IBM PowerHA SystemMirror for AIX

Proven availability for today's smarter computing environment

Highlights

- Graphical Management—IBM Director Plug-in for both data center and disaster recovery deployments

- Multichannel cluster communications for data center configurations with support for multicast or unicast network configurations

- *HyperSwap*® for active-active two site configurations with the IBM DS8800 and DS8870 storage servers

- Operator managed manual failover policy for multi-site linked clusters

- Federated Security for cluster wide security management

- Enhanced High Availability management support for SAP

The need for robust high-availability solutions

The objective behind implementing a high availability solution is to provide near-continuous application availability through both planned and unplanned outages. Business-critical applications are configured into a cluster which typically involves at least two systems (or nodes); the cluster monitors the critical resources for changes that may indicate a failure, a pending failure, or a possible configuration change. The cluster is monitored for health and for configuration changes that must be made consistent across the cluster. A cluster can also be configured for disaster recovery (DR) by providing clustering capabilities across geographically dispersed locations. As a best practice, IT shops conduct periodic disaster recovery tests to demonstrate compliance with corporate policy. Compliance tests can be both operationally expensive (tying up critical resource for the duration of the test) and cause business impact. Many companies simply cannot afford to have the IT operations unavailable for an extended DR test and therefore implement a cluster to simplify and shorten the test.

PowerHA SystemMirror Standard Edition and PowerHA System Mirror Enterprise Edition with Cluster Aware AIX (CAA), kernel-based health management, Graphical Management, HyperSwap and other integrated features are designed to provide a robust HA/DR environment focused on ease of implementation and ease of use.

PowerHA SystemMirror V7 for AIX

PowerHA SystemMirror V7 represents the next generation of solutions for high availability and disaster recovery. This offering integrates core clustering technology into the kernel and the OS, enabling our customers to be more productive and deliver higher quality IT services while enjoying a more robust and easier-to-manage clustering environment.

The IBM PowerHA SystemMirror for AIX Standard Edition features Cluster Aware AIX, which provides the strategic foundation for Power Systems Software. It enables PowerHA to do kernel level messaging, event management, and monitoring in coordination with AIX. PowerHA features a Director-based management interface, a set of Smart Assists and a number of other enhancements that will make the solution more robust and self managing.

PowerHA SystemMirror monitors numerous soft and hard errors within the cluster from various event sources, including problems that are severe enough to immobilize the system (such as a process failure or exhaustion of system resources). With PowerHA V7, monitoring and event management have been moved into the kernel of the operating system (OS), which provides a robust foundation not prone to job scheduling issues or other events related to OS operations. Cluster awareness enables operating-system-based functions to operate harmoniously with PowerHA. PowerHA SystemMirror is integrated with cluster-aware AIX and exploits the operating system features by extending them across the cluster, enabling efficient centralized management.

The PowerHA V7 graphical interface makes cluster management simpler and more productive by providing a secure, centralized point of operations. An administrator can readily deploy clusters and resource groups using the associated wizard. It provides live updates by graphically displaying the status of resource groups, nodes, sites, and clusters. With a single view you can see the health of the entire enterprise at a glance. With the V7 Enterprise Edition; geographically dispersed PowerHA SystemMirror clusters. You can use your Director based graphical user interface to deploy, monitor and manage your enterprise across multiple data centers.

PowerHA SystemMirror V7 provides Smart Assists for easier, out-of-the-box HA setup and application management for many well-known middleware products. The smart assists are high-availability agents for application deployment and management. Smart Assists are used to define high-availability

policies and also to discover software that is deployed within the cluster. Discovery-based information aids in defining the high-availability policy and provides periodic health monitoring, enabling middleware and resource dependencies to be restarted via the specified policy. With PowerHA SystemMirror V7 the Smart Assist portfolio supports DB2®, WebSphere®, MQSeries, Oracle, SAP, SAP MaxDB, Enterprise Content Manager, TSM, Lotus® Domino® Server, IBM LDAP, IBM HTTP printers, and FileNet. PowerHA SystemMirror also includes Smart Assists to deploy and manage the LiveCache and Netweaver environments.

PowerHA SystemMirror for AIX Enterprise Edition

Increasingly, IT organizations are being asked to provide multi-site configurations for disaster recovery as well as to periodically demonstrate compliance to corporate policy and regulations. In the past, this was typically a recover from tape operation or a reboot operation at the remote location. The

PowerHA SystemMirror Enterprise Edition is essential for clients who must both protect themselves from site-wide failures as well as to be able to readily demonstrate the capability to do so. PowerHA V7 enables clients to choose an operator managed failover policy for multi-site linked clusters. In this mode, the operator is the final arbiter deciding whether or not to failover to the alternate site.

Storage servers or host based replication provide the data replication services and the Enterprise Edition provides management and automation of the failover process. PowerHA SystemMirror Enterprise Edition V7 supports HyperSwap configurations with the IBM DS8800 or DS8870 in a Metro Mirror configuration. This advanced technology provides the capability for a cluster to span two sites with the storage and servers cross coupled in a manner that keeps the application resilient through either a storage server or a production server outage (for active-active workloads). HyperSwap can also be deployed in single AIX LPAR configurations. Customers can enable HyperSwap for multi node cluster configurations while at the same time exploiting the storage mirroring and swapping capabilities for single node AIX LPARs not in the cluster.

Geographically dispersed configurations can be deployed via a stretched cluster configuration defined as having a single cluster repository or via a linked cluster configuration with two independent yet linked cluster repositories. A stretch cluster can also be deployed with the Standard Edition and LVM mirroring in a cross site mirror configuration similar to what clients have deployed in previous versions. The stretched cluster configuration provides three levels of cluster communication redundancy via multi-cast across the network, SAN fabric and repository disk. Multicast network communication requires that switches on the network fabric connecting the hosts allow multicast IP packets to flow through them. PowerHA V7 also supports clustering based on non-multicast (unicast) IP communication for data center deployments.

- The Enterprise Edition with the GLVM (Geographic Logical Volume Manager) component provides host-based synchronous and asynchronous data replication and failover to remote sites. You can economically deploy your own disaster recovery solution with the GLVM configuration wizard.
- The Enterprise Edition supports IBM Storage Systems DS8800, SVC, V7000 and XIV with either Metro Mirror or Global Mirror, enabling automatic failover between geographically dispersed data centers. The Enterprise Edition also supports multi-site replication with select storage server options from EMC and Hitachi.

PowerHA SystemMirror enhancements and capabilities

PowerHA SystemMirror V7 for AIX is integrated with Cluster Aware AIX to exploit its most powerful features:

- AIX kernel based heart beat and cluster communication. Multicast heartbeat management discovers and uses available data center network and SAN fabric resources. With PowerHA V7 Standard Edition, the client has the option of choosing either multicast or unicast communications.
- Linked clusters with unicast management enables kernel based communications between sites.
- Support for cluster wide device naming for simplified storage management.
- Cluster repository for name space management, cluster configuration, and internode synchronization.
- Cluster-wide, kernel-based event monitoring and communications for networks and storage providing notification of outage events such as root volume group failures and kernel crashes.
- PowerHA Federated Security enables customer setup for LDAP based central security policy that applies to all the nodes in a cluster or multiple clusters. Role based access control, Encrypted File System and roles for delegated non-root cluster administration are some the features managed across the cluster.

- Director-based user interface enables intuitive cluster management for configuring, monitoring and managing data center and multi-site clusters from the management console.
- Fencing disks or disk groups; shuts off access to the shared disks in the cluster from other nodes preventing accidental access.
- Multicasting exploits the Storage Area Network (SAN) links for cluster communications. The SAN links in the data center are used as an alternative high-speed communications channel in addition to the traditional network links.
- Unicasting and linked clustering provides the capability for multi-site communications across the SAN fabric in addition to the traditional network. Unicasting is also available for datacenter configurations.
- Resource group and policy definition interfaces enable relationship management between multiple resource groups within the cluster.
- Custom resource management and resource group relationships such as Start After and Stop After dependencies are supported.
- PowerHA SystemMirror solution doesn't require a system shutdown for installation; enabling on-the-fly start-up without application outages (migrating to a major release such as 7.1 will require a node outage).
- PowerHA supports rolling upgrades that allow the administrator to reduce the service outage time by optimally relocating the workload across the nodes in the cluster during a migration or upgrade.

Administration, event processing and application recovery:

- Cluster Aware AIX and PowerHA SystemMirror V7 integrate to provide kernel-based monitoring and event management, meaning minimal administration and immediate cluster-wide communications.
- Centralized cluster network and storage repository for inter-node synchronization minimizes administration responsibility for monitoring and maintaining individual nodes for configuration consistency.

- PowerHA provides a rich set of high availability management tools for the SAP Advanced Planning Optimizer environment supporting the LiveCache Hot Standby solution. SAP, PowerHA and disk subsystem work in unison to enable a standby system that tracks the activities of the SAP stack on the primary and can failover and recover the entire stack in minutes instead of hours.
- The PowerHA Smart Assist also enables customizable HA solutions for Neteaver environments.
- Device fencing insures no one other than the primary node has access to shared disk resources.
- PowerHA SystemMirror smart assists enable faster installation and application management by automating set up with resource dependency discovery and management.
- Director-based interface provides an intuitive interface for centralized cluster management, greatly minimizing cluster administration time and effort as well as providing immediate notification to events and health management issues across multi-site deployments as well as the data center.

Provide disaster recovery across multiple sites for AIX environments:

- AIX Logical Volume Manager (LVM) split-site mirroring for high availability in SAN environments
- PowerHA SystemMirror Enterprise Edition provides a portfolio of tools that perform automatic recovery of hardware and software failures across disparate geographic distances. This portfolio includes:
  - GLVM technology for host-based synchronous and asynchronous remote data mirroring and failover
  - Support for System Storage Metro Mirror and Global Mirror for DS8800 and SAN Volume Controller, XIV and V7000
- Manage and move workload Service IP address (same ones or different ones) between remote sites, allowing users the flexibility to take over IP workloads at back-up locations
- Concurrent mode access allows active applications and data synchronization at a local site, while still backing up to a secondary site

Smart Assists streamline implementation and configuration

A set of HA agents, called Smart Assists, are bundled with the PowerHA SystemMirror Standard Edition to help discover and define HA policies for most common middleware products.

PowerHA SystemMirror Smart Assists for AIX simplify implementation and configuration of PowerHA SystemMirror 7.1 supporting DB2, WebSphere, MQSeries, Oracle, SAP, SAP MaxDB, Enterprise Content Manager, TSM, Lotus Domino Server, IBM LDAP, IBM HTTP and printers, and Netweaver environments. The Smart Assists package is customizable and provides the necessary application monitors and start/stop scripts to streamline the configuration and management of these application environments. Smart Assist provides comprehensive HA management for SAP NetWeaver environment it provides capability to customize the health management and monitoring policies of the SAP environment. Global file system can be part of the cluster or outside of the cluster. Additionally, multiple instances of SAP deployment can be managed through the SAP Smart Assist provided by PowerHA. Many customizations and related configuration parameters are supported which will allow the SAP field practitioner to enable HA management for many varied SAP deployments.

Complementary cluster software

IBM also offers a broad range of additional tools to aid in efficiently building, managing and expanding high-availability clusters in AIX environments. These include:

- PowerVM® enables you to move running workloads via Live Partition Mobility between servers to maximize availability by avoiding planned downtime and to dynamically adjust server capability to meet changing workload demands

- General Parallel File System (GPFS™) is a high-performance, shared-disk file system using standard UNIX file system interfaces and providing concurrent access to data from all nodes in a cluster. GPFS currently supports several of the world's most powerful supercomputers and can be configured to provide extremely high reliability by eliminating many single points-of-failure (which are typical of network and SAN file systems)
- Tivoli® Storage Manager provides enterprise management of backup and recovery to tape or disk
- GLVM is the AIX host-based mirroring over IP networks
- Workload Manager for AIX, which provides resource balancing between applications

New generation of servers

The PowerHA SystemMirror solution runs under the AIX and IBM i operating systems on IBM Power Systems™. Through innovative technology, logical partitioning, broad support of open standards for application flexibility and a full range of tools to manage IT infrastructure, these servers offer the performance, availability, scalability and infrastructure management demanded by today's growing on demand business environments. They combine the benefits of IBM Power Architecture® technology and mainframe-inspired reliability, availability, and serviceability (RAS) features with the OS for efficient handling of mission-critical applications.

Gaining the IBM advantage

High-availability solutions from IBM provide clients the confidence that comes from integrated design and testing. This reduces the risk of failures resulting from combining disparate components from multiple vendors and can be a critical factor for business environments. IBM high-availability solutions provide the advantage of IBM Power Systems, the AIX or IBM i operating systems, IBM TotalStorage® Proven offerings and PowerHA SystemMirror software.

IBM Power servers with PowerHA SystemMirror clusters are backed by comprehensive offerings and resources that provide value at every stage of IT implementation. These include High Availability Cluster Implementation Services, an offering that provides basic and customized assistance for installation of PowerHA SystemMirror clusters. This service is customizable with the following elements:

- High Availability Cluster Proof of Concept Review
- Planning and design of an Availability Cluster
- Installation and configuration of an Availability Cluster
- Application integration assistance (e.g. DB2, Oracle, WebSphere, SAP, Enterprise Content Manager)
- Development and execution of a Cluster Test Plan
- Enhanced monitoring and reporting setup
- Operations planning and operations documentation development
- Migration/upgrades services
- The Power Systems HACoC

Based on an assessment of the complete system environment, IBM availability experts can design a client solution to meet the target availability level for on demand business needs.

For more information

To learn more about the PowerHA SystemMirror solutions, contact your IBM marketing representative or IBM Business Partner or visit the following websites:

- **ibm.com**/power/software/availability
- **ibm.com**/power/software
- **ibm.com**/power
- Redbooks: redbooks.ibm.com
  - V7 Standard Edition: SG248030 (http://www.redbooks.ibm.com/abstracts/sg248030.html?Open)
  - V7.1.2 Enterprise Edition SG248106 (http://www.redbooks.ibm.com/abstracts/sg248106.html?Open)
  - PowerHA for AIX Cookbook: SG247739 (http://www.redbooks.ibm.com/abstracts/sg247739.html?Open)