Proactive Fault Management:
EMS Hardware Monitors

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EMS Hardware Monitors

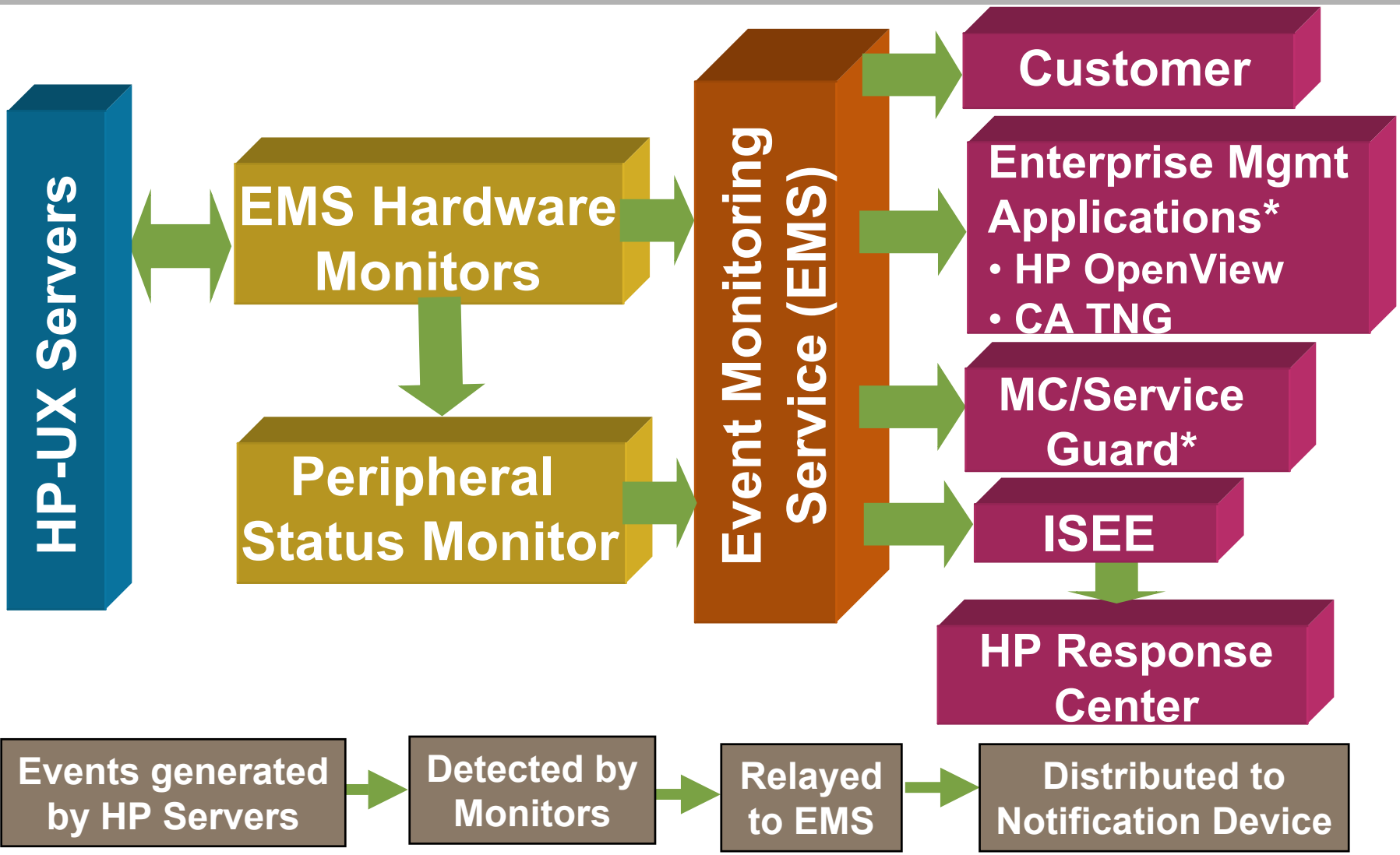
Introduction

- Hardware Monitoring Overview
- Hardware Monitoring Process
- Benefits of Hardware Monitoring
- Products Supported by Hardware Monitoring
- Available EMS Hardware Monitors

Hardware Monitoring Overview

- Hardware monitoring is part of the proactive fault management solution that gives you automatic fault detection, automatic fault isolation and automatic fault notification
- Standard package as part of HP-UX to provide a high level of protection against system hardware failures that could interrupt system operation or cause data loss
- Process of watching hardware resources for the occurrence of any unusual activity and reports the event to you using a variety of notification methods
- Integrates easily with other management applications such as MC/ServiceGuard and HP OpenView

Hardware Monitoring Process



Benefits of Hardware Monitoring

- Reduce system downtime
- Reduce time to repair
- Default monitoring configuration
- Common tool for monitoring hardware resources
- Various notification methods
- Integrate with other applications
- Minimal maintenance

Products Supported by Hardware Monitoring

- System Hardware
- Disk Arrays
- Disk Products
- Tape Products
- High Availability Storage Systems
- Fibre Channel SCSI Multiplexers
- Fibre Channel Adapters
- Fibre Channel Arbitrated Loop Hubs
- Fibre Channel Switches
- Interface Cards

Available EMS Hardware Monitors (1 of 4)

EMS HW Monitor	Monitor Name	Responsible for monitoring
Chassis Code Monitor	dm_chassis	System chassis logs
Core Hardware Monitor	dm_core_hw* ia64_corehw^	Hardware in the System Processing Unit (SPU)
CPU Monitor	lpmc_em* cmc_em^	Processors
Memory Monitor	dm_memory* memory_ia64^	System memory
Kernel Resource Monitor	krmond	Variety of HP-UX resources
System Status Monitor	sysstat_em	System and Online Diagnostics up status

* = HP 9000 Servers ^ = HP Integrity Servers

Available EMS Hardware Monitors (2 of 4)

EMS HW Monitor	Monitor Name	Responsible for monitoring
AutoRAID Disk Array Monitor	armmon	AutoRAID Disk Arrays
High-Availability Disk Array Monitor	ha_disk_array	High-Availability Disk Arrays
Fast/Wide SCSI Disk Array Monitor	fw_disk_array	Fast/Wide SCSI Disk Arrays
Disk Array FC60 Monitor	fc60mon	HP StorageWork E Disk Array FC60
Disk Monitor	disk_em	Fixed disk drives
SCSI Tape Devices Monitor	dm_stape	SCSI tape devices

Available EMS Hardware Monitors (3 of 4)

EMS HW Monitor	Monitor Name	Responsible for monitoring
High-Availability Storage System Monitor	dm_ses_enclosure	SES Enclosure
Fibre Channel SCSI Multiplexer Monitor	dm_fc_scsi_mux	Fibre Channel SCSI Multiplexers
Fibre Channel Adapters Monitor	dm_FCMS_adapter	Fibre Channel Adapter Cards
A5158A Fibre Channel Adapter Monitor	dm_TL_adapter	A5158A, A6684A, A6685A, A6795A Fibre Channel Adapter Cards
Fibre Channel Arbitrated Loop Hub Monitor	dm_fc_hub	Fibre Channel Arbitrated Loop Hubs

Available EMS Hardware Monitors (4 of 4)

EMS HW Monitor	Monitor Name	Responsible for monitoring
Fibre Channel Switch Monitor	dm_fc_sw	Fibre Channel Switches
SCSI Card Monitor	scsi123_em	SCSI1, SCSI2, and SCSI3 interface cards
Remote Monitor	RemoteMonitor	Devices via a remote connection to the device's management software
UPS Monitor	ups_mond	Uninterruptible Power System (UPS) devices connected to a system through RS-232 cables

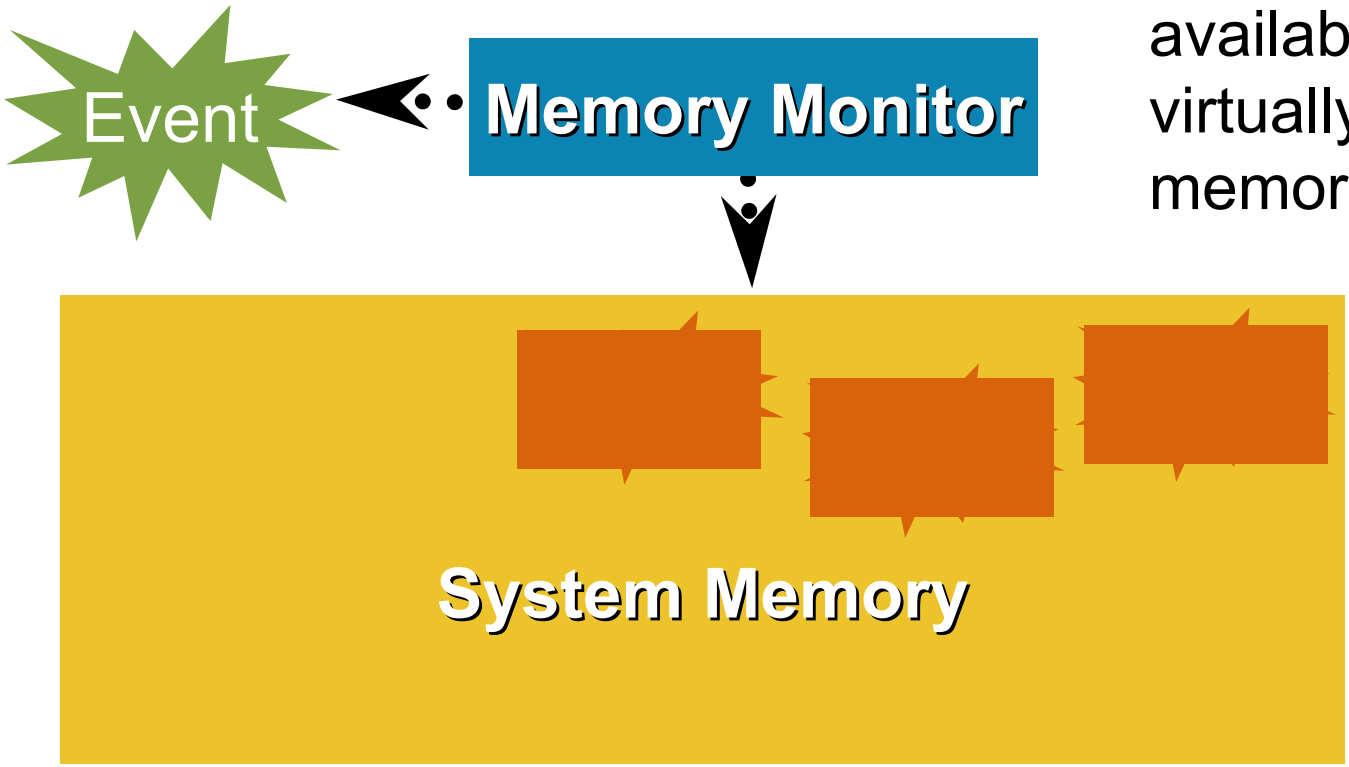
For more information, please visit:

www.docs.hp.com/hpux/diag/index.html

Example: Memory Monitor

Dynamic Memory Resilience

Monitors the rate of correctable errors in the system memory

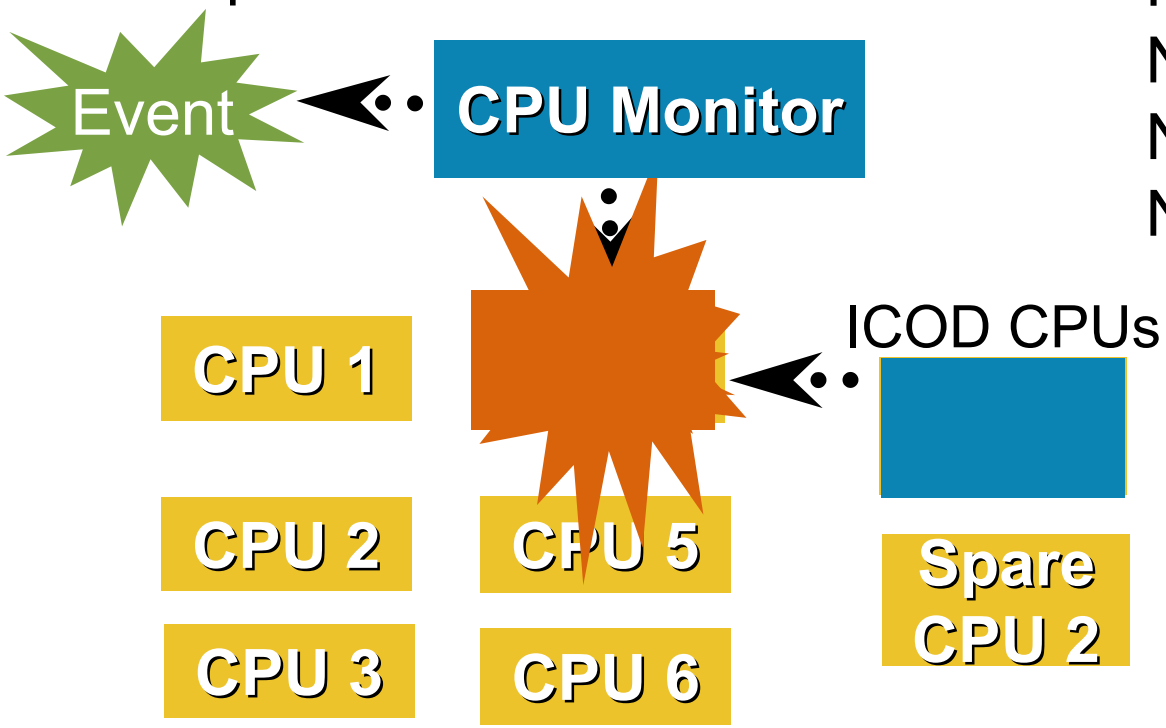


Improves system availability with virtually no visible memory loss to you!

Example: CPU Monitor

Dynamic Processor Resilience

Monitors the rate of correctable errors in each processor's on-board cache



HP proven technology

Provides:

No system crash

No performance loss

No resource loss

completely transparent to the end-users!

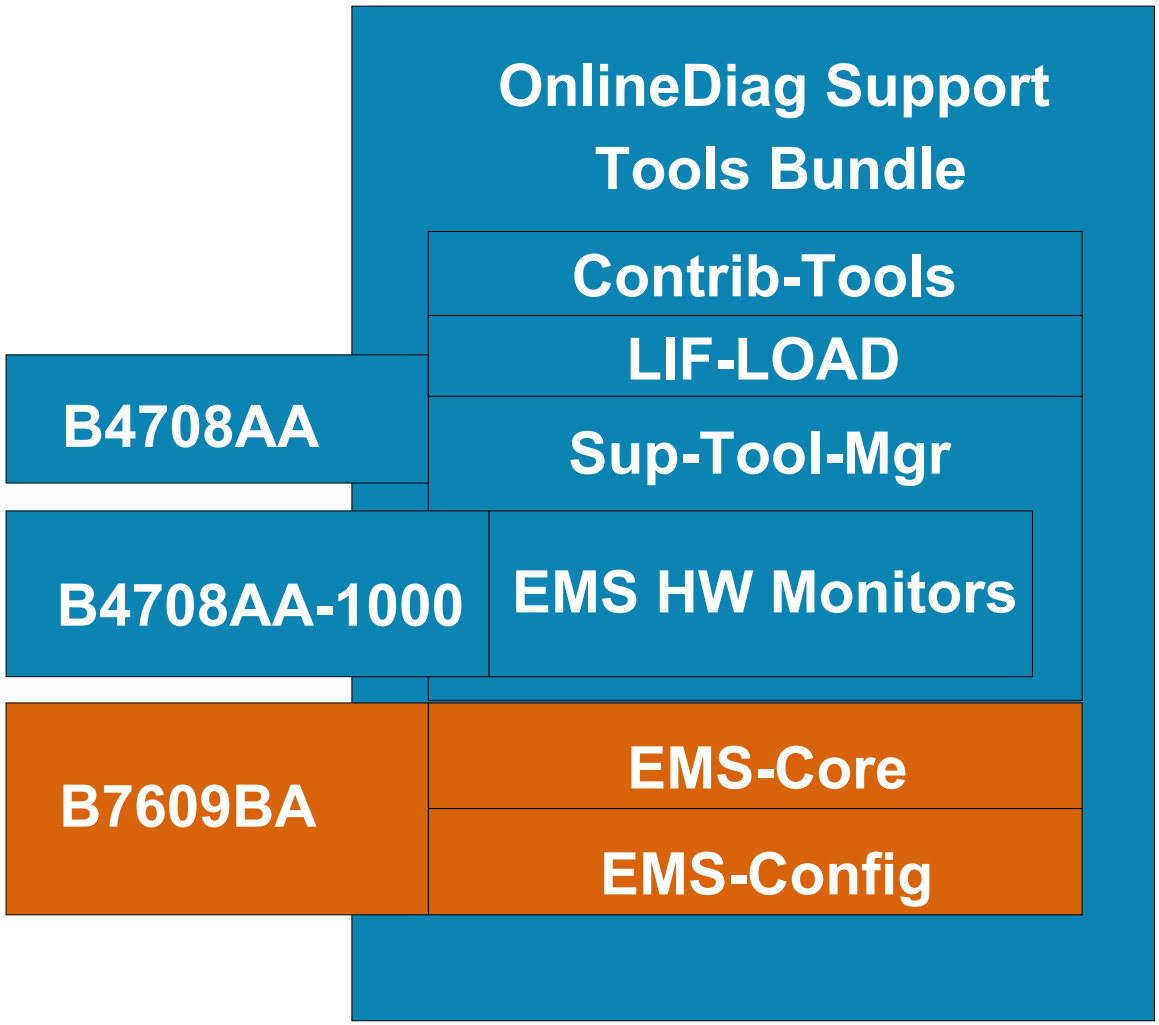
EMS Hardware Monitors

Installation

- Product Structure
- Installing EMS Hardware Monitors

Product Structure

S800
HP-UX 11.00
HP-UX 11.11
.....



Installing EMS Hardware Monitors

- By default, the Diagnostics and Support Tools are AUTOMATICALLY installed when you install the HP-UX operating system
- New versions of the Diagnostics and Support Tools are released
  - Incorporate improvements to the interface, tools, or functionality
  - Support new functionality or new hardware
- A copy of the OnlineDiag Software Depot can be obtained from:
  - Update Media (CD-ROM)
  - HP Software Depot (http://www.software.hp.com)

EMS Hardware Monitors

Usage and Operation

- Monitoring Request Overview
- Default Monitoring Requests
- Building a Monitoring Request
- Notification Methods
- Event Severity Levels
- Monitoring Request Manager

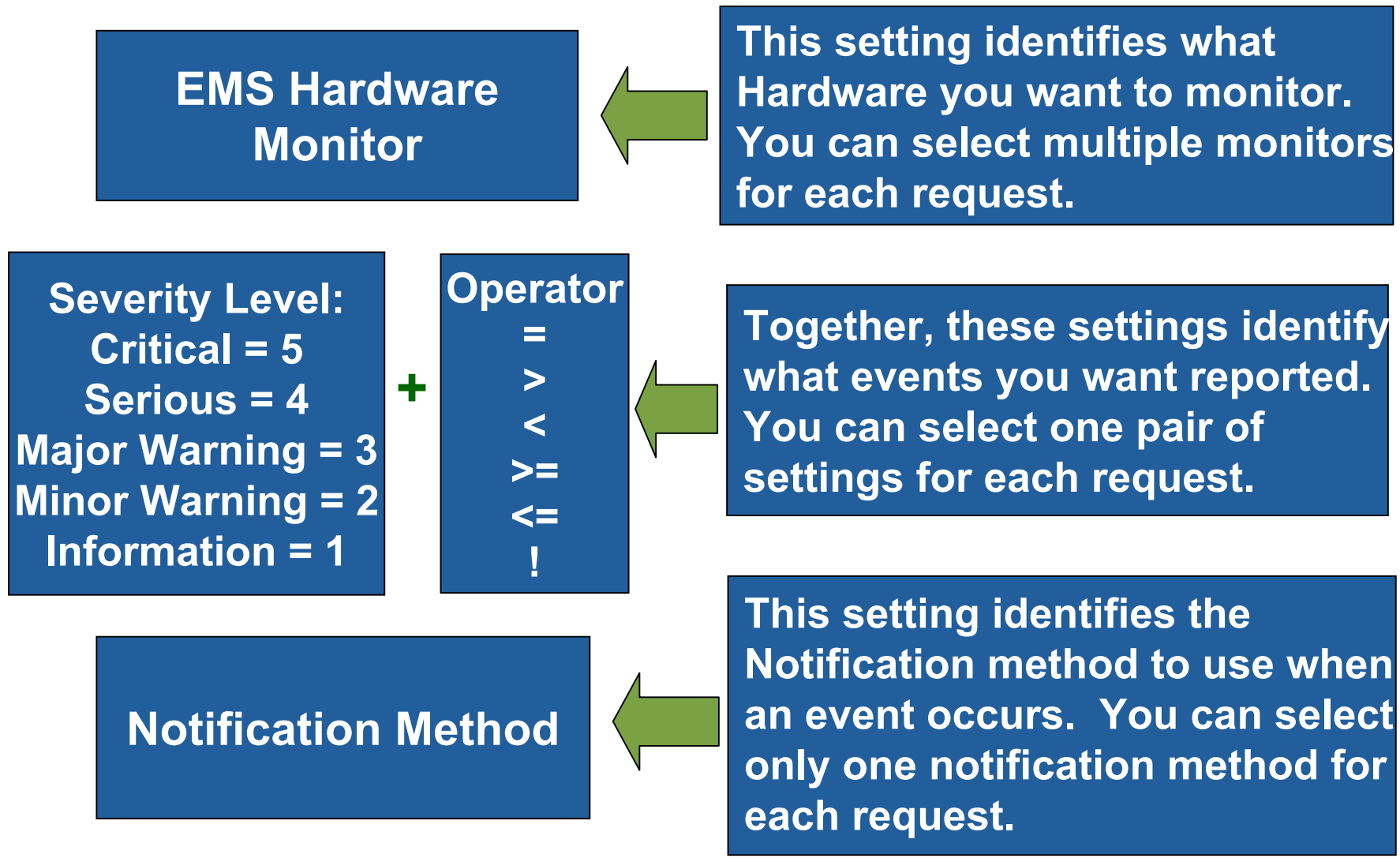
Monitoring Request Overview

- Used to implement your strategy for monitoring hardware resources
- Mechanism by which you mange how hardware event notification takes place
- Used to determine the following:
  - What events should be reported
  - What notification method should be used to report the events
- Monitoring Request Example:
  - Send events generated by all monitors with severity >= SERIOUS to EMAIL sysad@hp.com

Default Monitoring Requests

Severity Levels	Notification Methods
All (> = INFORMATION)	Text Log File: */var/opt/resmon/log/event.log*
Major Warning, Serious, Critical	SYSLOG: */var/adm/syslog/syslog.log*
Major Warning, Serious, Critical	EMAIL: *Root* email address

Building a Monitoring Request



Notification Methods

NOTIFICATION METHOD	NOTIFICATION TARGET
Write to syslog	*/var/adm/syslog/syslog.log*
Write to console	System console
Write to text log	User defined text log (default: */var/opt/resmon/log/event.log*)
Send via eMail	User defined eMail address (default: eMail root)
Send via TCP/UDP	User written socket program – host & port specified
Send via SNMP	Any application configured to receive SNMP msgs
Send OPC format	Templates provided for integration with HP OpenView IT/O

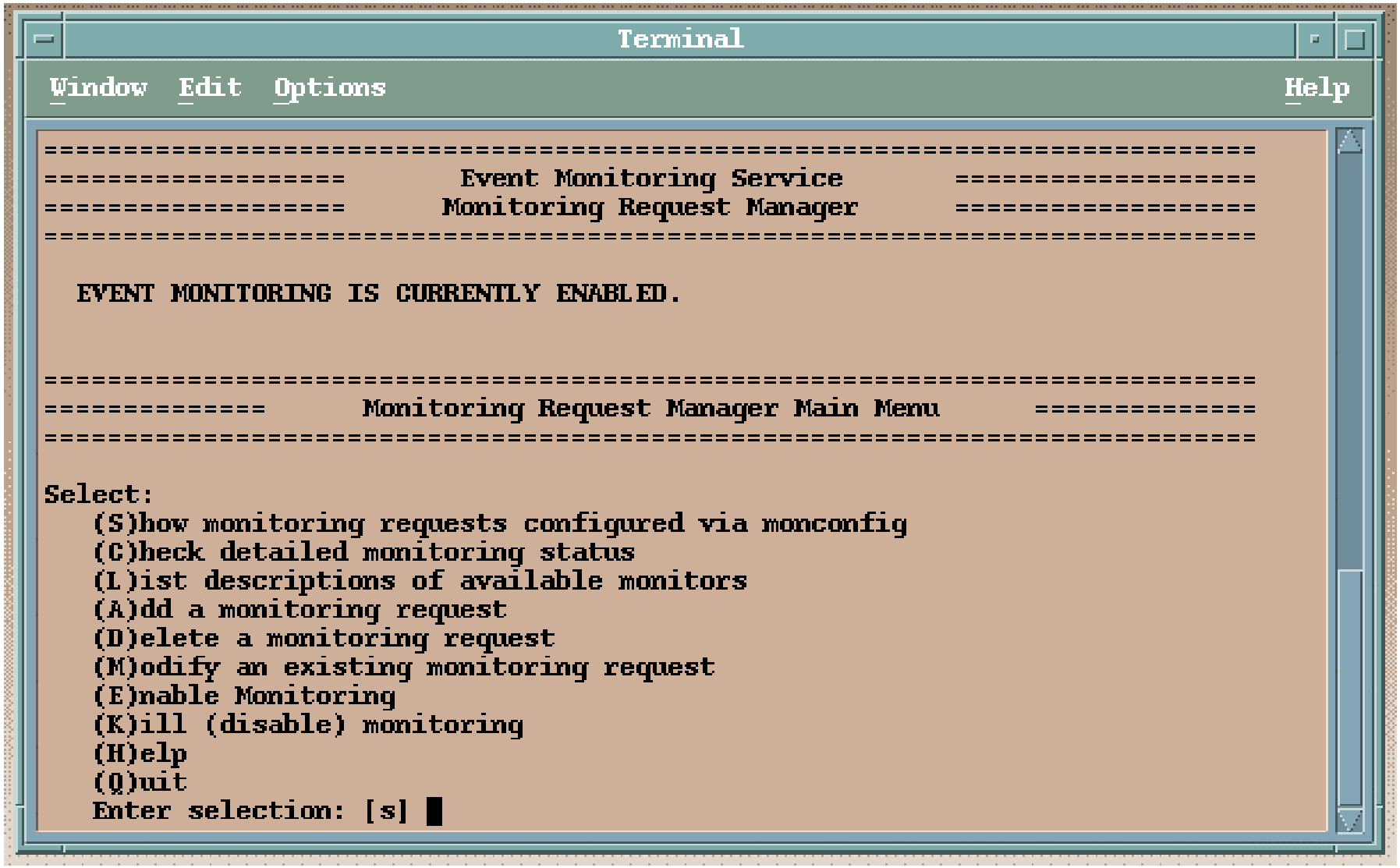
Event Severity Levels

Critical	An event that will or has already caused data loss, system down time, or other loss of service. System operation will be impacted and normal use of the HW should not continue until the problem is corrected. Immediate action is required to correct the problem.
Serious	An event that may cause data loss, system down time, or other loss of service if left uncorrected. System operation and normal use of the HW may be impacted. The problem should be repaired as soon as possible.
Major Warning	An event that could escalate to a Serious condition if not corrected. System operation should not be impacted and normal use of the HW can continue. The problem should be repaired at a convenient time.
Minor Warning	An event that will not likely escalate to a more severe condition if left uncorrected. System operation will not be interrupted and normal use of the hardware can continue. The problem can be repaired at a convenient time.
Information	An event that occurs as part of the normal operation of the hardware. No action is required.

Monitoring Request Manager

- A tool provided to you for creating and managing hardware monitoring requests
- To run the Monitoring Request Manager, you must be logged on as *root*
- Type */etc/opt/resmon/lbin/monconfig*

Monitoring Request Manager: Opening Screen



Monitoring Request Manager: Functions (1 of 3)

- Enable hardware event monitoring
  - Use the “(E)nable Monitoring” selection to enable hardware event monitoring if it is not already enabled
- List monitor description
  - Use the “(L)ist descriptions of available monitors” selection to list the descriptions of the available monitors and the hardware type each monitor supports
- View current monitoring requests
  - Use the “(S)how monitoring requests configured via monconfig” selection to view a list of all the current monitoring requests (both active and inactive)

Monitoring Request Manager: Functions (2 of 3)

- Add monitoring requests
  - Use the “(A)dd a monitoring request” selection to add a new monitoring request
- Modify monitoring requests
  - Use the “(M)odify an existing monitoring request” selection to alter one of the settings used in the monitoring request
- Check detailed monitoring status
  - Use the “(C)heck detailed monitoring status” selection to view a list of all the active monitoring requests

Monitoring Request Manager: Functions (3 of 3)

- Delete monitoring requests
  - Use the “(D)elete a monitoring request” selection to delete a monitoring request
  - USE WITH CAUTION: Only monitoring requests created exclusively for the hardware resource that has been removed from your system should be deleted
- Disable hardware event monitoring
  - Use the “(K)ill (disable) monitoring” selection to disable hardware event monitoring
  - USE WITH EXTREME CAUTION: While hardware event monitoring is disabled, your hardware resources are vulnerable to undetected failures

EMS Hardware Monitors

Detailed Picture of Hardware Monitoring

- Hardware Monitoring Components
- Event Detection Methods
- Peripheral Status Monitor (PSM)
- Monitor Configuration Files
- Event Messages

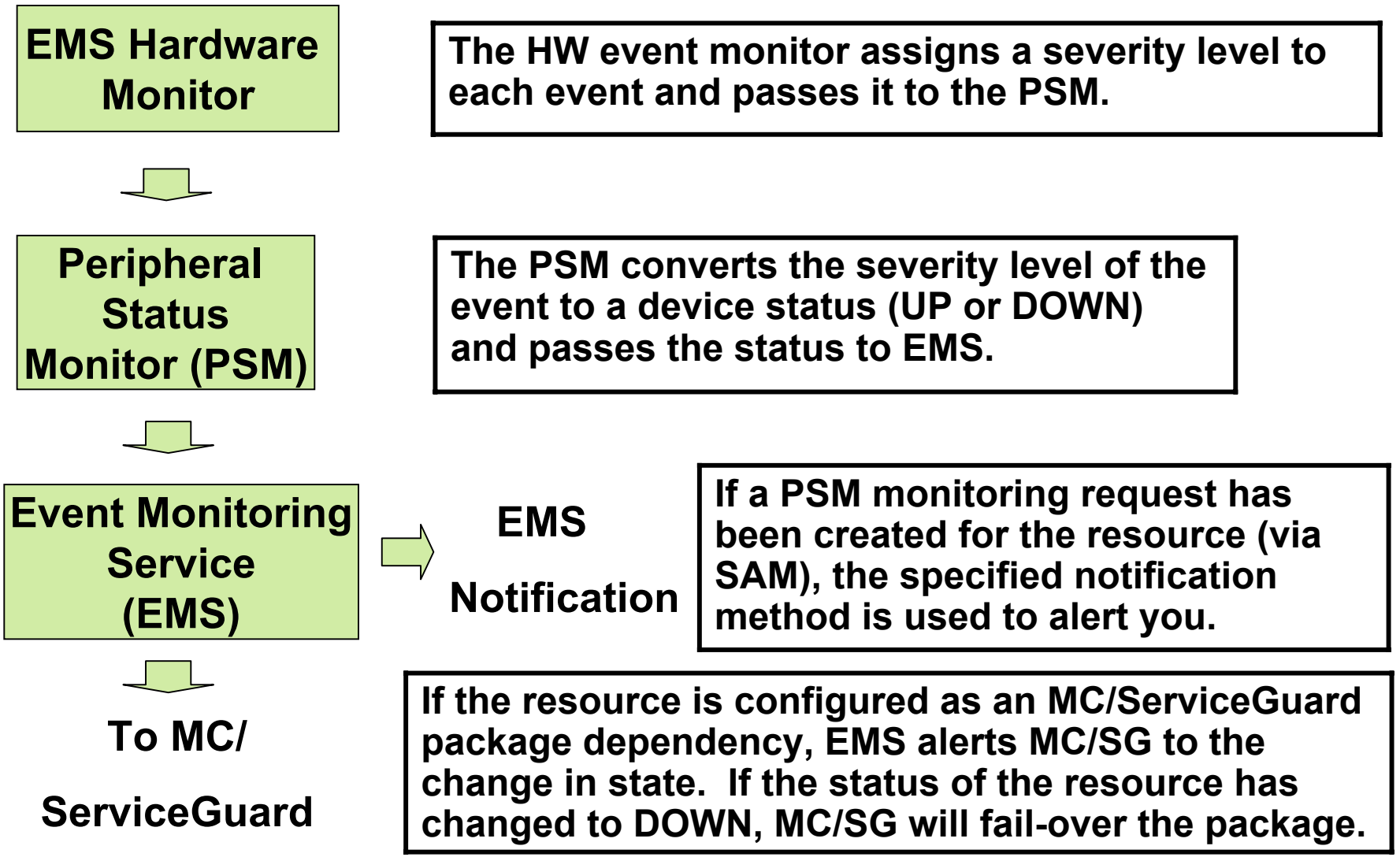
Hardware Monitoring Components

- Event Monitoring System (EMS):
  - The framework for event notification
- Hardware event monitoring components:
  - The EMS Hardware Monitors
  - The associated configuration files
  - The Monitoring Request Manager
- Support Tools Manager (STM):
  - The low-level handling components that are also used for recording and viewing system errors
  - The map used by the EMS Hardware Monitors to determine which devices they should be watching

Event Detection Methods

- Two event detection methods and a monitor may use one or both of the methods to detect events
- Polling Method
  - Checks the status of its hardware resources at regular intervals for any unusual condition reported by the hardware
  - Polling interval is selected to provide reasonable detection without impacting system performance
- Asynchronous Method
  - Allows a monitor to detect an event when it occurs to allow immediate notification and response to a critical situation

Peripheral Status Monitor



Monitor Configuration Files (1 of 2)

- Several configuration files are used to control the operation of each EMS Hardware Monitor
  - Located in */var/stm/config/tools/monitor/* directory
- Global monitor configuration file (*Global.cfg*)
  - Contains settings defined to be used for all monitors, unless overridden by a monitor-specific file
- Monitor-specific configuration file (*<monitor_name>.cfg*)
  - Contains monitor-specific settings that will override comparable settings defined in the global configuration file
- Client configuration files (*<monitor_name>.clcfg*)
  - Only for multiple-view monitors
  - Contains the qualification criteria on when to generate event to allow each client to control when to receive events

Monitor Configuration Files (2 of 2)

- Startup configuration file (<*monitor_name*>.*sapcfg*)
  - Contains the monitoring requests currently defined for the monitor
- Peripheral Status Monitor configuration file (<*monitor_name*>.psmcfg)
  - Controls the interaction between the Peripheral Status Monitor and the monitor
- Before editing any configuration file, create a backup copy of it
- The default configuration settings for each monitor have been carefully selected to provide efficient monitoring for most systems, it is not recommended to alter these settings unless you fully understand the implications of doing so

Retrieving Event Messages

- Email and text file notification methods deliver the entire content of the event message
- Other notification methods (such as console, syslog) alert you to the occurrence of an event
  - You will need to use the *resdata* utility in order to retrieve the entire content of the event message

Interpreting Event Messages

- Information contained in an event message:
  - Notification time
  - Value that triggered event
  - Event data from monitor
  - Description of error
  - Probable cause
  - Recommended action
  - Additional event and system data
  - Hardware resource information

Sample Event Message (1 of 3)

```
>-------- Event Monitoring Service Event Notification -------<
Notification Time: Thu Apr 11 18:17:02 2003
hpdst351 sent Event Monitor notification information:
/system/events/memory_ia64/memory is >= 1.
Its current value is CRITICAL(5).
Event data from monitor:
Event Time.....: Thu Apr 11 18:17:01 2003
Severity.....: CRITICAL
Monitor.....: memory_ia64
Event #.....: 4500
System.....: hpdst351.cup.hp.com
Summary:
     Memory Event Type : Single bit error (SBE) event.  A
     correctable single bit error has been detected and logged.
Description of Error:
    The memory component: Cab 1 Cell 0 DIMM 0A
    is experiencing an excessive rate of single bit errors on
    a single component.
```

Sample Event Message (2 of 3)

```
Probable Cause / Recommended Action:
    Although the single bit errors are being corrected, it is
    strongly advisable to monitor the situation.  This condition
    can indicate a potential problem.  Contact your memory vendor
    support representative to check the memory boards.

Additional Event Data:
     System IP Address...: 15.16.130.249
     Event Id.............: 0x3cb6358d00000002
     Monitor Version.....: B.01.00
     Event Class.........: Memory
     Client Configuration File.............:
     /var/stm/config/tools/monitor/default_memory_ia64.clcfg
     Client Configuration File Version...: A.01.00
          Qualification criteria met.
               Number of events..: 320
               Received within...: 7 day(s)
     Associated OS error log entry id(s):
          None
```

Sample Event Message (3 of 3)

```
Additional System Data:
     System Model Number.....: ia64 hp superdome server SD64A
     EMS Version.............: A.04.00
     STM Version.............: B.40.00
     OS Version..............: B.11.23
     Latest information on this event:
```

http://docs.hp.com/hpux/content/hardware/ems/memory_ia64.htm#4500

```
v-v-v-v-v-v-v-v-v-v    D  E  T  A  I  L  S    v-v-v-v-v-v-v-v-v-v
Component Data:
     DIMM Location.....: Cab 1 Cell 0 DIMM 0A
     Serial Number.....: A56E03466111
     Part Number.......: A5198-60001

>------ End Event Monitoring Service Event Notification -------<
```

EMS Hardware Monitors

Tips, Tricks

- Push EMS Hardware Monitors Configuration to Multiple Systems
- Getting Details About a Monitor
- Seeing What the Monitor Can Report
- Disable an EMS Hardware Monitor for a Single Instance
- Controlling Individual EMS Hardware Monitor Events
- Troubleshooting EMS Hardware Monitors
- Useful URL Links

Push EMS Hardware Monitors Configuration to Multiple Systems

- Create all the necessary monitoring requests on one system via the Monitoring Request Manager
- Perform further edits, if any, in the other configuration files
- For each system where the new configuration is desired, copy all files in */var/stm/config/tools/monitor/* to the new system
- Execute */etc/opt/resmon/lbin/startcfg_client* to enable the new configuration on the new system

Getting Details About a Monitor

- Key information about each monitor is contained in the monitor data sheet, which provides:
  - What the monitor does and how it operates
  - When the monitor was released or underwent major changes
  - Firmware, OS versions, etc. required to properly operate
  - Resource path for the monitor
  - Whether it supports automatic PSM state control
  - Monitor name
  - Locations, names, and default values for all configuration files
- Basic information can be obtained from HP-UX man page
  - *man <MONITOR_NAME>*

Seeing What the Monitor Can Report

- Good way to learn what a monitor does is to look at the list of events it can report
- List of events for each monitor can be obtained from the Event Descriptions

Disable an EMS HW Monitor for a Single Instance (1 of 2)

- To temporarily stop the reporting of the error message on a hardware instance only after you have acknowledged the event and until you get the hardware instance working again
- You can now use the */var/stm/data/tools/monitor/disabled_instances* text file to list all the instances that you wanted to disable
  - Fully qualified instances listed, one per line
  - Wildcards can be used in the instance names
- Instances listed in the disabled instance file will show no monitoring requests in monconfig
  - The monitor will not stop polling the device but any events will not be forwarded to the log files

Disable an EMS HW Monitor for a Single Instance (2 of 2)

- Perform the following:
  - Add/delete/modify instances in the disabled_instances file
  - Run the Monitoring Request Manager and execute (E)nable Monitoring
- USE WITH CAUTION!

Controlling Individual EMS Hardware Monitor Events

- For multiple-view monitors, you can control the way a monitor reports individual events by modifying the client configuration files (.clcfg) for the monitor
- To control the qualification criteria on when a monitor should generate an event to meet your monitoring and notification strategy
- For each event:
  - Severity
  - Enable flag
  - Suppression time
  - Threshold
- USE WITH CAUTION!

Troubleshooting EMS Hardware Monitors (1 of 2)

- To check if EMS Hardware Monitors are functioning:
  - Run the Monitoring Request Manager
  - The initial screen tells you whether hardware monitoring is enabled
  - List all monitoring requests that have been created by executing (S)how monitoring request configured via monconfig
  - List all currently active monitoring requests by executing (C)heck detailed monitoring status
- To verify if EMS Hardware Monitors are working:
  - For multiple-view monitors, use the *send_test_event* program to have the monitor generate a test event
  - */etc/opt/resmon/lbin/send_test_event –v –a <monitor_name>*

Troubleshooting EMS Hardware Monitors (2 of 2)

- To check if EMS Hardware Monitors are properly functioning:
  - Check the *api.log* file for any error messages logged by the monitor
  - Used to indicate if there were any errors encountered when trying to perform its operation of monitoring the hardware resource
  - Located in the */etc/opt/resmon/log/* directory
  - Any error messages logged will identify the error, indicate the probable cause(s), and recommend action to the error encountered

Useful URL Links (1 of 2)

- For an overview on the EMS Hardware Monitors, see the “EMS Hardware Monitors: Overview”:
  - http://docs.hp.com/hpux/onlinedocs/diag/ems/emo_summ.htm
- For complete background information on the EMS Hardware Monitors, see the “EMS Hardware Monitors User’s Guide”:
  - http://docs.hp.com/hpux/onlinedocs/2512/ems.pdf
- For key information about each EMS Hardware Monitor, see “EMS Hardware Monitors: Data Sheets”:
  - http://docs.hp.com/hpux/onlinedocs/diag/ems/emd_summ.htm
- For a list of events reported by each EMS Hardware Monitor, see “EMS Hardware Monitors: Event Descriptions”:
  - http://docs.hp.com/hpux/onlinedocs/diag/ems/eme_summ.htm

Useful URL Links (2 of 2)

- For a history of changes to the EMS Hardware Monitors, see the “EMS Hardware Monitors: Release Notes”:
  - http://docs.hp.com/hpux/onlinedocs/diag/ems/ems_rel.htm
- For information on both general and specific Frequently Asked Questions (FAQs) about the EMS Hardware Monitors, see the “EMS Hardware Monitors: FAQs”:
  - http://docs.hp.com/hpux/onlinedocs/diag/ems/ems_faq.htm
- For information on the requirements and the products supported by the EMS Hardware Monitors, see the “Requirements and Supported Products”:
  - http://docs.hp.com/hpux/onlinedocs/diag/ems/ems_prod.htm
- For information on supporting the Multiple-View feature in the EMS Hardware Monitors, see “Multiple-View Monitors”:
  - http://docs.hp.com/hpux/onlinedocs/diag/ems/ems_pred.htm

Questions?

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