - ◆ Risk to customer data—backup
 - ◆ Understanding flow of data
 - ◆ Disk Enclosure (5214)
 - ❖ Data **IN** → I/O module **top** (or **bottom**) port → bay 1 → bay 2..→ bay 14 → **OUT** I/O module **bottom** (or **top**) port
 - ◆ Bypass circuit:
 - ❖ Drive present—signal connected to drive
 - ❖ Empty bay—into bypass circuit to next bay
 - ◆ Disk errors logged in the Controller Event Log

Error Indication—Controller LEDs

- ↙ Fault
- ↙ Host Link
- ↙ Controller Heartbeat
- ↙ Cache Battery Assembly

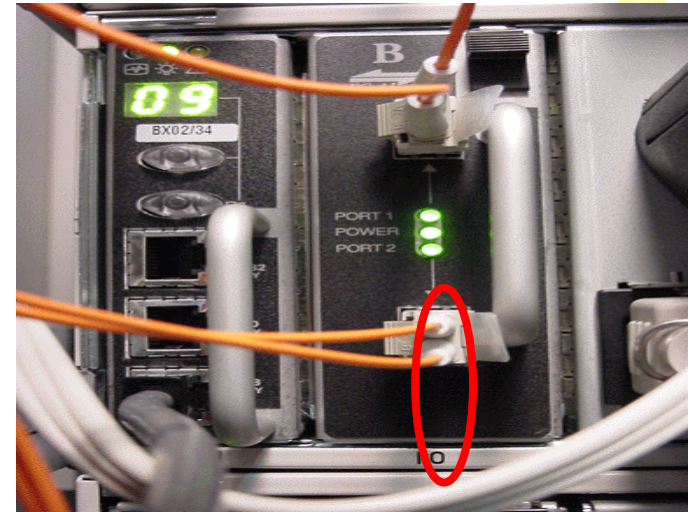


- ↙ Fabric Ports
- ↙ Mirror Port
- ↙ Device Ports



Error Indication—Enclosure I/O Module LEDs

- ↓ Top port status
- ↓ I/O Module power
- ↓ Bottom port status
- ↓ **Flashing Port** → data transfer
- ↓ Port Status → **Off** when:
 - Bad frames detected
 - Bad connection/cabling
 - No light from I/O module "upstream"
 - HSV110 Controller disabled device port as a result of too many errors
 - ◆ 10 minute timer before re-enabling
 - ◆ Wait for at least 11minutes to diagnose
 - Cable may be lit from both controllers
 - Remove cable from top controller → check ports → re-install and wait 10 minutes → remove cable from bottom controller → check ports



Error Indication—Drive LEDs

- ↓ Lit (Activity LED) indicates drive idle
- ↓ Flashing indicates activity
- ↓ When a drive is inserted:
 - Spin up and enable ports
 - LIP will occur (FC-AL)
- ↓ LIP will cause all drives on loop pair to flash the Activity LED
- ↓ All drives flashing Activity LED ~every 30 seconds may indicate system has detected problem
- ↓ LIPs to establish loop stability

