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# SYSTEM TROUBLESHOOTING

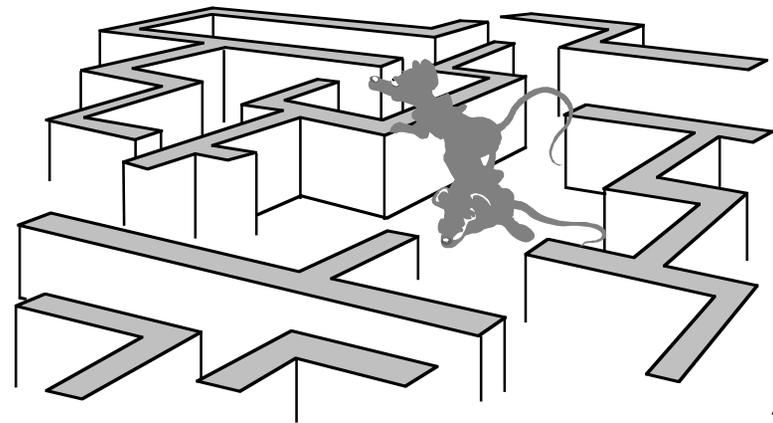
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ECS Pre-Release B Testbed Training

# Overview of Lesson



- **Introduction**
- **System Troubleshooting Topics**
  - System Performance Monitoring
  - Problem Analysis/Troubleshooting
  - Trouble Ticket (TT)
  - Diagnosing Network Communications Problems
- **Practical Exercise**



# Objectives



- **Overall: Proficiency in methodology and procedures for system troubleshooting for ECS**
  - **Conduct system performance monitoring**
  - **Perform problem analysis and troubleshooting**
  - **Set up trouble ticket users and configuration**
  - **Diagnose network communications problems**

# Objectives (Cont.)



**Lesson helps prepare several ECS roles for effective system troubleshooting, maintenance, and problem resolution:**

- **DAAC Computer Operator, System Administrator, and Maintenance Coordinator**
- **SEO System Administrator, System Engineer, System Test Engineer, and Software Maintenance Engineer**
- **DAAC System Engineers, System Test Engineers, Maintenance Engineers**



# System Performance Monitoring



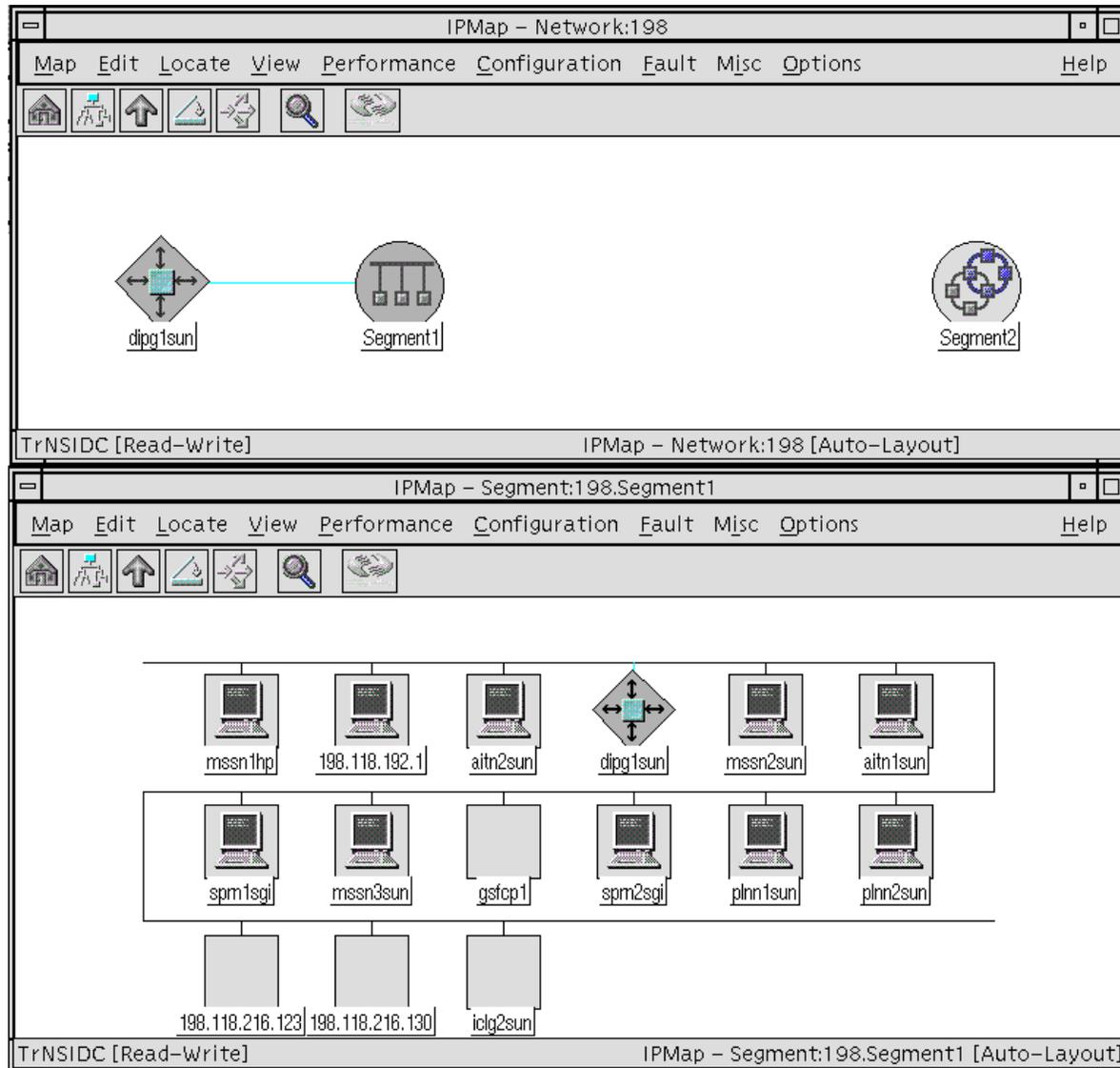
- **Maintaining Operational Readiness**
  - **System operators -- close monitoring of progress and status**
    - **Notice any serious degradation of system performance**
  - **System administrators and system maintenance personnel -- monitor overall system functions and performance**
    - **Administrative and maintenance oversight of system**
    - **Watch for system problem alerts**
    - **Use monitoring tools to create special monitoring capabilities**
    - **Check for notification of system events**

# Checking Network Health & Status



- **HP Open View system management tool**
  - Site-wide view of network and system resources
  - Status information on resources
  - Event notifications and background information
  - Operator interface for managing resources
- **HP Open View monitoring capabilities**
  - Network map with color alerts to indicate problems
  - Indication of network changes
  - Creation of submaps for special monitoring
  - Event notifications

# HP Open View Network Map



# Network Discovery and Status



- **HP OpenView discovers and maps network and its elements**
  - Configured to display status
  - Network maps set for read-write
  - IP Map application enabled
- **HP OpenView Network Node Manager start-up**
  - Starts ECS applications
  - Infrequent: While ECS is running, HP OpenView is active
- **Status categories**
  - Administrative: Not propagated
  - Operational: Propagated from child to parent
- **Compound Status: How status is propagated**

# HP OpenView Default Status Colors



Status Condition	Symbol Color	Connection Color
Unmanaged <sup>(a)</sup>	Off-white	Black
Testing <sup>(a)</sup>	Salmon	Salmon
Restricted <sup>(a)</sup>	Tan	Tan
Disabled <sup>(a)</sup>	Dark Brown	Dark Brown
Unknown <sup>(o)</sup>	Blue	Black
Normal <sup>(o)</sup>	Green	Green
Warning <sup>(o)</sup>	Cyan	Cyan
Minor/Marginal <sup>(o)</sup>	Yellow	Yellow
Major <sup>(o)</sup>	Orange	Orange
Critical <sup>(o)</sup>	Red	Red

<sup>(a)</sup> Administrative Status

<sup>(o)</sup> Operational Status

# Monitoring: Check for Color Alerts



- **Open a map**
- **Compound Status set to default**
- **Color indicates operational status**
- **Follow color indication for abnormal status to isolate problem**

# Monitoring: Check for New Nodes



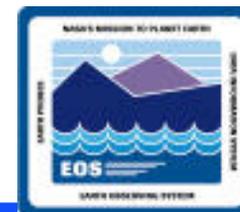
- **IP Map application enabled**
  - Automatic discovery of IP-addressable nodes
  - Creation of object for each node
  - Creation and display of symbols
  - Creation of hierarchy of submaps
    - Internet submap
    - Network submaps
    - Segment submaps
    - Node submaps
- **Autolayout**
  - Enabled: Symbols on map
  - Disabled: Symbols in New Object Holding Area

# Monitoring: Special Submaps

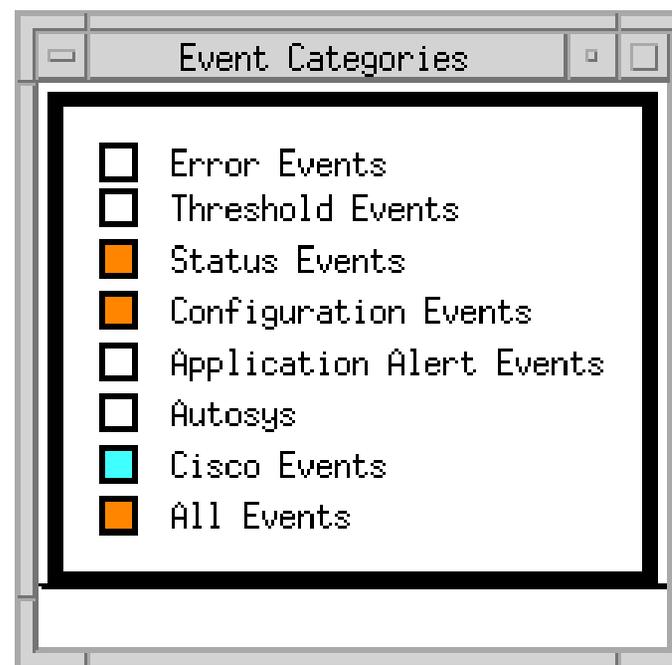


- **Logical vs. physical organization**
- **Create map tailored for special monitoring purpose**
- **Two types and access options**
  - **Independent of hierarchy, opened by menu and dialog**
  - **Child of a parent object, accessible through symbol on parent**

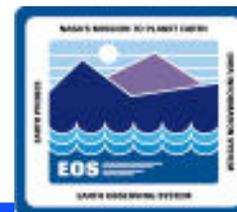
# Monitoring: Event Notifications



- **Event: a change on the network**
  - Registers in appropriate Events Browser window
  - Button color change in Event Categories window
- **Event Categories**
  - Error events
  - Threshold events
  - Status events
  - Configuration events
  - Application alert events
  - Application alert events
  - All events



# Accessing the EBnet Web Page



- **EBnet is a WAN for ECS connectivity**
  - DAACs, EDOS, and other EOSDIS sites
  - Interface to NASA Science Internet (NSI)
  - Transports spacecraft command, control, and science data
  - Transports mission critical data
  - Transports science instrument data and processed data
  - Supports internal EOSDIS communications
  - Interface to Exchange LANs
- **EBnet home page URL**
  - <http://skynet.gsfc.nasa.gov/EBNET/EBnet.html>

# EBnet Home Page



Netscape: EBnet Homepage

File Edit View Go Bookmarks Options Directory Window Help

Back Forward Home Reload Images Open Print Find Stop

Location:

What's New What's Cool Handbook Net Search Net Directory Software

## EOSDIS Backbone Network (EBnet)

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The following documents can be downloaded to your computer. All EBnet documents are served as postscript (PS) and Adobe Portable Document Format (PDF) formats. The '.pdf' files can be viewed and printed from your computer using the [Adobe Acrobat Reader](#). The '.ps' files are postscript files that you can print from your computer.

Obtain the EBnet Review RID form.  
Format available : [RTF](#)

Obtain the EBnet Review Comment form.  
Format available : [RTF](#)

Obtain the 505-10-01-6, ESDIS Project Level 2 Requirements, Vol. 6, EBnet Requirements (09/95)  
Formats available : [PDF](#) [PS](#)

Obtain copies of the FINAL [IRD](#) and [ICDs](#) here.

Obtain the EBnet Consolidation Briefing Presentation (08/95)  
Formats available : [PDF](#) [PS](#)

Obtain the EBnet TRMM Review Presentation (11/95)  
Format available : [PDF](#) [PS](#)

Obtain the EBnet AM-1 Review Material (05/96)  
Formats available : [PDF](#) [PS](#)

EBnet Traffic Database Output (01/97)  
Formats available : [PDF](#) [PS](#)

Explanation and Summary of Assumptions for Ebnet Traffic Database (01/97)

# Analysis/Troubleshooting: System

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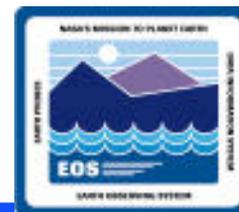
- **COTS product alerts and warnings**  
(e.g., HP OpenView, AutoSys/Xpert)
- **COTS product error messages and event logs**  
(e.g., HP OpenView, ClearCase,)
- **ECS Custom Software Error Messages**

# Systematic Troubleshooting



- **Thorough documentation of the problem**
  - Date/time of problem occurrence
  - Hardware/software
  - Initiating conditions
  - Symptoms
- **Verification**
  - Identify/review relevant publications (e.g., COTS product manuals, ECS tools and procedures manuals)
  - Replicate problem
- **Identification**
  - Review product/subsystem logs
  - Review ECS error messages
- **Analysis**
  - Detailed event review (e.g., HP OpenView Event Browser)
  - Determination of cause/action

# Analysis/Troubleshooting: Hardware



- **ECS hardware is COTS**
- **System troubleshooting principles apply**
- **HP OpenView for quick assessment of status**
- **HP OpenView Event Browser for event sequence**
- **Initial troubleshooting**
  - **Review error message against hardware operator manual; prepare trouble ticket**
  - **Verify connections (power, network, interface cables)**
  - **Run internal systems and/or network diagnostics**
  - **Review system logs for evidence of previous problems**
  - **Attempt system reboot**
  - **If problem is hardware, report it to the DAAC Maintenance Coordinator**

# Hardware Problems: (Continued)



- **Difficult problems may require team attack by Maintenance Coordinator, System Administrator, and Network Administrator:**
  - **specific troubleshooting procedures described in COTS hardware manuals**
  - **non-replacement intervention (e.g., adjustment)**
  - **replace hardware with maintenance spare**
    - **locally purchased (non-stocked) item**
    - **installed spares (e.g., RAID storage, power supplies, network cards, tape drives)**

# Hardware Problems: (Continued)



- **If no resolution with local staff, maintenance support contractor may be called**
  - **Update trouble ticket with problem data, support provider data**
  - **Call technical support center**
  - **Facilitate site access by the technician**
  - **Update trouble ticket with data on the service call**
  - **If a part is replaced, additional data for trouble ticket**
    - **Part number of new item**
    - **Serial numbers (new and old)**
    - **Equipment Identification Number (EIN) of new item**
    - **Model number (Note: may require CCR)**
    - **Name of item replaced**

# Non-Standard Hardware Support



- **For especially difficult cases, or if technical support is unsatisfactory**
  - **Escalation of the problem**
    - Obtain attention of support contractor management
    - Call technical support center
  - **Time and Material (T&M) Support**
    - Last resort for mission-critical repairs

# Preventive Maintenance



- **Only element requiring PM initially is the EMASS robot**
  - **Scheduled by local Maintenance Coordinator**
  - **Coordinated with maintenance organization and using organization**
    - **Scheduled to be performed by maintenance organization and to coincide with any corrective maintenance if possible**
    - **Scheduled to minimize operational impact**
  - **Documented using a trouble ticket**

# Trouble Ticket (TT)



- **Documentation of system problems**
- **COTS Software (DDTS)**
- **Documentation of changes**
- **Failure Review Board**
- **Emergency fixes**
- **Configuration changes  $\neq$  CCR**

# Using DDTs



- **Creating and viewing Trouble Tickets or Non-Conformance Reports (NCRs)**
- **Modifying DDTs configuration and establishing privileges for DDTs users**
- **Generating problem reports**

# DDTS Configuration and Privileges



- ***DDTS Administrator's Manual, Release 3.2***
- **DDTS Administrator logs in as DDTS**
- **Use *adminbug* program set up projects**
  - ***aprj* -- add a project**
  - ***mprj* -- modify a project (e.g., add users)**

# Operational Work-around



- **Managed by the ECS Operations Coordinator at each center**
- **Master list of work-arounds and associated trouble tickets and configuration change requests (CCRs) kept in either hard-copy or soft-copy form for the operations staff**
- **Hard-copy and soft-copy procedure documents are “red-lined” for use by the operations staff**
- **Work-arounds affecting multiple sites are coordinated by the ECS organizations and monitored by ECS M&O Office staff**

# Diagnosing Network Problems



- **Network failures require same management as other failures**
  - Detection of the fault
  - Isolation of the fault
  - Correction of the fault
- **Standard troubleshooting tools apply**
  - Error logs
  - Error detection processes
  - Diagnostic testing

# Identifying Connectivity Problems



- **HP OpenView -- color of connections on maps**
  - cyan: warning
  - yellow: minor
  - orange: major
  - red: critical
- **HP OpenView Fault Diagnostic Aids**
  - Ping
  - Remote Ping
  - Route Analysis

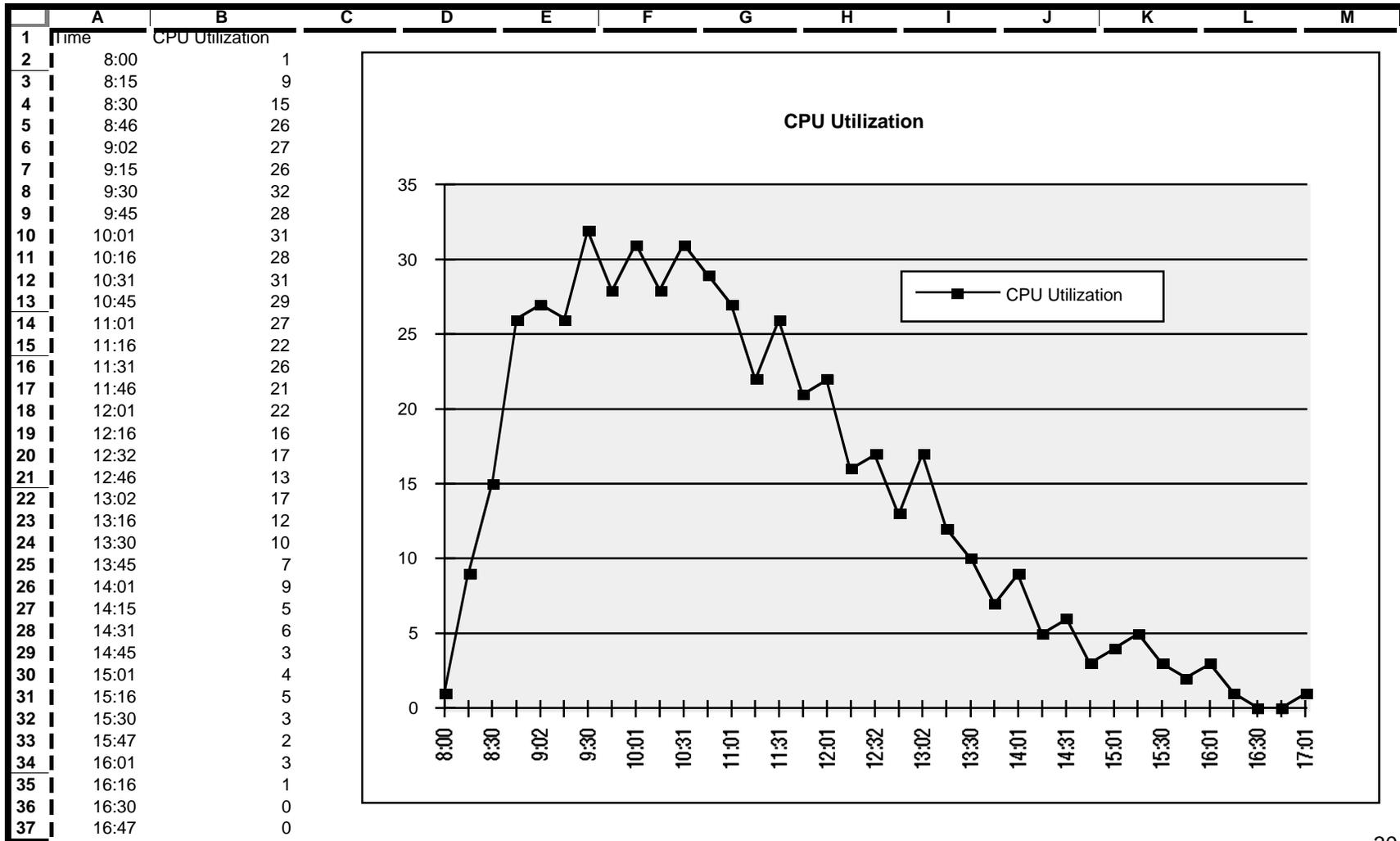
# Diagnosing Performance Problems

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- **HP OpenView**
  - Check interface traffic
  - Check CPU loading

# Example of HP OpenView Graphical Display of CPU Usage



# Diagnosing Network Service Problems



- If unable to access a network service (e.g., ftp, telnet) on a remote system, use diagnostic procedure
- **General Systematic Troubleshooting**
  - Review Trouble Ticket
  - HP Open View
    - Look for color alerts
    - Locate relevant host
    - Check network activity, traffic on host
    - Check CPU load on host

# Viewing Historical Trends



- **HP OpenView Network Node Manager**
  - Data collection
  - Event configuration
  - Application building
- **Process**
  - Establish baselines
  - Build applications to monitor trends
  - Establish and refine thresholds
  - Set up event-triggered actions

# Viewing Historical Trends (Cont.)



- **HP OpenView Grapher**
  - Viewing of collected information in graph form
  - Graphing of combinations of data values
  - Viewing data values representing different instances of data variables or different variables for different nodes
  - Viewing data for selected nodes or viewing all the data in the Data Collector database

# Viewing Historical Trends (Cont.)



- **HP OpenView Event Log Browser**
  - List events at or near the time of a problem