

Modern OpenVMS Systems Management

Johan Michiels

CockpitMgr Product Manager



Johan



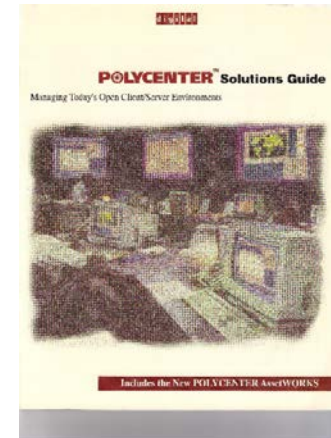
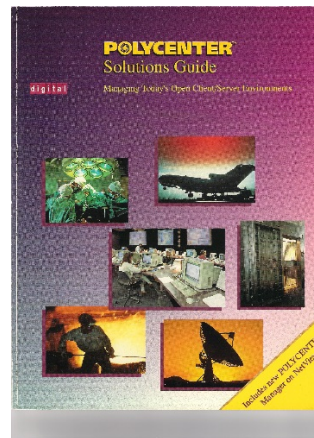
- Independent OpenVMS Consultant
- Worked 32 years at Digital/Compaq/HP
- 35 years of experience on OpenVMS
- OpenVMS Ambassador since 1997
- Member of OpenVMS Engineering in 2003-2004
- Specialized in OpenVMS systems management, centralized monitoring and automated operations
- Initiated the CockpitMgr product in the early 90s



Some history

1993: Digital announces Polycenter

- A marketing name for many point solutions
 - Problem management, performance management, storage management, automation, network management, security management, ...
- Existing management products got new names
- “Assists network and system managers in planning and managing an open and integrated distributed environment”



What can we say?

- Great point solutions
- Perfect for managing VMS environments in the early nineties
 - Standalone systems, and CI or DSSI clusters located in 1 datacenter
 - Locally attached storage or storage behind HSC/HSJ/HSD controllers
- The marketing umbrella did not trigger any product integration
 - Each product comes with its own configuration utility, notification mechanisms...etc.
- First version of CockpitMgr included configuration utilities and integration of Polycenter products.



But technology and customer demands evolve...

- Multi-site disaster-tolerant VMScusters
 - Network is now part of the cluster
- SAN
 - Storage is drifting away from the systems
- Increased security demands
 - SSH
- Internet technologies
 - Web browser for event notification and reporting
 - XML to store information, XSLT for reporting
- Cell phones
 - Text message is ideal for important/urgent event notification



Let's build a cockpit

- In 1996 CA acquired Polycenter and we did not see a real future for the products.
- We decided to build everything from scratch, in a fully integrated way, deploying the latest technologies, and based on real customer demands.
- Our idea was to implement a dedicated system that monitors the entire OpenVMS production environment
 - Consoles, systems, network, storage, security, log files, performance, configuration changes,...
 - Consolidate and process all collected information, and deliver it to the system manager in the most appropriate way.
- That dedicated system is an OpenVMS system. It's called "the cockpit".



Our starting points

- What information does a system manager of mission-critical VMS systems and clusters need to manage efficiently the entire VMS environment?
- Where can this information be found?
- How can all the available information be centralised, processed, and presented in an uniform way?
- Which modern technologies are the most appropriate to use and are demanded by our customers?





Today

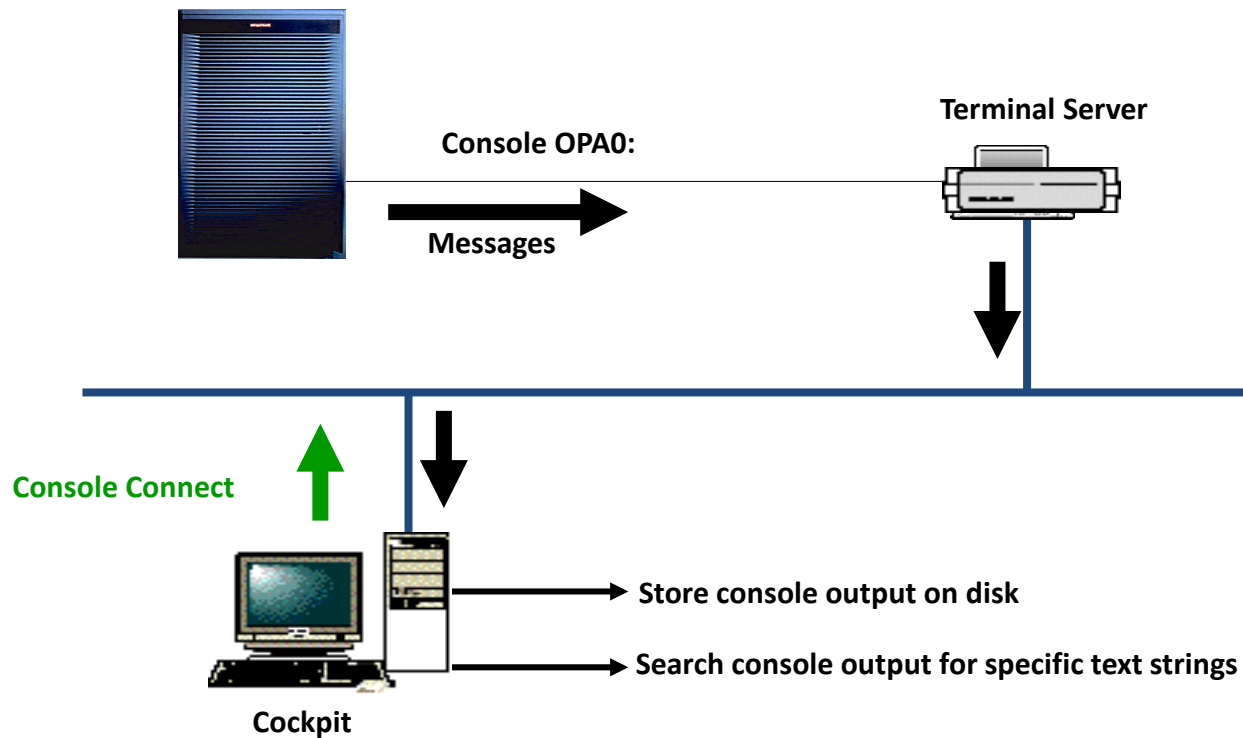
- CockpitMgr evolved to the most complete toolset in the industry, supporting VMS system managers in the daily operations.
- Made by VMS system managers, for VMS system managers.
- One product that bundles the experience of many VMS system managers
- Still adding functionality (regular new release)
- Worldwide in use at major OpenVMS customers
- This presentation contains an overview of the major features.



Console Manager



Console Manager



Console Manager

- CockpitMgr provides complete console management:
 - Connect to remote system console
 - Log console output for further reference
 - Search console output for specific text strings
- Many up-to-date scan profiles included:
 - OpenVMS, VMScluster, shadowing, LAN failover messages....
 - VAX, AlphaServer and Integrity messages
 - Layered products such as SLS, ABS, MDMS, Rdb, DCPS ...



Console Manager

- Terminal server support:
 - Classic DECservers
 - Marvel NAT box
 - Perle (work in progress)
 - Cisco Access Server
 - Digi CM server
- Direct connection to Integrity ILO
 - No need for extra terminal server
- Communication protocols : LAT, Telnet and SSH



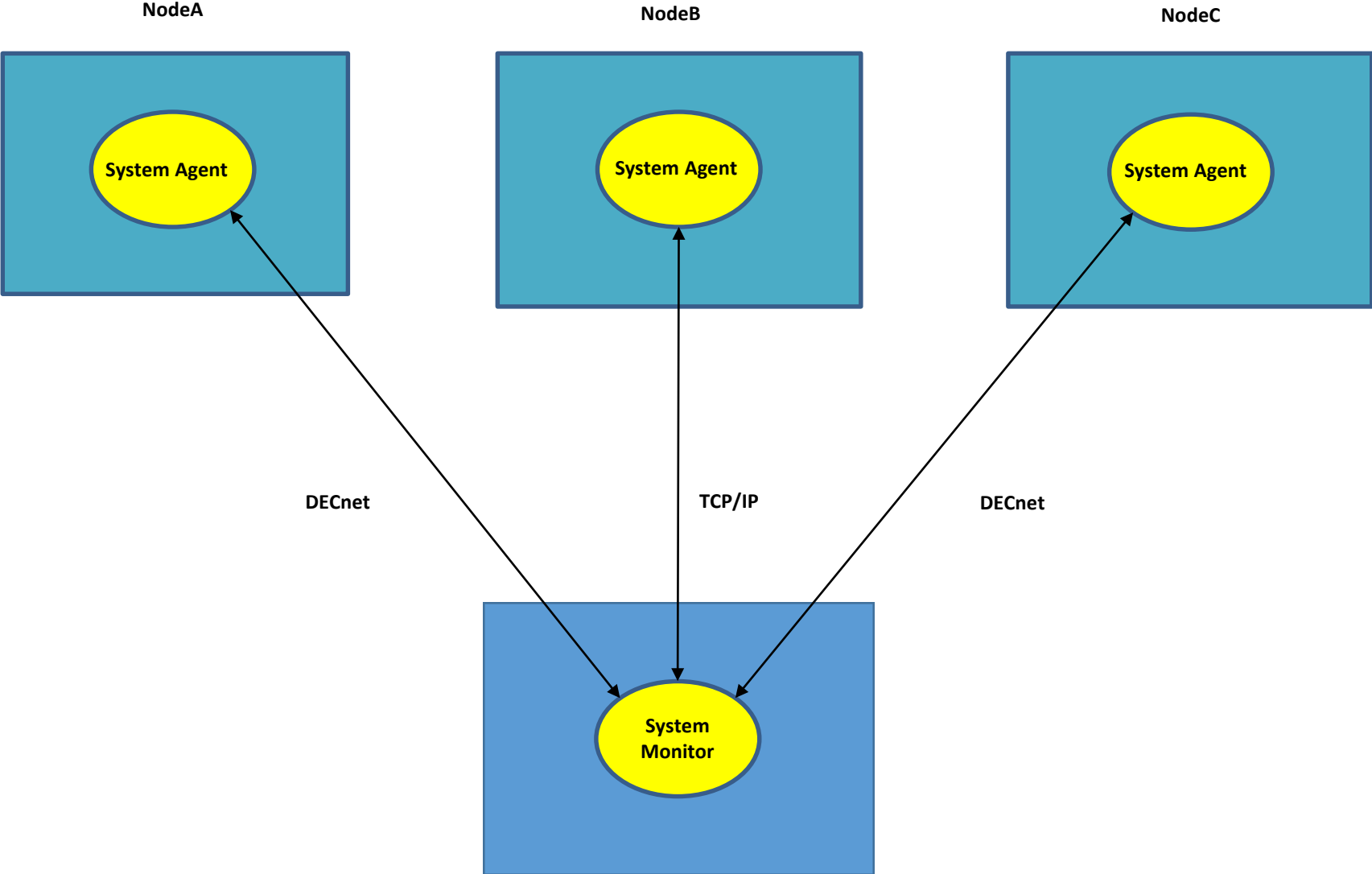


System Monitor

System Monitor

- System Monitor on the cockpit communicates with an Agent running on each VMS production system
- What must to be monitored is defined centrally on the cockpit
- Connection is made at regular time intervals
- Connection is only accepted from a “trusted” cockpit
- Implemented with non-transparent DECnet task-to-task and TCP/IP socket programming





What is monitored?

- System reachability
- Changes in the hardware error counts of CPU, memory, devices, buses, controllers ...
- The system time difference between cockpit and managed system
- Processes
 - Does a process exist on one system or cluster-wide?
 - If process name contains wildcards, the minimum number of occurrences can be specified
 - Specification of a UIC is optional
- Disks
 - Disk free space
 - Disk states (e.g. mount verification, not mounted, write-locked, ... etc.)
 - Highwater marking – Erase on delete

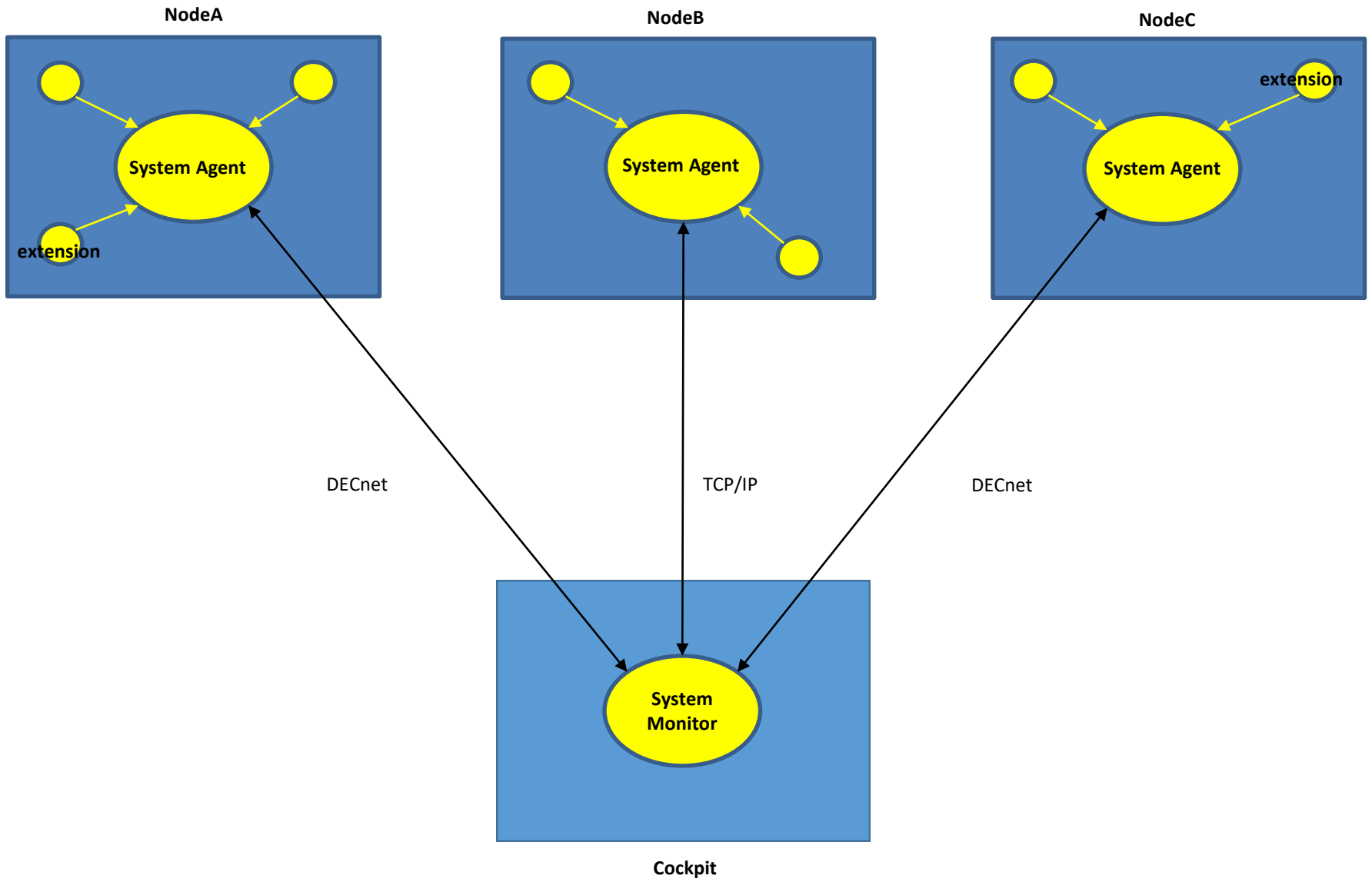
What is monitored? (cont.)

- Shadow sets
 - Is there a disk missing as shadow set member?
 - Are the shadow set members doing copy and merge operations?
 - Is a disk unexpected member of a shadow set?
- Status of queue manager, batch and print queues, and the number of pending jobs on a queue
- Checks presence of permanent batch jobs
 - Supports generic queues

System Monitor Key features

- Monitoring of every item can be restricted to certain periods of the week
- Items can be monitored per node or per cluster
- Wildcards can be used
- Fast configuration utility available
- Automatic repair actions can be defined
- The System Agent can easily be extended with your own specialized monitoring modules
 - API
 - DCL





Standard extensions

- CockpitMgr comes with 6 extensions that can be enabled/disabled per system
- Integrity server hardware checks, using IPMI
 - Checks if temperatures (internal sensors and ambient) are within range
 - Check fan states, and checks if fan tach is within range
 - Power supply failures
- Smart Array monitor
 - Controller status
 - Parity errors
 - Cache status and battery status
 - Status of mirror sets and RAID sets
 - SSD errors



Standard extensions (cont.)

- Volume checker
 - Searches for selected files with a large size
 - Searches files with a large version number
 - Compares the total number of files on disk against volume maxfiles
 - If disk quotas are enabled, looks for accounts close to maximum quota or with exceeded quota
- ACMS monitor
 - ACMS correctly started?
 - State of ACMS applications?
 - Number of server processes between minimum and maximum thresholds?
 - Waiting tasks?
 - Free pool percentage



Standard extensions (cont.)

- FC path monitoring
 - Is the current path from HBA to disk a preferred one?
- LAN device monitor
 - Checks if the settings of the LAN devices are as wanted.
 - Checks if all members of a LAN failover device have link state “Up”.



Storage & Network Monitoring



Storage & Network

- Storage
 - Storage is located in a SAN
 - Local storage is configured behind a RAID controller
 - Redundant storage configurations are build and operations continue after a single failure
- Network
 - Is used as cluster interconnect
 - Any network issue may have immediate impact on the VMScluster
 - Good working systems are useless in case of network problems
- The Agent and Agent Extensions are working on the VMS level.
 - What can be done outside the server?



SNMPtrap Listener

- Configure devices to send SNMPtraps to the cockpit
- An SNMPtrap Listener receives the SNMPtraps, analyses and interprets them.
- CockpitMgr comes with many pre-defined SNMPtraps.
- No MIB expertise is required.
- Some examples:
 - 3PAR, EVA, HDS storage arrays
 - Brocade and Cisco SAN switches and routers
 - Cisco Catalyst and Nexus switches



Monitoring using SNMPgets

- Use SNMPgets to query MIB agents on selected devices.
- No MIB expertise required: configuration requires only device type, hostname, community name, and list of ports to check.
- Monitoring of the port states, error counters and device-specific diagnostic information
- Performance data collection
- Examples:
 - Blade enclosures
 - Cisco Catalyst and Nexus
 - includes monitoring of trunks, VLANs, and etherchannels
 - Includes checking of changes in the port states, and changes in the port error counters
 - Fibre Channel Switches



SNMP-based monitoring

- Possibility to add monitoring of more devices on project basis.
- Development based on customer demand.
- Some examples:
 - Printers
 - UPS
 - Temperature & Humidity sensors
 - Power Distribution Units
- Integrated in the System Monitor or as Agent Extension.

More features



Performance Monitor

- The Performance Monitor looks for possible indications of system performance slowdowns
 - CPU utilisation (also per mode)
 - Memory utilisation
 - Page and swap file utilisation
 - Looping processes
 - Idle processes
 - Pool utilisation
 - Processes in special wait state (RWAST, RWMBX...)
 - Process quota utilization
- CockpitMgr collects some performance metrics, and makes the data available in graphs
 - PNG files to display in web browser
 - Not a replacement for solutions such as T4 or Perfdot



Real-time security monitoring

- Based on events detected by the Audit Server.
- Each security event is summarized in one line of text.
- Allows system and security managers to monitor in real-time the security of the data entrusted to their OpenVMS system.

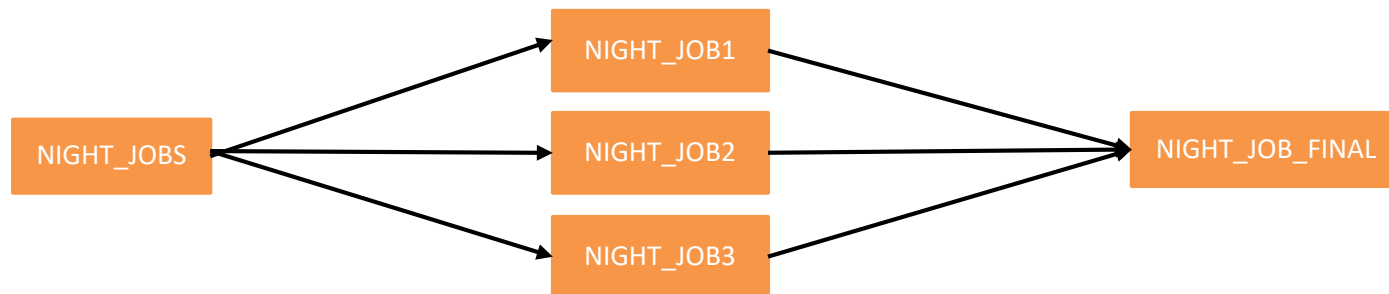


Log File Browser

- Search batch and applications logs for errors
 - Define per file a list of strings to search for
 - Search strings may contain wildcards
- Can be used with open files
- Allows e.g. early detection of problems in job chains

Job Scheduler

- Manages repetitive jobs on a node or cluster
- Scheduling possible on daily, weekly, monthly or interval basis.
- Job start and completion messages displayed in the cockpit
- Allows to create job trees. Job execution is dependent of successful completion of one or more other jobs.
- Example:



NETDCL

- Execute one or more DCL commands on a remote system with output to the cockpit
- Facilitates remote system management
- Allows creation of scheduler jobs that execute on remote nodes.

Monitoring Unix and Windows systems

- Unix System Agent
 - Monitors processes and free file system space.
 - Monitoring scripts can be used as Agent Extension.
- Windows
 - Monitoring by quering the SNMP Agent.
 - Processes, services, disk space, high CPU and memory utilization.
- Unix Syslog and Windows Event Log can be sent to cockpit.
 - Use Syslog format.
 - CockpitMgr has a Syslog Server.
 - Syslog messages are searched for pre-defined strings.



Standby cockpit

- In a disaster-tolerant environment, you can't depend on anything that is only at either site
- Your cockpit is key in the operations. After loss of the cockpit, you need to be able to activate the cockpit in the other site
- Standby cockpit will automatically become active
 - If primary fails
 - When the network connection between the 2 sites is broken
- Manual switch between the active and standby cockpit is possible
- Events detected by active cockpit are sent to standby cockpit.
- All historical event information is available in both sites.



Census: Configuration and Change Management

- Configuration details are collected and stored in XML format.
 - OpenVMS systems
 - Brocade Fibre Channel switches and routers
 - Cisco Catalyst and Nexus switches
 - Storage Arrays
 - Blade enclosures
- Collected information is displayed in web browser using XSLT.
- Generate difference report of current configuration compared to older XML files.
- Information can be correlated
 - To which FC switch/port is a HBA connected
 - To which catalyst/port is a NIC connected





Event notification

Notification utilities

- Event console
- GUI
- Text message to cell phone
- Web browser
- Integration with enterprise manager



Control Customize

System	Date&Time	Text	Solution
TETHYS	11-APR-2015 22:32:18.58	Disk \$1\$DGA203: (DISK\$ORACLE_1) has 7.32% free blocks (663E480 blocks)	
BRSADV	11-APR-2015 23:00:03.06	Disk \$2\$DGA5: is not mounted	
FCS3	11-APR-2015 23:44:18.18	The physical state of port 4 has changed from inSync to noLight	
NEPTUN	12-APR-2015 03:01:11.25	Please mount device _\$2\$DKB300: (NEPTUN)	
BRSOPI	12-APR-2015 13:57:29.85	%SECURITY_BREAKIN, BRS001::VISITOR attempts breakin with user SMITH	
HUB001	12-APR-2015 00:00:00.03	A module has been removed.	
HUB001	12-APR-2015 00:00:04.04	A backplane connection change has occurred.	
LUX	12-APR-2015 14:16:19.25	Disk _\$1\$DGA300 is copy target in shadow set DSA3:	Copy operation terminated
BRSADV	12-APR-2015 14:17:18.35	Only 320 global page table entries free	
BRSADV	12-APR-2015 14:19:54.99	Process DB_server is missing	Process available
BRSVMS	12-APR-2015 14:19:58.02	Process UPDATER (PID: 20400129) seems to be looping	Process deleted
PLUIS	12-APR-2015 15:59:11.47	%SYSTEM-W- PAGEFRAG, page file filling up; please create more space	
BRSAXP	12-APR-2015 16:12:33.24	- SYSTEM-F-NOSLOT, no PCB available	
LUX	12-APR-2015 18:00:04.25	Disk \$1\$DGA420: is missing as member of shadow set DSA5:	
BRSOPI	12-APR-2015 18:16:08.83	User OPERATOR modified SYSUAF record SMITH: PGFLQUOTA,BYTLM	
BROBAT	12-APR-2015 18:19:12.04	Scheduler job FIBAS_EOD (PID: 202001D3) for user ACCOUNTING1 has started	Job completed OK
BROBAT	12-APR-2015 18:19:16.07	Scheduler job FIBAS_FULL (PID: 202001D9) for user ACCOUNTING1 has started	
GFD0002	12-APR-2015 21:04:25.91	The STP state of port 3-1 in VLAN 99 (GFD0004) has changed from "forwarding" to "broken"	
BRSVMS	12-APR-2015 22:48:12.51	%SYSTEM-W- POOLEXP, Pool expansion failure	
PLUIS	12-APR-2015 22:53:26.32	%LICENSE-W- NOLOAD, license was not loaded for VMSCUSTER	
LU2	12-APR-2015 22:59:42.13	%QMAN-E- CREPRCSTOP, failed to create a batch process, queue TCPOLYSRV_LU2 will be stopped	
TETHYS	12-APR-2015 22:59:42.16	Disk \$1\$DGA201: (DISK\$WORKFILES) has 9.88% free blocks (2002762 blocks)	Threshold not exceeded
CISCO_001	13-APR-2015 00:02:08.22	Link down (2)	
SANM01	13-APR-2015 00:08:18.28	An HSV controller's battery assembly has malfunctioned	

Console

System Monitor

Operations

Performance

Storage/Backup

Security

SNMP

Other

Load All

Delete Cleared

Delete Shown

Show Marked

AutoScroll

Quit



Atrium

K-2

SABINTT

ERS

EPA

TEST

TAMARA-EXT

TAMARA-INT

EDI

L15S50

L15S51

L15S60

L15S70

L15S76

L15S80

L15S90

L25S20

HS680

HS680

L15S52

L15S53

L15S61

L15S71

L15S77

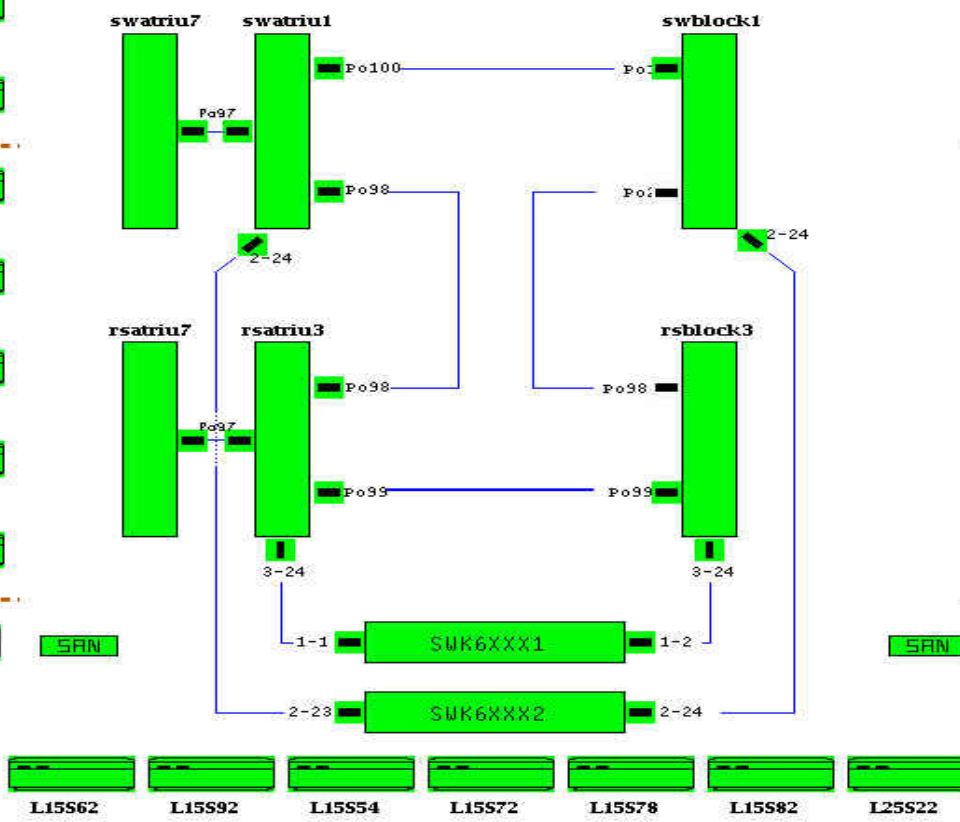
L15S81

L15S91

L25S21

HS680

HS680



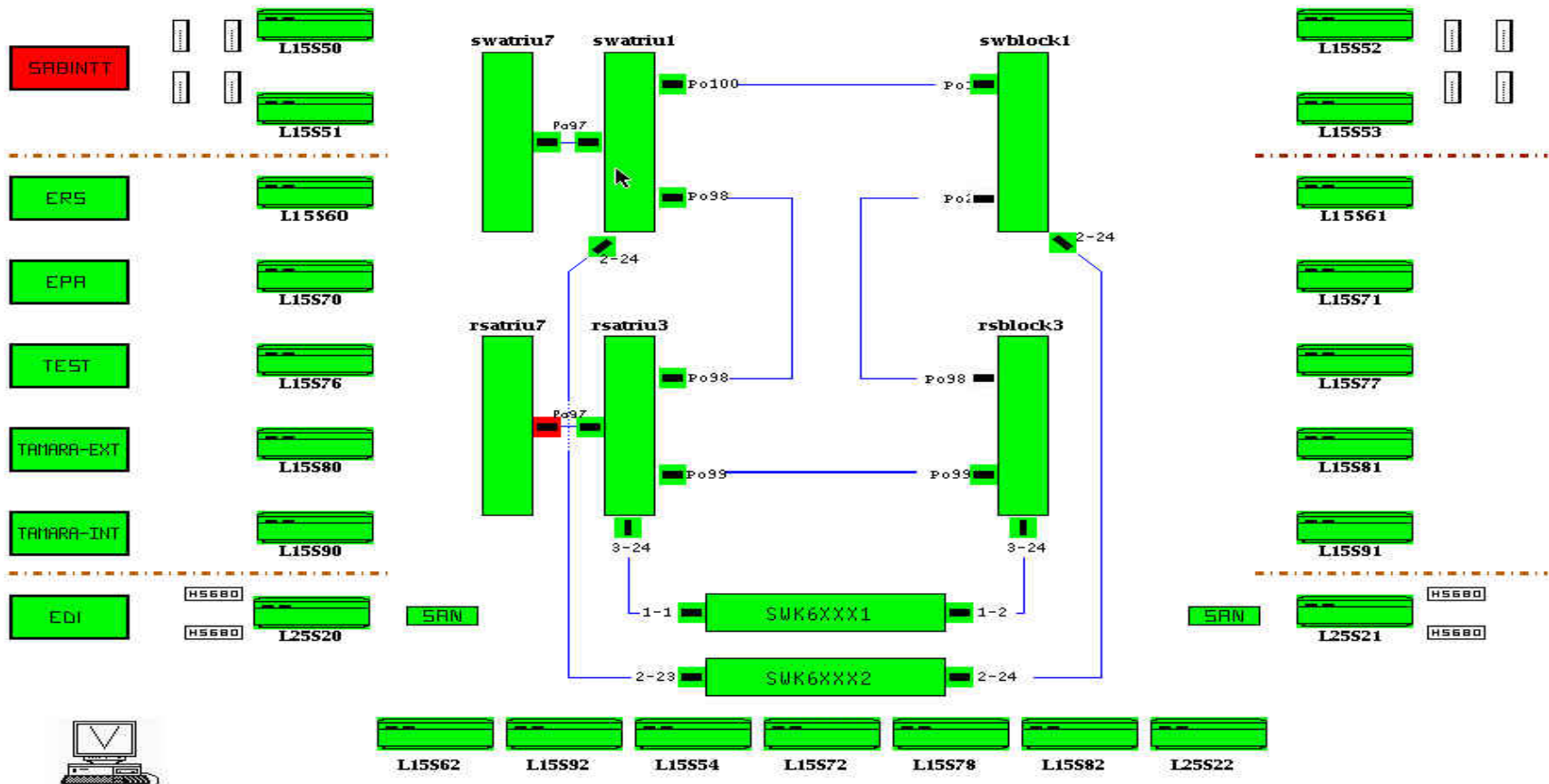
Active Cockpit: L15S36

ENS event received on "swk6xxx1_1-1" State: 5 (swk6xxx1.Port.1-1)



Atrium

K-2



Active Cockpit: L15S36

ENS event received on "\$2\$DKC102" State: 1 (yy)

0378/0171



Atrium

K-2

SABINTT

File Options Help

Processes BatchJobs

Disks BatchQueues

ShadowSets PrintQueues

Definition File saved!

EPA

L15S70

TEST

L15S76

TAMARA-EXT

L15S80

TAMARA-INT

L15S90

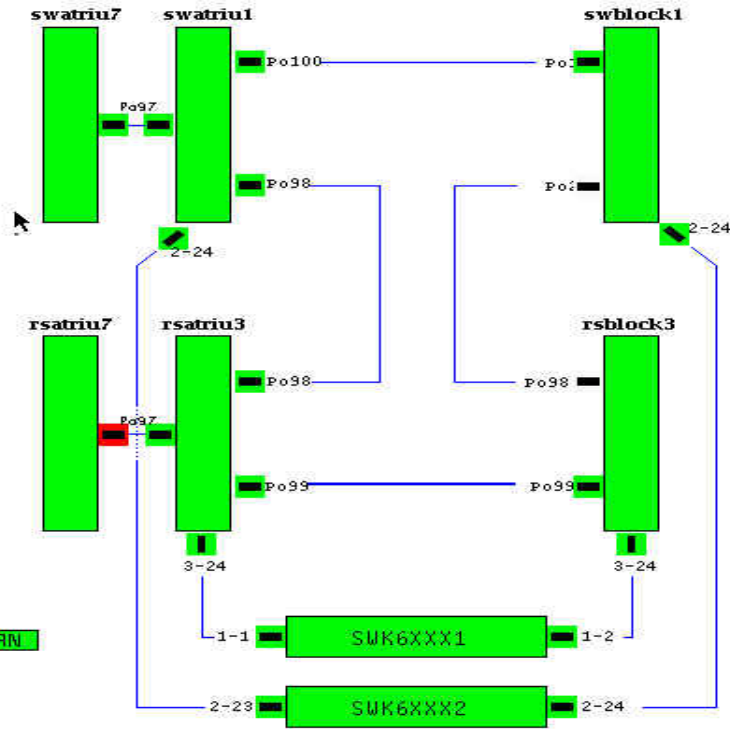
EDI

H5680

H5680

L25S20

SAN



L15S52

L15S53

L15S61

L15S71

L15S77

L15S81

L15S91

SAN

H5680

H5680

L25S21

H5680

H5680

L15S62 L15S92 L15S54 L15S72 L15S78 L15S82 L25S22

Active Cockpit: L15S36

ENS event received on "\$2\$DKC102" State: 1 (yy)

0285/0212



CockpitMgr for OpenVMS - Graphical User Interface V7.2

File Options Help

Atrium

SABINTT

File Options Help

Processes BatchJobs

Disks BatchQueues

ShadowSets PrintQueues

K-2

L15S52

L15S53

L15S61

L15S71

L15S77

L15S81

L15S91

L15S21

SABINTT.ShadowSet

File Options Help

ShadowMembers Atrium				ShadowMembers K-2			
1	2	3	4	1	2	3	4
5	6	7	8	5	6	7	8
9	10	11	12	9	10	11	12
13	14	15	16	13	14	15	16

Definition File saved! 0218/0084

TANARR-INT L15S90

EDI H5680 L15S20 SAN

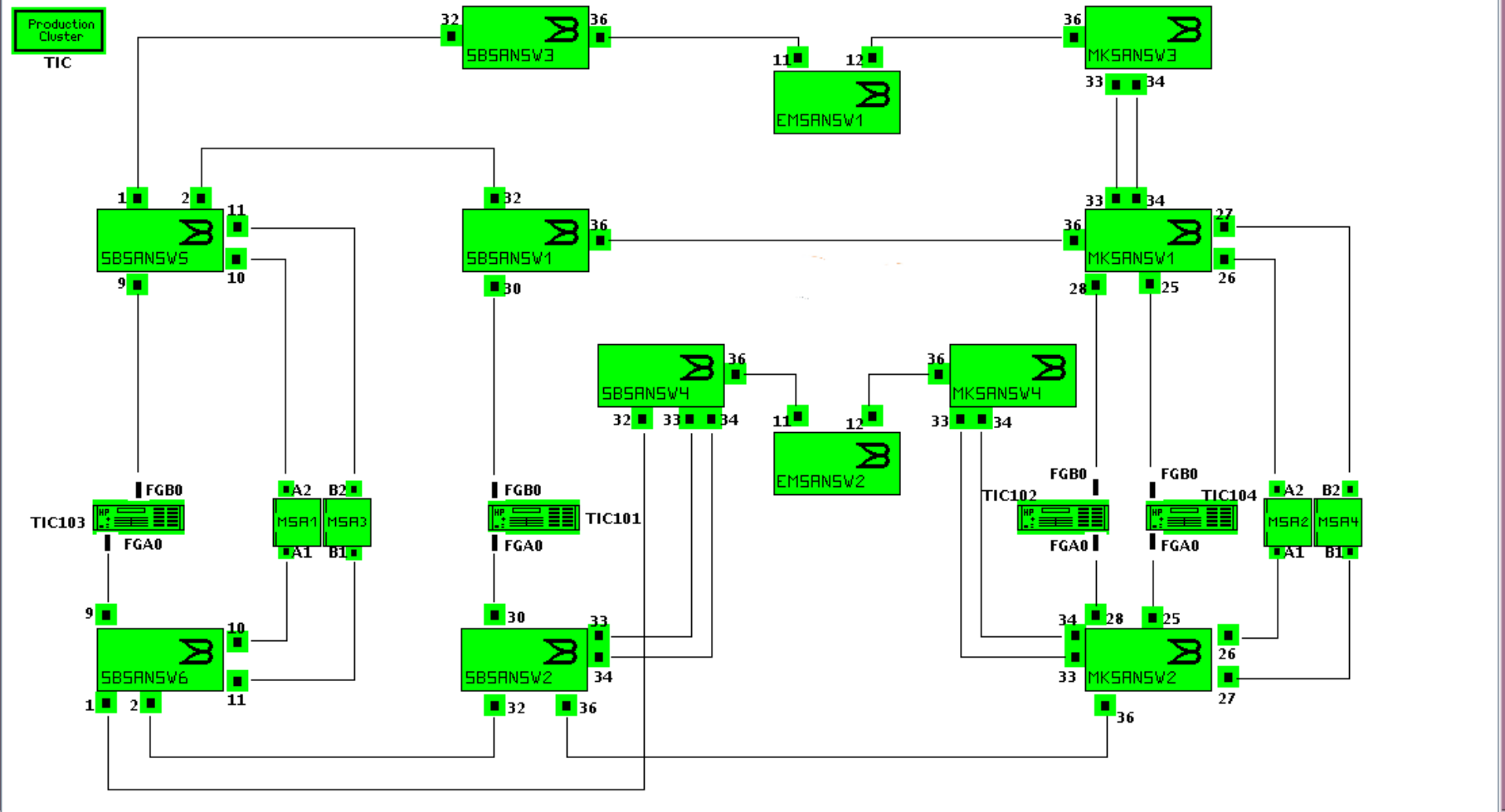
SWK6XXX1 SWK6XXX2

L15S62 L15S92 L15S54 L15S72 L15S78 L15S82 L25S22

Active Cockpit: L15S36

ENS event received on "Status" State: 5 (SAHADES1D3.Status)





ENS event received on "MSATIC4_B2" State: 5 (MSATIC4.Port.4)



Root Message Groups [michiels]

CockpitMgr Event Console -- Cockpit BRSCPT -- User SYSTEM

Control Customize

System	Date&Time	Text	Solution
BRSCPT	13-MAY-2003 10:29:05.99	%SECURITY_SYSUAF, SYSTEM modified SYSUAF record SYSTEM - PGFLQUOTA	
BRSMV2	13-MAY-2003 10:29:07.94	Disk \$2\$DKA300: (DISK\$MV2_SYSTEM) has 7% free blocks (153585 blocks).	
FDDI	13-MAY-2003 10:29:08.45	Disk _\$4\$DKA200: is missing as member of shadow set _DSA99.	
FDDI	13-MAY-2003 10:29:09.14	Batch Job DEMOBATCH for user SYSTEM is missing on queue SYS\$BATCH	
BRSMV4	13-MAY-2003 10:29:09.75	Disk \$4\$DKA100: (DISK\$MV4_PAGESWAP) has 14% free blocks (116622 blocks).	
BRSMV4	13-MAY-2003 10:31:17.69	Memory utilization exceeds 94%	

OpenVMS System Monitor Operations Performance Storage/Backup

Load All Delete Cleared Delete Shown Show Marked AutoScroll

Sev.	Date	Time	Node	MsgGroup	Message Text
Maj	05/13/03	08:36:41	brscpt.bro	OpenVMS	%SECURITY_SYSUAF, SYSTEM modified SYSUAF record SYSTEM - PGFLQUOTA
Warn	05/13/03	08:36:43	brsmv2.bro	OpenVMS	(NEW) BRSMV2: Disk \$2\$DKA300: (DISK\$MV2_SYSTEM) has 7% free blocks
Crit	05/13/03	08:36:43	brsmv2.bro	OpenVMS	(NEW) FDDI: Disk _\$4\$DKA200: is missing as member of shadow set _DSA
Crit	05/13/03	08:36:44	brsmv2.bro	OpenVMS	(NEW) FDDI: Batch Job DEMOBATCH for user SYSTEM is missing on queue
Min	05/13/03	08:36:45	brsmv4.bro	OpenVMS	(NEW) BRSMV4: Disk \$4\$DKA100: (DISK\$MV4_PAGESWAP) has 14% free block
Maj	05/13/03	08:40:52	brsmv4.bro	OpenVMS	Memory utilization exceeds 94%

2 2 1 1 0 0 Active Messages

Own Highlight Details... Perform Action Annotations...



CockpitMgr for OpenVMS - Web Tools

Monitoring

[All Events](#)[Events per Group](#)[Events per Class](#)

Maintenance

[All Events](#)[Events per Group](#)

Performance

[Systems](#)[Catalysts](#)[VC Modules](#)[Brocades](#)

Reporting

[Brief Report](#)[Full Report](#)[Customized Report](#)

Configuration

[Configuration Mgmt](#)[XML search](#)[Serial Numbers](#)

Special Reports

[Environment](#)[Licenses](#)

Documentation

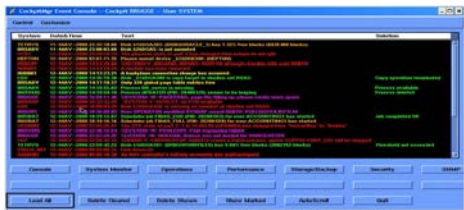
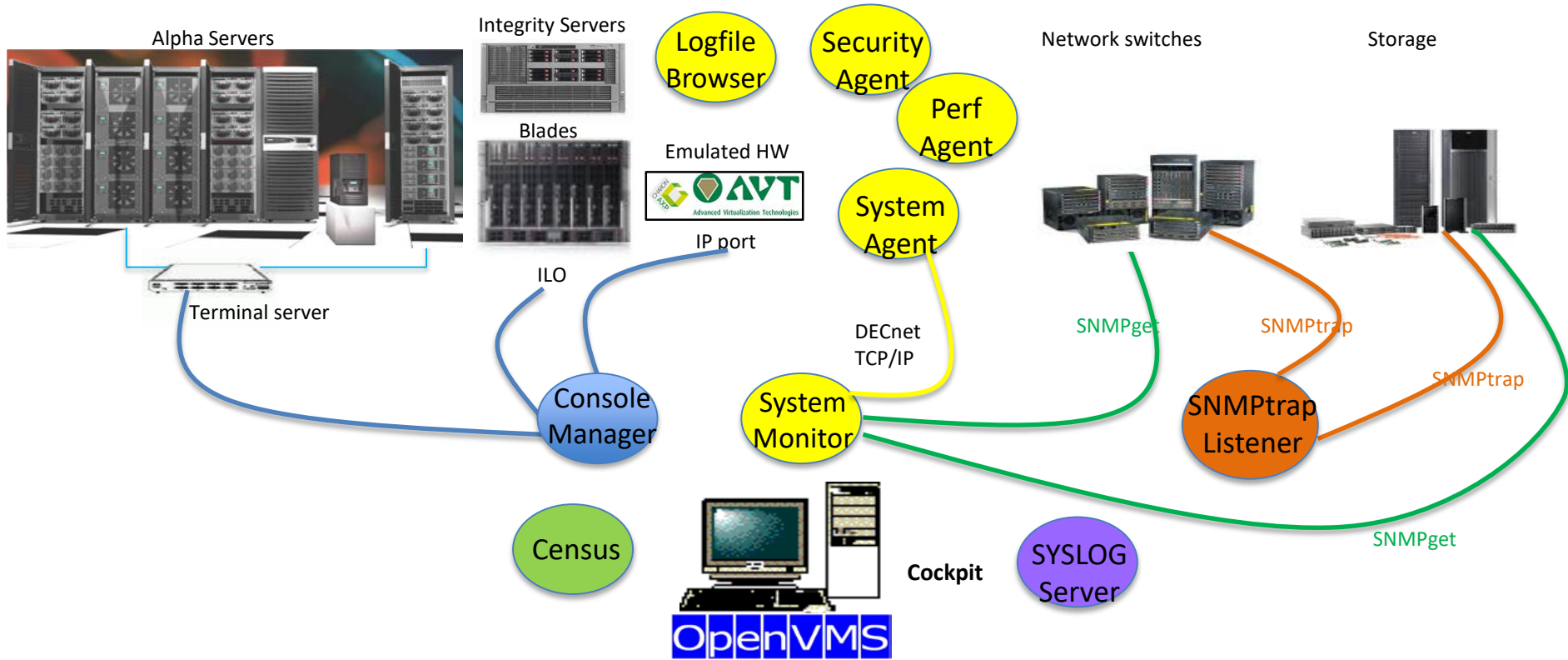
[User Guides](#)

Message to cell phone

- Two ways:
 - In many cases, it can be done via e-mail to your telecom provider
 - Using a cellular engine, antenna, power cable, cable to connect to COM port and SIM card



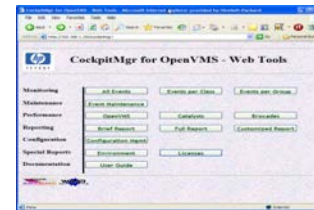
- CockpitMgr makes it easy to define which messages should be sent to who and when.



Event Console



GUI



Web browser



Cell Phone





OpenVMS Technical Journal (2003)

<http://h71000.www7.hp.com/openvms/journal/v1/index.html>

CockpitMgr Product Manager

Johan Michiels, EuroVMS

e-mail: johan.michiels@eurovms.com

Tel: +32-498.946.148

Web site

www.eurovms.com

