HP-UX and Linux Serviceguard cluster manageability

Purpose

The purpose of this paper is to present the management tools and integration points necessary to achieve a comprehensive and cohesive management solution for HP High Availability and Business Continuity architectures. As a point of reference, a brief summary of HP High Availability and Business Continuity solutions will be provided in an appendix.

Audience

The intended audience for this paper includes IT managers, administrators, and operators, as well as anyone involved in the planning and procurement process relative to the implementation of a highly available architecture.

Executive summary

In an Adaptive Enterprise, business and IT are synchronized to capitalize on change. When business and IT are in alignment, change—though constant, unexpected, and frequently disruptive—presents opportunities that can allow a company to maintain and even strengthen its competitive advantage.

High availability is in the forefront of many IT objectives as a contributing factor to a company's profitability and its ability to compete effectively. Companies invest in high availability solutions for applications that require 24x7 availability and rigorous accountability because having a system unavailable for as little as a few minutes can mean thousands of dollars in lost revenues and customers who go to the competition. The need for an IT infrastructure that supports business agility drives the selection of high availability (HA) computing environments and underlies the importance of solutions like HP Serviceguard. HP Serviceguard is the foundation HA clustering product on which many other solutions discussed in this paper are built. HP Serviceguard is designed to support the data integrity and availability requirements of enterprise-class applications. Further, it delivers the simplicity, agility, and value that are the hallmarks of Adaptive Enterprise solutions. While HA solutions adapt to the changes in network services and infrastructure and provide almost no unplanned interruption of service, it is important to manage the solution itself.

The challenges of managing an HA solution can be attributed to the high complexity of applications and infrastructure, heterogeneous environments, early detection of potential failures, change management, and the necessity to reduce total cost of management. HP has products that allow the monitoring and management from a single console across platforms and operating systems to address these challenges. This paper will illustrate not only point products, but components that can work together as a fully integrated HA solution.

HP management solutions

Cluster management overview

HP Serviceguard Manager (HP-UX and Linux)

HP Serviceguard Manager is a free product and provides graphical user interface (GUI)-based management of HP Serviceguard products, including the creation, modification, administration, and monitoring of clusters and packages. HP Serviceguard Manager runs on HP-UX, Linux, or Microsoft® Windows® platforms for Serviceguard clusters on HP-UX and Linux.

HP Serviceguard Manager includes the following features:

- GUI based management
- Cluster, node, and package configuration

- Cluster monitoring
- Cluster administration
- Roles-based access definition
- Hosted on Windows, HP-UX, or Linux for Serviceguard HP-UX and Linux clusters

Figure 1. HP Serviceguard Manager with Event Browser window expanded to show Serviceguard SNMP agent events
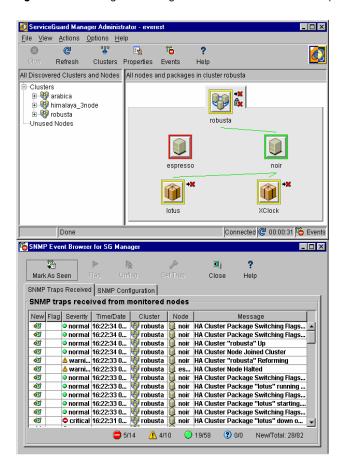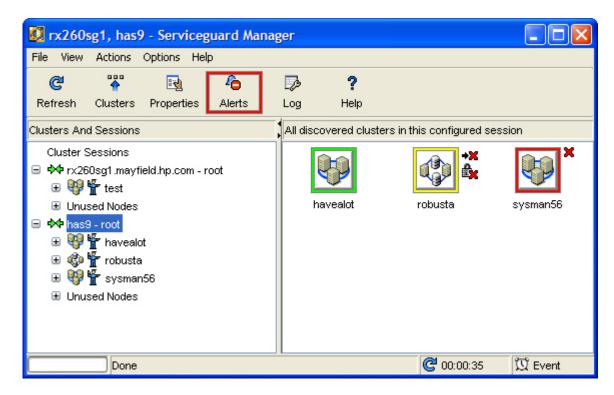
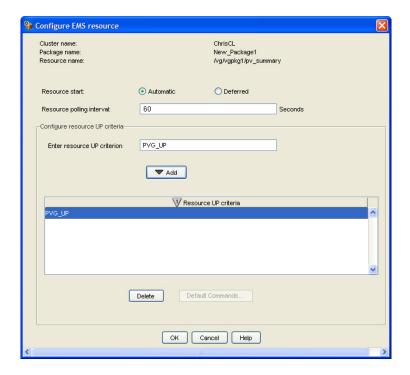**Figure 2.** Multiple cluster map for HP-UX and Linux

HP Event Monitoring Service and HA monitors (HP-UX)

HP Event Monitoring Service (EMS) is a system monitoring application that is included in the HP-UX Enterprise Operating Environment and Mission-Critical Operating Environment and is also available for sale. EMS HA monitors are designed to facilitate real-time monitoring and error detection for HP products in the enterprise environment. This framework provides centralized management of hardware devices and system resources and provides immediate notification of hardware failures and system status.

HP HA monitors help to ensure the highest availability by notifying you of an event before it happens. HA monitors include a database monitor, disk monitor, cluster monitor, network interface monitor, and resource monitor. These monitors can poll hardware, disks, clusters, network interfaces, and system resources, sending event notification or causing a Serviceguard protected application to failover. Event viewers supported include Simple Network Management Protocol (SNMP) managers, the HP-UX system log file, and forwarding of events to e-mail. A toolkit for those who want to develop an event viewer of their own is also included.

Figure 3. EMS resource configuration in a Serviceguard package

Systems management

HP Systems Insight Manager

HP Systems Insight Manager is a cross-platform hardware platform management solution hosted on Windows, Linux, or HP-UX that manages the life cycle of HP servers, storage, clients, printers, and other networked devices. Systems Insight Manager helps IT organizations proactively manage system faults, assets, and hardware configurations on servers and other HP devices from a single application. HP Systems Insight Manager provides a choice of access modes through an intuitive Web-based GUI or a command line interface (CLI).

Systems Insight Manager includes the following features:

- In-depth hardware life cycle management
- Hardware status and fault management
- Systems configuration information
- System software version control
- Inventory data collection
- Provided for and hosted on Windows, HP-UX, and Linux

Enterprise management

HP OpenView Operations

HP OpenView Operations provides a single-pane-of-glass view for close and efficient control of events happening across all systems, creating a "mission control" center for your entire distributed environment. It monitors, filters, correlates, and responds to the thousands of events that occur daily from network devices, systems, databases, and applications. Used to correlate the impact of IT infrastructure on business-critical services, such as e-mail, Enterprise Resource Planning (ERP), and

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e-commerce, HP OpenView Operations builds on an extensive policy base to monitor operating system and application attributes and provide automated responses to common events.

HP OpenView Operations features include:

- Multivendor systems management
- Network topology discovery and monitoring
- Operating system and application events and performance
- Service-level availability
- Heterogeneous platform support

HP OpenView Network Node Manager

HP OpenView Network Node Manager (NNM) provides robust standards-based management for heterogeneous networks of all sizes that require advanced management of routers and switches, sophisticated root-cause analysis, and distributed management for large or complex networks.

Achieving end-to-end management with HP Serviceguard Manager, HP Systems Insight Manager, and HP OpenView management software

HP Serviceguard Manager, HP Systems Insight Manager and HP OpenView management software complement each other strongly, enabling administrators to:

- Develop a consolidated management platform for their heterogeneous Linux and HP-UX IT environments
- Link platform resource availability with service level requirements and business needs
- Simplify IT operations, increase resource availability, and improve business agility
- Reduce administrator training costs with consistent tools across operating systems that interoperate seamlessly

Better together: complementary management delivering the best return on IT

HP Serviceguard clusters can be managed from HP OpenView management software and integrated with Systems Insight Manager to drill down to specific hardware events and root causes, delivering true end-to-end management from the hardware chassis to the business transaction. HP Serviceguard Manager provides a GUI for the creation, administration, and monitoring of Serviceguard clusters and provides automatic integration with Systems Insight Manger and HP OpenView management software.
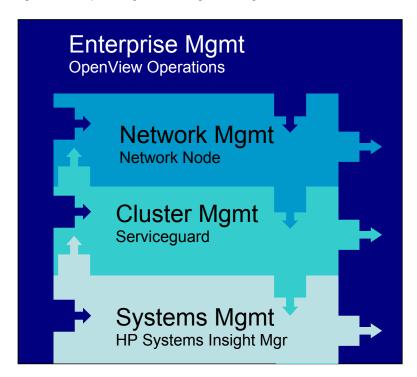
With HP OpenView management software as the primary interface to manage the availability and performance of critical business services, integration with HP Serviceguard Manager and HP Systems Insight Manager enables administrators to correlate HP Serviceguard cluster and HP hardware status with the availability of business service levels and obtain in-depth data for more accurate root cause analysis and faster problem resolution. Add in HP Serviceguard Manager launch capabilities and specific cluster configuration, management, and administration, and you have a cohesive solution that provides full coverage of all components of the highly available environment. For information on Systems Insight Manager and HP OpenView management software integration, refer to the paper titled, "HP Systems Insight Manager and HP OpenView" at http://www.docs.hp.com.

Key benefits

The integration between HP Serviceguard Manager, HP Systems Insight Manager, and HP OpenView management software:

- Maximizes investments in HP Serviceguard clusters, HP hardware, HP Systems Insight Manager, and HP OpenView management software
- Provides a common enterprise platform for cluster, hardware, and service level management
- Synchronizes IT resource availability with business service needs
- Simplifies management operations and enables more efficient use of IT operations staff
- Increases systems and service availability and reduces time to analyze and resolve problems
- Provides access to in-depth HP systems data from within the HP OpenView management software environment

Figure 4. Conceptual diagram of management integration

Enterprise Mgmt
OpenView Operations

Network Mgmt
Network Node

Cluster Mgmt
Serviceguard

Systems Mgmt
HP Systems Insight Mgr

Indicates integration points

HP Serviceguard Manager integration with HP Systems Insight Manager

HP delivers tight integration between HP Serviceguard Manager and HP Systems Insight Manager by means of automatic integration and automatic discovery of clusters and cluster member nodes, status, and event notification. Systems Insight Manager provides robust hardware monitoring, providing enhanced cluster node manageability. Additionally, from the Systems Insight Manager interface, administrators can select a cluster node and launch Serviceguard Manager in the context of the cluster in which the selected node belongs.

Key features of integration

- Automatically identifies and displays HP Serviceguard clusters and status through an HP Serviceguard SNMP sub-agent for HP-UX on the HP Systems Insight Manager interface with unique color-coded icons

- Provides detailed HP SNMP events for cluster, servers, and storage displayed in the Systems Insight Manager event log

- Provides embedded menu item to launch HP Serviceguard Manager

- Integrates into all major Systems Insight Manager host platforms, including HP-UX, Linux, and Windows

- Offers automatic and free of charge download of HP Serviceguard Manager from http://www.software.hp.com
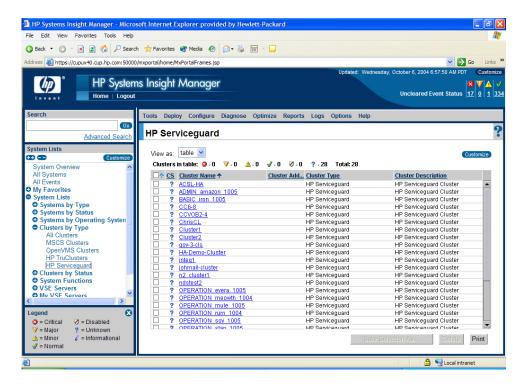
Figure 5. HP Systems Insight Manager with HP Serviceguard Manager integration

HP Serviceguard Manager integration with HP OpenView Network Node Manager

Integration between HP Serviceguard Manager and HP OpenView NNM is automatic when both are installed, which enables users of NNM to manage and administer Serviceguard clusters and view in-depth hardware data from the same common HP OpenView management software console used to monitor enterprise network availability. HP Serviceguard Manager integration also provides translation of SNMP events into easy-to-read messages.

Key features of integration

- Automatically integrates upon installation of Serviceguard Manager into an existing NNM console
- Provides HP SNMP events for cluster and package status, servers, and storage
- Provides embedded menu items to launch HP Serviceguard Manager
- Integrates into all major NNM host platforms, including HP-UX, Windows, and Linux

Integration instructions can be found in the HP Serviceguard Manager release notes, which can be accessed from http://www.docs.hp.com.
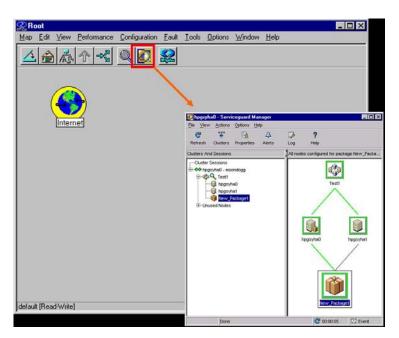
Figure 6. NNM with the program launch integration of Serviceguard Manager
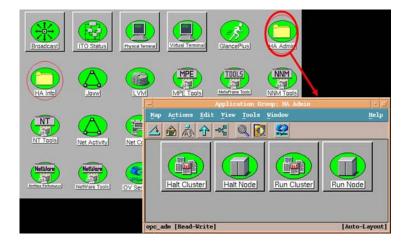
HP Serviceguard Manager integration with HP OpenView Operations

The integration between HP Serviceguard Manager and HP OpenView Operations is automatic and delivers cluster administration capabilities such as running and halting cluster and package. This solution enables IT administrators to administer clusters directly from the HP OpenView Operations console, which enables users of HP OpenView Operations to administer Serviceguard clusters and view in-depth hardware data from the same common HP OpenView management software console used to monitor enterprise service levels. Serviceguard Manager integration creates two folder groups: HA Admin, which enables administrators to halt and run clusters and nodes, and HA Info, which provides the ability to query the cluster configuration, scan clusters, view cluster binary files, and view system logs.

Key features of integration

- Automatic Serviceguard Manager integration when it is installed on an existing HP OpenView Operations console
- High availability SNMP events in HP OpenView Operations
- Embedded menu items and tools, which launch HP Serviceguard Manager tasks as well as the Serviceguard Manager GUI

Figure 7. HP OpenView Operations with HP Serviceguard Manager

Example

A two-node cluster in a main data center provides failover services for critical applications that are accessed from various locations and for customer access through the Internet.

The current management model is to use a consultant who is remote and connects to the systems over a secure internet connection. In the event of a failover, it is important to get notification to their consultant so time can be scheduled to correct the initial failure and restore to full state of redundancy.

The consultant will have remote access to monitor and manage systems and will schedule on-site services within 72 hours of a failure, providing services are still available.

Management solution and objectives

- Consultant can be on-site within two hours of complete system failure.
- HP Systems Insight Manger must be installed at main data center.

- HP Serviceguard Manager must be installed on the same system as Systems Insight Manager (integration into Systems Insight Manager is automatic).
- SNMP will be enabled on all cluster member nodes.
- EMS HA monitors will be configured for SNMP and e-mail.
  - EMS HA monitors will be configured to send e-mail event notification to the consultant's e-mail address.
- Trap destinations will be set on each cluster member node to include the IP address.
- To make Systems Insight Manager highly available, a Serviceguard package will be created for Systems Insight Manager.

Usage scenarios

The following table outlines many common cluster and IT administration roles and the combination of HP management applications used to address the requirements most effectively.

IT administration roles	HP management applications
High availability - Cluster and package creation - Cluster modification - Monitor cluster status - Cluster administration (run, halt, move)	Use HP Serviceguard Manager or command line utilities
Hardware infrastructure focused on: - Maintaining availability of HP servers and other IT hardware platforms - Deploying and managing hardware resources in local and remote offices - Ensuring server driver levels are in accordance with corporate baselines - Running hardware inventory reports	Use HP Systems Insight Manager for in-depth hardware life cycle management + Integrate HP Serviceguard Manager for context sensitive drill-down to cluster specific management
Network administration focused on: - Maintaining availability of hardware platforms across the network - Understanding layout and routing of the network infrastructure - Managing network communications across multiple business sites	Use HP OpenView NNM for comprehensive network management + Extend with HP Serviceguard Manager for cluster management tool launch from NNM console + Extend and complement NNM with the HP Insight Integration module for NNM for HP hardware discovery and fault management from within NNM + HP Systems Insight Manager for hardware life cycle management from the NNM console
Enterprise operations focused on: - Maintaining availability of hardware platforms across the enterprise - Preserving the performance and operations of operating systems and business applications in the enterprise - Monitoring service levels to defined objectives and agreements	Use HP OpenView Operations for broad business operations and service level management + Extend with HP Serviceguard Manager integration for cluster management from the HP OpenView Operations console + Extend and complement HP OpenView Operations with the Insight Manager Smart Plug-In components for hardware status and event translation + HP Systems Insight Manager for hardware life cycle management from the HP OpenView console

IT administration roles	HP management applications
Enterprise operations covering all aspects of management listed previously: • IT hardware platforms • Network infrastructure • Cluster management • Enterprise business operations	Use HP Systems Insight Manager + Extend with HP Serviceguard Manager integration + HP OpenView NNM + HP OpenView Operations

Statement on future direction

HP is committed to evolve cluster manageability as product enhancements and customer environments change and mandate new functionality. Immediate plans include tighter integration with other HP management solutions, such as single system management, virtualization, and volume management tools. Additionally, future plans include failover simulation, centralized logging, and more comprehensive single-point-of-failure analysis and storage and networking configurations.

Summary

Today's economic realities demand that businesses leverage IT investments more effectively to get the best return (RoIT) and create a competitive advantage. HP understands that enterprises are facing changes in their business conditions at unprecedented rates and from a variety of sources. Now, more than ever, staying competitive means maximizing IT infrastructure resources and employing more efficient operation procedures to respond to a demanding marketplace.

The HP vision for the Adaptive Enterprise helps companies synchronize their IT resources, processes, and infrastructure with business strategies. This approach enables businesses to reduce the cost of change and total cost of ownership, simplify management complexity, and provide the enterprise with the ability to rapidly implement solutions that deliver a competitive advantage. With an HP Adaptive Enterprise, IT can rapidly adjust to the changes needed to meet new business initiatives and opportunities.

HP is in a unique position to deliver a complete portfolio of products, solutions, and expertise that enables businesses to develop a truly adaptive enterprise. Together, HP OpenView management software and HP Systems Insight Manager provide a solid and reliable IT foundation, as well as end-to-end capability to manage change and automate the dynamic link between business and IT—the essence of the Adaptive Enterprise.

Appendix A

HP high availability and business continuity solutions for HP-UX and Linux

HP has a family of solutions to meet various high availability and business continuity needs; following is a brief description of each product.

HP Serviceguard (HP-UX and Linux)

HP Serviceguard sits at the foundation of HP HA and business continuity solutions and is designed to protect mission-critical applications from a wide variety of hardware and software failures. It provides support for up to 16 nodes, which are organized into an HA enterprise cluster that delivers highly available application services (up to 150 per cluster) to LAN-attached clients. Serviceguard is currently available for both HP-UX (HP 9000 and HP Integrity based systems) and Linux (HP ProLiant and HP Integrity based systems) environments.

HP Serviceguard Extension for RAC (HP-UX only)

HP Serviceguard Extension for RAC (SGeRAC), formerly called HP Serviceguard OPS Edition, is an add-on product to HP Serviceguard and allows a group of HP 9000 or HP Integrity servers to be configured as an HA cluster that supports Oracle9i and 10g Real Application Cluster (RAC) on both HP-UX PA-RISC and Intel® Itanium® processor family platforms. These two products are tightly integrated to provide the best aspects of HP enterprise clusters and Oracle® relational database servers: high availability, data integrity, flexibility, scalability, and reduced database administration costs.

HP Serviceguard Extension for SAP (HP-UX and Linux)

HP Serviceguard Extension for SAP is an add-on product to HP Serviceguard and extends the powerful Serviceguard failover capabilities to SAP environments. It continuously monitors the health of each SAP node and automatically responds to failures or threshold violations. As an added bonus, it can minimize planned downtime when performing SAP upgrades. Serviceguard Extension for SAP protects the SAP Central Instance and database—business-critical pieces in an SAP environment—within a Serviceguard cluster.

HP-UX HA Toolkits

The HP Enterprise Cluster Master Toolkit (ECMT) is a collection of specific product toolkits that integrate popular applications into a Serviceguard environment. Specific toolkits in the ECMT include HA Internet toolkits (including HP Apache, HP Tomcat, and HP CIFS/9000) and database toolkits for Oracle, Informix, DB2, Sybase, and Progress. (Oracle is only database toolkit available on Itanium). Serviceguard NFS Toolkit is also available separately.

Linux HA Toolkits

Toolkits available for integration into the Serviceguard for Linux environment include Apache, Network File System (NFS), MySQL, Oracle, Samba, PostgreSQL, Tomcat, and SendMail.

Extended Campus Cluster (HP-UX only)

Included with HP Serviceguard for HP-UX is the ability to configure an extended campus cluster. An Extended Campus Cluster has a typical local cluster design and protects two geographically dispersed data centers (up to 100 km apart) from unforeseen circumstances, and it enhances data and application availability. It uses the host-based software MirrorDisk/UX or Veritas VxVM mirroring for data replication. Used with an arbitrator (also know as Quorum Server), Extended Campus Cluster can protect up to 16 nodes.

Included with SGeRAC is the ability to configure an extended cluster for RAC. This active-active disaster-tolerant solution maintains continuous application availability while recovering from the complete loss of a data center. The Extended Cluster is distributed across two data centers up to 100 km apart, with a single database that is replicated and synchronized. All servers are Virtual Server Environment (VSE) enabled.

HP Metrocluster (HP-UX only)

Metrocluster provides automatic and bidirectional failover of mission-critical data and applications. Metrocluster can support data centers geographically dispersed up to 260 km. Up to 16 HP 9000 servers can be active, protected, and capable of handling package failover for each other in each Metrocluster. There are three different Metrocluster solutions:

- HP Metrocluster with Continuous Access XP—Cluster support for data replication with HP StorageWorks XP disk array storage systems
- HP Metrocluster with Continuous Access EVA—Cluster support for data replication with HP StorageWorks EVA disk array storage systems
- HP Metrocluster with EMC SRDF—Cluster support for data replication with EMC Symmetrix disk arrays

HP Continentalclusters (HP-UX only)

HP Continentalclusters is a business continuity product that offers failover over unlimited distances. This solution is based on multiple clusters that are geographically dispersed to provide application recovery. Application data is replicated between two data centers by either storage array-based data replication products, such as HP StorageWorks Continuous Access XP or HP StorageWorks Continuous Access EVA and EMC SRDF, or software-based data replication, such as Oracle 9i Data Guard. Continentalclusters supports local area networking protocols as well as wide area network protocols, thus supporting unlimited distances between data centers.

HP StorageWorks Cluster Extension XP (Linux)

HP StorageWorks Cluster Extension XP allows dispersion of data center resources by enabling cluster systems to take advantage of XP disk arrays configured for HP StorageWorks Continuous Access XP mode of operations. Cluster Extension XP connects the XP disk array software to control XP disk arrays (and Continuous Access XP) with cluster software such as HP Serviceguard for Linux and uses the ability to cluster software to react to system hardware and application failures.

HP Serviceguard Quorum Server (HP-UX and Linux)

HP Serviceguard Quorum Server (QS) is a complementary product of HP Serviceguard and provides arbitration services for Serviceguard clusters when a cluster partition is discovered. Should equal-sized groups of nodes become separated from each other, the quorum server allows one group to achieve quorum and form the cluster, while the other group is denied quorum and cannot start a cluster.

For example, if a node cannot reach another node in the cluster, it will attempt to reform the cluster without the other node. If the nodes are all running but cannot communicate, a quorum count is taken to determine who should take over the work of the cluster. If one group of nodes has more than 50% of the original cluster membership, that group will become the new cluster. However, if the cluster splits into two equal parts, a cluster lock is needed to break the tie and prevent a "split-brain" cluster in which two different incarnations of an application try to do the same work and access the same disks.

For more information

- http://www.hp.com/go/serviceguard
- http://www.hp.com/go/sglx
- http://docs.hp.com