HP Serviceguard Solutions

Protect your business with uncompromising resiliency

March 2014

Disaster recovery for your most critical workloads

Do you know how much unplanned downtime your organization experiences every month? What would you estimate your monthly downtime to be? If you have a number in mind, chances are your estimate is considerably lower than the unplanned downtime reported by organizations similar to yours.

While IT is becoming increasingly integral to the outcome of your business, more applications are being classified as mission critical. These changes are occurring so rapidly that you may not completely apprehend their implications. Assessing your IT needs and addressing these problems successfully requires considering downtime and complexity as two intertwined issues. HP Serviceguard Solutions for HP-UX 11i enable robust high availability and disaster recovery in one converged infrastructure to help your business excel.

The impact of downtime on your organization can be radically reduced by employing HP Serviceguard Solutions to transparently maintain the health of your infrastructure. Additionally, the portfolio includes tools to enhance the manageability of your entire environment, extending coverage from hardware and software to reduce human error. This data sheet gives you a clear understanding of the features and benefits of various products within the HP Serviceguard Solutions family and how they can help you maintain continuous business.

HP Serviceguard

HP Serviceguard

Experience increased availability with HP Serviceguard high-availability clustering software, which is the foundation of every HP Serviceguard business continuity solution.

When you need your business to perform at its full potential, it is not enough to protect only bits and pieces of it. This is why HP Serviceguard combines all of your critical services, such as an application or a database, together with their associated resources. It monitors the resulting package for any faults related to hardware, software, operating system, virtualization layer, network, and storage. When a failure is detected, HP Serviceguard shuts down the application, restarts it on an available server in the cluster, connects it to the appropriate storage device, and resumes normal operations—all in a few seconds—to reduce the possible impact on your business.
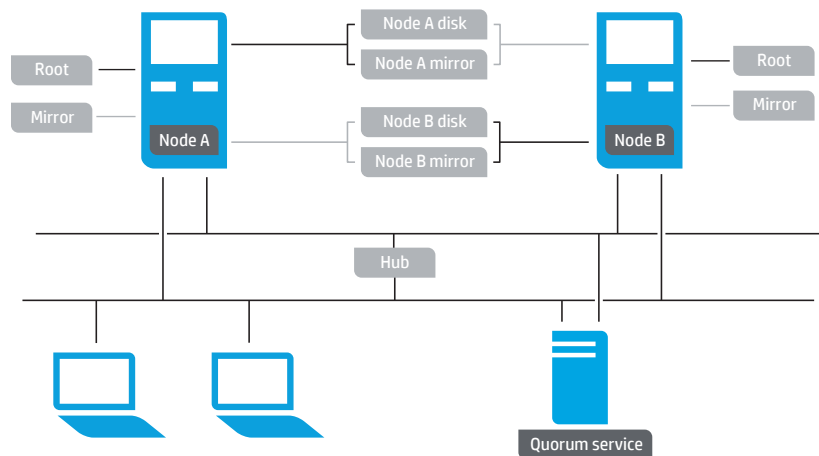
Your IT needs to manage multiple tiers of applications together in a controlled and well-defined way. Let HP Serviceguard craft and control the relationships between these applications in an automated and standardized way. This will help in clustering, managing, and monitoring your workloads exactly how you want to, reducing complexity to save you time and money.

You can strive for continuous availability using redundant hardware along with HP Serviceguard. This can help you remove single points of failure. A typical local cluster with this architecture is shown in figure 1.

Capabilities

• Comprehensive protection against hardware, software, virtualization, network, and storage faults

• Advanced cluster arbitration mechanisms to prevent data corruption and loss

• Seamless integration with the HP Matrix Operating Environment to help increase resource utilization and flex resources in real time, to maintain service levels after a failover or disaster

• Complete support for both physical and virtualized server environments

• Complete integration with utility pricing to synchronize movement of hardware resources and software licenses along with a service during failover

• The cluster file system (CFS) works in conjunction with Oracle Disk Manager to significantly improve I/O performance and simplify application installation and ongoing management, particularly for Oracle Real Application Clusters (RAC) databases; Oracle Disk Manager can be used with both single-instance Oracle on a regular file system or CFS, and with Oracle RAC over a CFS

• Complete scalability for large clusters with no degradation in failover speed

• Ease of installation and configuration

• Reduced planned downtime associated with the maintenance of HP Serviceguard through Live Application Detach

• Simple cluster customization and replication

Figure 1. A basic HP Serviceguard cluster

Technical specifications

HP Serviceguard A.11.20

Cluster types	Active/active, active/standby, rotating standby
Quorum	Yes
Maximum nodes	Fibre Channel: 16; single-path SCSI: 2; multipath SCSI: 4
Operating systems	HP-UX 11i v3
Supported nodes	All HP Integrity and HP 9000 servers (including mixed clusters) HP Integrity Virtual Machines, vPars, nPars
Fibre Channel	HP Modular Smart Array (MSA) HP Enterprise Virtual Array (EVA) HP XP disk arrays HP 3PAR StoreServ 7000, StoreServ 7400, StoreServ 7450 (all-flash array), and StoreServ 10000 Arrays EMC Symmetrix EMC CLARiiON
SCSI storage	HP MSA
iSCSI storage	HP LeftHand P4000 Storage (through software initiator)
File systems	Base VxFS, Full VxFS, CFS, and NFS
Volume managers	LVM, VxVM, and CVM
Data replication	HP Continuous Access for XP and EVA disk arrays HP 3PAR Remote Copy software Symantec Veritas Mirroring HP MirrorDisk/UX EMC Symmetrix SRDF
Application integration toolkits and extensions	HP Serviceguard NFS Toolkit HP Serviceguard Enterprise Cluster Master Toolkit HP Serviceguard Extension for SAP HP Serviceguard Extension for RAC HP Serviceguard Extension for Oracle E-Business Suite HP Serviceguard Toolkit for Database Replication Solutions HP Serviceguard Developer's Toolbox
Disaster recovery	Yes (described later)
Interconnects	Gigabit Ethernet, HyperFabric, Fibre Channel, InfiniBand, 10 GbE
Management	HP Serviceguard Manager, HP OpenView, HP Systems Insight Manager

Table 1. HP Serviceguard 11.20

Features	Benefits
New! Load sensitive package placement	Increased resource utilization with improved workload balancing across a cluster via HP Serviceguard's best-fit, load-sensitive package placement to nodes with either the highest remaining or least-used capacity
HP LeftHand P4000 Storage SAN support	Provide support for HP LeftHand P4000 Storage arrays with iSCSI connectivity through software initiator
vPar 6.1 and IVM 6.1	Provide support for vPar 6.x and HP Integrity Virtual Machines (IVM) including monitoring capability of vPars and virtual machines as nodes as well as packages
Utility to migrate legacy style packages to module style packages	Enable easy migration from legacy to modular style packages and optionally consolidate CFS mount point/disk groups packages
Suspend halt feature enablement	Halt an application gracefully during a manual package shutdown for applications to resume quickly
Support for System Fault Management (SFM)	Use HP Serviceguard to provide a framework to allow integration with SFM monitors; this framework enables monitors from other monitoring resources as well as allows users to integrate monitors from any source
Easy deployment for partner products	Enable the configuration of packages, storage, and clusters using HP Serviceguard Manager for Disaster Recovery Solutions, HP Serviceguard Extension for Oracle RAC, HP Serviceguard Extension for SAP, and HP Serviceguard Storage Management Suite (SG SMS)
CFS disk group multiple mount points in a single package	Benefit from improved manageability with reduced package count and the capability to configure multiple disk groups and mount points through a single modular package
Parallel halt multinode package performance improvement	Reduce the package halt time by up to 90 percent on a 16-node cluster by a parallel halt of packages[1]
Cluster-wide device file names	Access the same storage device (disk or LUN) from all nodes in a cluster with the same name, reducing time and effort, when managing clustered storage, by nearly 90 percent[1]
Easy deployment	Create mount directories, volume groups, logical volumes, and file systems, and distribute them to all packages by using a single command—allowing a cluster to be created in minutes
Multinode package start performance enhancements	Get 90 percent faster application startup[1] by initiating packages in parallel instead of sequentially
Live Application Detach	Halt a node or the cluster without halting the packages its currently running; perform HP Serviceguard online hardware changes while the application continues to run, reducing planned downtime
Cluster verification	Verify whether packages in the cluster are able to fail over and the cluster is configured correctly with a single, easy-to-use command that can also be automated to further reduce unplanned failures due to human errors
NFS file type support	Achieve storage configuration flexibility with Package Manager enhancement, allowing support of NFS in a modular package as a file type required for certain applications
Integration with HP-UX 11i v3 Dynamic Root Disk	Reduce planned downtime significantly when performing upgrades to HP Serviceguard by performing upgrades on clones instead of active systems; avoid downtime except for that incurred when rebooting from the upgraded clone
Fast cluster reformation	Reduce downtime and its associated revenue impact by delivering full scalability of failover speed regardless of cluster size, and enabling faster failovers
IP-level network monitoring across routers and subnets	Achieve more comprehensive and faster recovery from network failures; very flexible networking configurations; robust and rapid network detection for a large variety of failure scenarios; restore network communications transparently with redundant interfaces
IPv6-compliant clustering	Supports federal mandates for IPv6; allows full IPv6 or mixed IPv4/IPv6 clusters and supports IPv6 for any subnet configured into the cluster, including subnets that carry the cluster heartbeat and those connected to a quorum server (critical for organizations that require IP addresses for growth)
Robust monitoring	Provide comprehensive protection against hardware, software, virtualization, network, and storage faults
Advanced cluster arbitration mechanisms	Prevent data corruption and loss; flexible configuration options include lock LUN, lock disk, and quorum server
Centralized logging and advanced log-filtering features	Enable a highly available log consolidation server
Rapid automatic detection and recovery time	Prevent failed nodes from jeopardizing the integrity of application data
Ability to survive multiple node failures	Increase application availability and reduce operator error
Fast failback	Provide superior protection
Rolling upgrades	Reduce application downtime during system maintenance and upgrades
Multiple cluster configurations—active/active, active/standby, and rotating standby	Provide flexible configuration options and complete support for extensive virtualization models
Integrated workload balancing capabilities for static resource environments	Avoid overload of servers after a failure in fixed-resource environments by placing packages with fixed weights onto nodes with predefined capacities
Complete integration with the Matrix Operating Environment	Enhance resource utilization and flex resources in real time to maintain service levels after a failover or disaster; maintain server-level objectives during planned and unplanned downtime
Full support for both physical and virtualized server environment	Enable cluster physical servers, HP nPartitions (nPars), HP vPartitions (vPars), or HP Integrity Virtual Machines to react to software/hardware failures while assisting with consolidation
Complete integration with HP Utility Pricing solutions	Synchronize movement of hardware resources and software licenses along with a service during failovers

[1] Based on HP internal testing comparing to older versions, 2010

HP Serviceguard Manager

Save time and money on your IT operations with HP Serviceguard Manager, a simple graphical user interface (GUI) that provides configuration, administration, and monitoring capabilities for HP Serviceguard, HP Serviceguard Extension for SAP (SGeSAP), HP Serviceguard Extension for RAC (SGeRAC), and HP Serviceguard Disaster Recovery Solutions.

Now you can fully understand and maintain your clusters with a summary of their health, and the status of each node and each package within them. You gain great oversight with a color-coded summary of the health and configuration of all clusters, as well as the status of each node and package. In addition, you have the ability to drill down and proactively manage clusters, systems (nodes), and packages that run each of your applications.

Take advantage of this effective control of your infrastructure and applications with end-to-end management from hardware chassis to applications through integration with HP Systems Insight Manager, HP Virtualization Manager, and HP OpenView. Free of charge with HP Serviceguard, HP Serviceguard Manager is a Web-based, HP System Management Homepage plug-in application helping further simplify your complex IT infrastructure.

Capabilities

• Allows viewing the cluster status at a glance through a Cluster Topology Map

• Maintains consistency of configuration files on cluster member nodes

• Provides administration for clusters, nodes, and packages

• Enables management and configuration of multiple clusters using CLI and GUI options

• Provides centralized logging and advanced log-filtering features that enable a highly available log-consolidation server

• Provides command fan-out tools to execute shell commands and distribute files across your HP Serviceguard clusters

• Supports administration functions, including:

  – Run, halt, or move a package through drag and drop (standalone version)

  – Run or halt a node or a cluster

  – Use of easy-to-understand confirmation dialogs

• Monitors functions to act on changing status

  – An alerts panel reports cluster status in one place

  – An SNMP event browser displays all SNMP traps generated by HP Serviceguard nodes (standalone version)

  – An auto-refresh feature provides automatic updates, including property sheets

• Provides command-line preview of configuration operations

• Delivers package dependency graph

Technical specifications

HP Serviceguard Manager B.03.30

Supported clusters plug-in	Software requirements plug-in
• HP Serviceguard version A.11.17.01 or later	• Any Web browser supported by HP System Management Homepage
• SGeRAC A.11.17.01 or later	
• SGeSAP B.05.10 or later	
• Enterprise Cluster Master Toolkit (ECMT) B.06.00 or later	
• NFS Toolkit A.11.31.07 or later	
• HP Serviceguard Metrocluster (all versions compatible with HP Serviceguard versions A.11.17.01 or later)	
• HP Serviceguard Continentalclusters (all versions compatible with HP Serviceguard versions A.11.17.01 or later)	

Table 2. HP Serviceguard Manager B.03.30

Features	Benefits
Support for EnterpriseDB Postgres Plus Advanced Server (PPAS)	Administer and monitor HP Serviceguard toolkit for EnterpriseDB PPAS
Support for SFM	Enable support for simple and extended generic resources using SFM
Support for IBM DB2 High Availability and HP Serviceguard Toolkits for Database Replication Solutions	Provide GUI-based configuration, monitoring, and administration for the IBM DB2 HADR Toolkit, which is part of the HP Serviceguard Toolkit for Database Replication Solutions; simplify configuration by auto-discovering values for IBM DB2 Toolkit
Site Aware Disaster Tolerant Architecture cluster configuration and administration	Deliver enhanced usability with GUI-based interface for configuring site-aware clusters, as well as managing three data center (3DC) configurations
Manual site-switching support	Enable the operator to specify the failover site manually
Integration with HP Serviceguard Extension for Oracle E-Business Suite, HP Serviceguard Extension for SAP, HP Serviceguard Toolkit for Oracle Data Guard, and HP Serviceguard NFS Toolkit	Provide GUI-based configuration for value-added products; a single tool for all key configurations
Easy deployment of CFS cluster	Enable simplified configuration of HP Serviceguard with CFS, with a GUI-based configuration for system multinode package
Easy deployment for partner products	Easy configuration of packages, storage, and clusters using HP Serviceguard Manager for Disaster Recovery Solutions, HP Serviceguard Extension for Oracle RAC, HP Serviceguard Extension for SAP, and HP Serviceguard Storage Management Suite (SG SMS)
Improved CFS integration (CFS multiple disk group mount point)	Allow users to merge multiple mount point and disk group packages that are needed for a single application
Usability enhancements	Enable support to open Toolkit README file in the GUI, as well as single-click access to package logs for easier troubleshooting
Easy deployment	Provide simplified creation of clusters using a graphical wizard that creates a simple cluster with just a few clicks
Easy storage configuration	Benefit from the wizard that automatically discovers available file systems and volume groups across a cluster to accelerate storage configuration by up to 50 percent[2]
SGeSAP management	Make use of the intuitive wizard to cluster SAP® using SGeSAP for step-by-step configuration and monitoring
Cluster verification	Validate changes done to the cluster quickly so that a cluster is configured correctly and behaves as expected
Live Application Detach	Halt a node or the cluster to perform HP Serviceguard or hardware changes while applications continue to run
Metrocluster management enhancements	Take advantage of Metrocluster modular package configuration, monitoring, and administration, including the Metrocluster site-aware clusters capability
Integrated package dependencies	Control dependencies between packages precisely without custom scripting for orderly startup and shutdown of interdependent applications to save up to 25 percent on administrator time and effort[2]
Online cluster maintenance	Change the configuration of the quorum server, the lock disk, the lock LUN, or change an interface from IPv4 to IPv6, or vice versa—all while the cluster is running
Online package maintenance	Perform configuration changes to modular and legacy packages while the package is running
Command preview	Preview the effect on packages of certain actions or events before they actually occur
Partial startup maintenance mode	Allow a package to be put into a partially started state for maintenance purposes and easier iterative testing during deployment
Command fan-out tools with HP-UX Distributed Systems Administration Utilities (DSAU)	Execute shell commands and distribute files across your HP Serviceguard clusters—send the same command to all systems in your configuration in a single action
Configuration synchronization with DSAU	Specify a specific server as your configuration master with all other systems defined as clients. The configuration master retains copies of all files you want synchronized across your clients. Synchronization actions can include updating client files from the configuration master, executing shell commands, or checking for certain processes
Log consolidation with DSAU	Logs from all systems you manage, whether in a cluster or not, and can send their logs (system, package, and cluster) to a single location on the consolidation node from which they are easily monitored; the GUI front end is also integrated into HP Serviceguard Manager
Cluster Topology Map	Provide comprehensive monitoring, color-coded, graphically-intuitive icons, online status, and configuration information for multiple clusters and their member nodes; HP Serviceguard Manager enables a user to view cluster status at a glance and manage a cluster via a graphical map, alerts panel reports cluster status in one place; auto-refresh provides automatic updates, including property sheets
Unified manageability	Identify nodes that are VMware guests, Integrity VM hosts, Integrity VM guests, nPars, or vPars with context-sensitive links to HP Partition Manager (on nPars) and HP Integrity Virtual Machines Manager, fully integrated with HP Systems Management Homepage and HP Systems Insight Manager

[2] Based on HP internal testing comparing to older versions, 2010

HP Serviceguard Toolkits

Simplify application integration with the plug-and-play capabilities of HP Serviceguard Toolkits.

To protect your mission-critical workloads, HP Serviceguard Toolkits instruct HP Serviceguard on how it should monitor a specific application or service and what to do in the event of a failure. Because of its unique design, our simple HP Serviceguard Toolkit framework presents a standardized, simple mechanism to integrate virtually any application or service into your cluster.

Capabilities

• Cluster Topology Map to view the cluster status

• Precisely integrated services

• Complete support from HP

• Reduction in time and effort

• A common look and feel for each clustered application

HP Serviceguard NFS Toolkit

Leverage HP Serviceguard to set up highly available NFS servers using configuration files and control scripts of HP Serviceguard Network File Server (NFS) Toolkit with configuration files customized for each end-user's environment. A special script monitors the health of NFS services; if one of your services fails, the monitor issues a restart on the local node or triggers a node switch.

HP Serviceguard Toolkit for Database Replication Solutions

Speed-up the integration of industry-standard database replication tools into an HP Serviceguard cluster with HP Serviceguard Toolkits for Database Replication Solutions. With HP Serviceguard Toolkit for Oracle Data Guard and the HP Serviceguard Toolkit for IBM DB2 High Availability and Disaster Recovery (HADR), it complements the high availability provided by Oracle Data Guard or IBM DB2 HADR to lower downtime and data loss in your data center. The HP Serviceguard Toolkit for IBM DB2 HADR provides high availability for both primary and standby databases, as well as the capability to manage the role of the DB2 HADR database automatically.

HP Serviceguard ECMT

Accelerate the integration of major industry databases and Internet servers into a HP Serviceguard cluster with HP Serviceguard Enterprise Cluster Master Toolkit (ECMT). This bundle includes HP Serviceguard Toolkits for Oracle single-instance database, Apache Tomcat, HP CIFS/9000 Client, IBM DB2 software, MySQL, and Sybase.

HP Serviceguard Developer's Toolbox

Develop any toolkit to fit all your needs. HP Serviceguard Developer's Toolbox enables independent software vendors and customers to develop their own toolkits quickly with a validation loopback to the HP development team at no charge.

Technical specifications

HP Serviceguard A.11.20

Databases	
Oracle	10g R1, 10g R2, 11g R1, 11g R2 (on HP Integrity with HP-UX 11i v3), with or without Oracle ASM
IBM DB2	V9.1 HP Integrity and HP 9000 servers V9.5, V9.7, and V10.0 on HP Integrity servers
MySQL server	5.0.56 and later
Sybase Adaptive Server Enterprise	15.0.2 and later
EnterpriseDB PPAS	PPAS 9.0, PPAS 9.1
Internet servers	
HP Apache	B.2.0.55.03 and later
HP CIFS/9000	A.02.03.01 and later
Tomcat on HP-UX	B.5.5.9.04 and later

Table 3. HP Serviceguard Solutions 11.20 Toolkit

Features	Benefits
Support for Integrity Virtual Machines 6.1 and vPar 6.1	Support IVM 6.1 and vPar 6.1 and allows support for online migration of IVM 6.1 guests when configured as HP Serviceguard nodes
EnterpriseDB PPAS support	Simplify integration of EnterpriseDB PPAS database in HP Serviceguard environment that allows start, stop, and monitoring of EnterpriseDB PPAS instances
HP LeftHand P4000 Storage support	Support HP LeftHand P4000 Storage array through iSCSI software initiator
Coexistence of ECMT and HP Serviceguard Extension for RAC	Increase flexibility with the ability to have Oracle RAC and Oracle single-instance databases in the same HP Serviceguard cluster
Support for IBM DB2 Database Partitioning feature	Provide ECMT IBM DB2 toolkit support for Database Partitioning feature
Easy deployment and cluster verification for Oracle single-instance toolkit	Achieve ease of configuration with a smaller number of manual steps, as well as increased availability with the capability to verify a cluster set
Live Application Detach for ECMT	Halt a node or the cluster without halting the packages that are currently running on those nodes to perform HP Serviceguard or online hardware changes while the application continues to run, reducing planned downtime
Enhanced file system support	Enable support for Oracle 11g R2 with CVM/CFS 5.0.1 and 5.1 SP1. Support for Apache and CIFS with CVM/CFS 5.1 SP1
Prewritten, tested, and supported toolkits for error-proof clustering of key applications and databases	Deliver extensible infrastructure to accommodate any application and its resources (available for all major services, applications, and databases—completely supported, tested, and qualified by HP) • HP Serviceguard ECMT • HP Serviceguard NFS Toolkit • HP Serviceguard Toolkit for Oracle Data Guard
Common look and feel for each cluster service	Reduce time and effort, and dependency on expertise
HP Serviceguard Developer's Toolbox	Facilitate quick, easy, and correct integration of an application into a HP Serviceguard cluster with a validation loopback to HP

Table 4. HP Serviceguard Toolkits for Database Replication Solutions

Features	Benefits
HP Serviceguard Toolkit for IBM DB2 HADR	Assists in the easy integration of IBM DB2 HADR into a HP Serviceguard cluster; provides high availability to both primary and standby databases; in addition, the toolkit provides the capability to manage the role of the DB2 HADR database, changing the role of the standby to primary whenever the primary database goes down
Enhanced Oracle database support	Support for Oracle RAC 11g R1 and single-instance Oracle 11g R2
Cluster verification for HP Serviceguard Toolkit for Oracle Data Guard	Validates changes done to the cluster quickly so that a cluster is configured correctly and behaves as expected
Enhanced file system support for HP Serviceguard Toolkit for Data Guard	Oracle 11g R1 RAC and Oracle 11g R2 RAC with Cluster Volume Manager (CVM)/CFS 5.0.1

HP Serviceguard Extensions

Experience deep application integration of HP Serviceguard and your mission-critical applications with HP Serviceguard Extensions. Each HP Serviceguard extension is developed, tested, and refined with our partners to provide you high availability in one simple and fail-proof solution.

HP Serviceguard Extension for Oracle E-Business Suite
Address both unplanned and planned downtime automatically and transparently as HP Serviceguard Extension for Oracle E-Business Suite (SGeEBS) handles all the complexities of Oracle EBS. It delivers you fast and foolproof high availability for the Oracle E-Business Suite (EBS) of enterprise resource planning, customer relationship management, and supply-chain management applications relying on Oracle database.

Capabilities
- Deploys Oracle EBS application tier on multiple nodes

- SGeEBS supports multiple storage options, including Oracle Automated Storage Management (ASM)

- HP Serviceguard Manager provides a GUI-based interface to configure and administer SGeEBS packages easily

- Supports cluster verification to validate the cluster configuration quickly

- Supports Live Application Detach for reduced planned downtime

HP Serviceguard Extension for SAP
Protect your SAP environment with the powerful failover capabilities of HP Serviceguard extension for SAP (SGeSAP). It monitors the health of each SAP component and automatically responds to failures or threshold violations.

SGeSAP provides a single, uniform interface to cluster SAP NetWeaver® systems and SAP applications based on ABAP or Java stacks in a vast range of supported release versions. SGeSAP also clusters underlying databases. SAP liveCache cluster packages or SAP Master Data Management (MDM) packages can be created on demand.

You can combine all clustered components of a single SAP system into one failover package for simplicity and convenience. You also have the full flexibility to split components into several packages to avoid unwanted dependencies, and to lower potential failover times. Multiple SAP applications of different types and release versions can be consolidated in a single cluster. SGeSAP B.05.00 requires the use of either the HP Serviceguard NFS Toolkit or the HP Serviceguard CFS.

Capabilities
- Co-developed, fully tested, and recognized by SAP

- Automatically upgrades if purchased with support

- Protects the SAP central instance, SAP system central services, SAP dialog instances, SAP replication instances, SAP liveCache, SAP MDM, and underlying Oracle, IBM DB2, or SAP MaxDB databases

- Reduces downtime while performing maintenance

- Integrates with HP Serviceguard Metrocluster for disaster-tolerant SAP environments

- Integrates with HP Serviceguard Extension for RAC

- Enables SAP virtualization capabilities by moving redundant SAP application server instances between hosts to adapt to changing resource demands or maintenance needs quickly

- Utilizes SAP-replicated enqueue technology to become a complete cluster solution that provides fully automated and transparent zero-impact failover for SAP single points of failure in the software stack

- The secondary node can function as an application server in the production SAP environment or run as a separate SAP development or test instance (it does not need a dedicated secondary node to serve as a backup during normal operations)

- Reduces recovery time for SAP liveCache from hours to minutes

Table 5. HP Serviceguard Extension for SAP B.05.00

| Features	Benefits
Support for Sybase ASE	Using SGeSAP, supports Sybase ASE 15.7 in SAP NetWeaver clusters enabling startup/shutdown, maintenance mode, and instance health monitoring
Support for IVM 6.1 and vPar 6.1	Enable configuration of Integrity Virtual Machines 6.1 and vPar 6.1 as HP Serviceguard nodes
HP LeftHand P4000 Storage support (iSCSI)	Use HP LeftHand P4000 Storage arrays with software initiator in combination with SAP NetWeaver stacks (excluding support for SAP hot standby clones)
Cluster verification	Validate changes to a cluster quickly to enable the cluster to be configured correctly and to behave as expected
Enhanced SAP NetWeaver support	Get support for SAP NetWeaver 7.30
Enhanced high availability for SAP environments	Deliver the capability to cluster and monitor SAP Web dispatcher module
Easy package deployment	Simplify package deployment for SGeSAP
Ease of management	Benefit from modular package support for easier configuration; integrate with HP Serviceguard Manager for ease of configuration and administration; a wizard GUI helps you configure a modular SGeSAP package and automatically discovers SAP applications and fills in parameters whenever possible
Co-developed, fully tested, and endorsed by SAP	Achieve confidence in the resiliency and robustness of your SAP environment
Automatic upgrades if purchased with a support contract	Stop devoting staff to updating or maintaining SAP integration into the cluster
Comprehensive availability and monitoring	Protect the SAP central instance, SAP system central services, SAP dialog instances, SAP replication instances, SAP liveCache, and underlying Oracle or SAP MaxDB databases; software monitors are available for SAP enqueue services, SAP enqueue replication, and SAP MaxDB database services
Online maintenance	Reduce downtime, even when you are performing maintenance or installing patches
Integrated with HP Serviceguard Disaster Recovery Solutions	Protect against site outages or natural and man-made disasters
Integrated with HP SGeRAC	Reduce the complexity of integrating SAP environments with Oracle RAC to ease the deployment and configuration of high-end complex SAP environments that require and can sustain heavy workloads
Enables SAP virtualization	Enable the use of HP-UX virtualization technologies with SAP
Utilizes SAP replicated enqueue technology	Deliver fully automated and transparent zero-impact failover for SAP single points of failure in the software stack
Helps optimize resource utilization	Remove dependency on a dedicated secondary node to serve as backup—during normal operation, the secondary node can function as an application server in the production SAP environment or run as a separate SAP development or test instance
HP Hot Standby service for SAP liveCache	Reduce recovery time for SAP liveCache from hours to less than two minutes—endorsed by SAP as the first solution of its kind
Natural extension of HP Serviceguard from multisystem to multi-data center	Comprehensive, robust, and unified solution for varying levels of availability
Host-based data mirroring	Compatible with any Serviceguard-supported storage
Synchronous data replication	Data availability at both the sites for lower impact on recovery point objectives

HP Serviceguard Extension for RAC

To better protect your environment and create a completely available solution, the application environment should be designed to remove single points of failure and reduce the impact of various component failures. SGeRAC provides a comprehensive and consistent continuity solution for the database, non-database data, and higher-level applications for Oracle 10g and 11g RAC environments.

Experience a highly available and efficient database that continues to operate even if one hardware component fails. High-availability clusters configured with Oracle Real Application Clusters software are known as RAC clusters. In figure 2, two loosely coupled systems (each one known as a node) are running separate instances of Oracle software that read data from and write data to a shared set of disks. Clients connect to one node or the other through a LAN. Gain added processing power without the need to administer separate databases since RAC on HP-UX lets you maintain a single database image that is accessed by the HP servers in parallel.

Capabilities
- Advanced cluster arbitration mechanisms and the use of robust volume managers help remove data corruption and preserve data integrity
- Robust I/O fencing provides data integrity protection among nodes, both inside and outside of the cluster
- Flexible storage management options for Oracle RAC: CFS, Shared Logical Volume Manager (SLVM), Cluster Volume Manager (CVM), Automated Storage Management (ASM) on SLVM, and raw volumes
- Simple manageability with HP Serviceguard Manager
- Seamless integration with HP System Management tools and both HP Serviceguard CFS and HP volume managers
- Increased storage subsystem availability
- LAN monitoring
- Increased availability with ability to withstand multiple node failures
- Helps maintain application availability during hardware and software maintenance with rolling upgrades and Dynamic Root Disk support
- Integration with HP-UX Virtual Server Environment
- Extended-distance clustering facilitates disaster-tolerant protection
- Support for Oracle ASM
- Joint support from HP and Oracle

Figure 2. Sample SGeRAC configuration
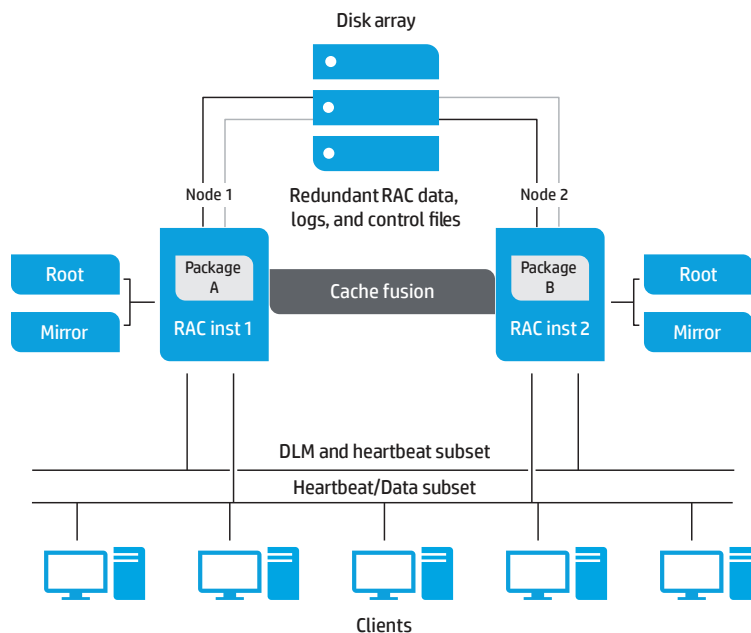
How SGeRAC can enhance the availability of an Oracle RAC environment:

• Enhanced cluster availability

• Enhanced network link availability

• Robust data integrity

• Faster failure detection times

• Rich integration with disaster recovery solutions, including 3DC architectures

• Storage management choice, flexibility, and consistency

• Improved manageability

• Easier integration of other cluster applications

• No dependency on the database stack for other applications

• Value-added volume manager features with HP Serviceguard Storage Management Suite (SG SMS)

Technical specifications

HP Serviceguard A.11.20

Maximum nodes	16
Cluster networks and interconnects	Gigabit Ethernet, HyperFabric, Fibre Channel, InfiniBand, 10 GbE
Storage supported	HP XP, VA, EVA, MSA 1000, MSA 1500; EMC Symmetrix
File systems supported	Online JFS (VxFS), JFS, and CFS
Cluster-wide I/O device access	SLVM, CVM/CFS
Failover configurable	Active to standby Active to active Rotating standby
Multipathing	Dynamic multipathing and native multipathing in HP-UX 11i v3
Volume management	SLVM, CVM
Single-view cluster management	Yes, HP Serviceguard Manager with HP Systems Insight Manager

Table 6. HP Serviceguard Extension for RAC 11.20

Features	Benefits
Support for user-defined database services	Start and stop user-defined database services along with toolkit package
SGeRAC bundled with HP-UX Operating Environments	SGeRAC is now available as a part of the HP-UX 11i v3 High Availability Operating Environment (HA-OE) and the Data Center Operating Environment (DC-OE)
Easy deployment	Simplified setup with the ability to configure the cluster; prepare storage and deploy packages using a single command
Support for CFS disk group multiple mount points in a single package	Improved manageability with reduced package count and the capability to configure multiple disk groups and mount points through a single modular package
Coexistence of ECMT Oracle Toolkit packages and SGeRAC packages in the same cluster	Trouble-free consolidation by allowing packages created by HP Serviceguard ECMT and SGeRAC to coexist in the same cluster
Support for cluster-wide device special files (cDSFs)	Simplified storage configuration through cluster-wide device file name; a cDSF enables each storage device to be used by the cluster (or any group of nodes within the cluster) and have a unique file name
Support for cluster interconnect monitoring on IPv4 and IPv6 subnets	Enhanced monitoring of subnet networks required in Oracle RAC to respond more quickly to NIC outages or subnet problems that might otherwise cause nodes to be evicted with a subsequent loss of RAC service
Enablement of improved RAC VIP management and failover performance, and VIP network monitoring on IPv4 and IPv6	Simplified network configuration in a RAC environment and enhanced availability of networks needed by Oracle clients
Group Membership Service authorization	Better prevention of unauthorized users from accessing cluster information and registering or deregistering group memberships, to help secure the environment so that only certain users can modify it according to your security policies
Joint support from HP and Oracle	Single point of contact, comprehensive inclusion of both HP and Oracle best practices
Advanced cluster arbitration mechanisms and the use of robust volume managers	Helps to avoid data corruption and preserve data integrity
Robust I/O fencing	Data integrity protection among nodes, both inside and outside of the cluster
Supports CFS, SLVM, CVM, and Automated Storage Management on SLVM and raw volumes	Flexible storage management options
Seamless integration with HP Serviceguard Manager, HP System Management tools, and both HP Serviceguard CFS and HP volume managers	Improved manageability
LAN monitoring	Rapid recovery and transparent restoration of service following events like hardware network interface failures
Increased storage subsystem availability	Removes the impact of storage link failures by providing multiple independent pathways to storage and comprehensive monitoring services
Ability to withstand multiple node failures	Better node availability; service continues to run even in case of multiple node failures
Rolling upgrades	Maintain application availability during hardware and software maintenance
Integration with HP-UX Virtual Server Environment	Enhanced resource utilization; flex resources in real time to maintain service levels after a failover or disaster
Compatible with HP Serviceguard Disaster Recovery Solutions	Better protection against site outages, and natural and man-made disasters

HP Serviceguard Disaster Recovery Solutions

For some installations, the level of protection you receive from a local cluster is insufficient. Consider your most vital processes, which need to interface directly with your customers around the clock, or run entire workloads of applications for all of your employees. For these installations, it is important to guard them not only against single points of failure, but also against multiple points of failure or single massive failures that cause many components to fail. Configurations that help protect you against these types of failures are considered disaster tolerant.

HP Serviceguard Disaster Recovery Solutions extend your protection through greater distance between nodes. Your nodes can be located in different rooms, on different floors of a building, or even in separate buildings or cities. The distance between the nodes is dependent on the types of disaster from which you need protection and on the technology used to replicate data. If one data center fails, a second one continues to operate, since HP Serviceguard Disaster Recovery Solutions utilize multiple data centers and multiple copies of your data. Regardless of the distance, you can survive the loss of a data center and maintain access to critical data and applications. The result: clusters that are resistant to multiple points of failure and to singular, massive failures. For more than 20 years, customers like you have protected their data centers with help from HP Serviceguard Disaster Recovery Solutions.
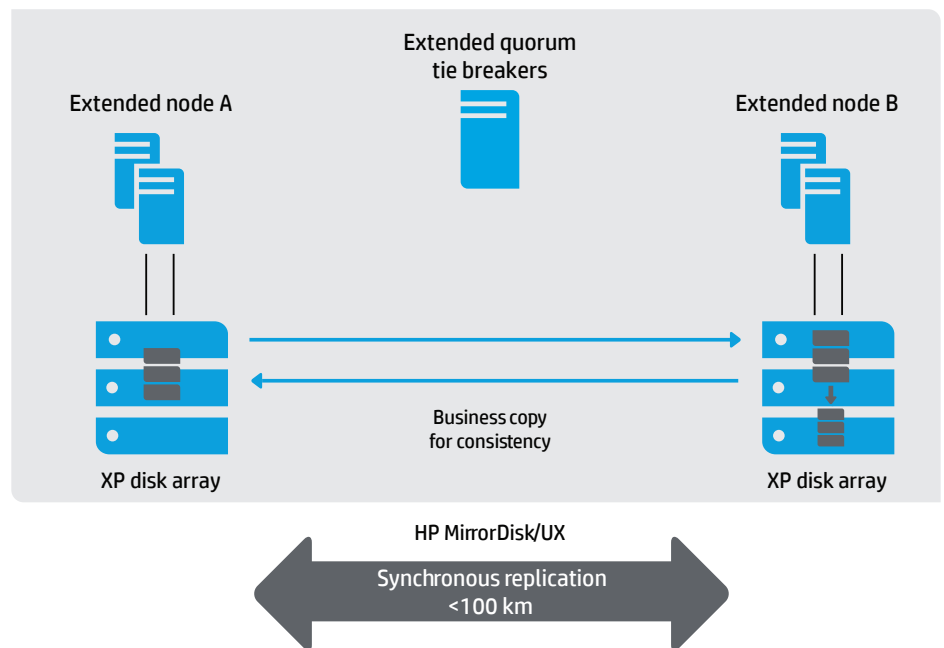
HP Serviceguard Extended Distance Cluster
Protect your data in two or three data centers up to 100 km apart with the host-based data replication of HP Serviceguard Extended Distance Cluster (EDC). It is an inexpensive and easy-to-implement solution because HP Serviceguard is the only cluster license required. Additionally, you can choose and mix any HP Serviceguard-supported storage with this solution. Each clustered server is directly connected to all storage in both data centers.

HP EDC for RAC
You can get the protection of HP EDC tailored to your Oracle RAC environments (EDC for RAC). EDC for RAC delivers failover capabilities for a single RAC database that is replicated and synchronized across two remotely located data centers (up to 100 km apart) in an active/active configuration.

Figure 3. Sample SGeRAC configuration

Technical specifications

HP Serviceguard Extended Distance Cluster

Maximum distance	100 km[3]
Maximum sites	2[4]
Maximum clusters	1
Cluster size	16 nodes
Hardware support	HP Integrity and HP 9000 servers
Operating system support	HP-UX 11i
Oracle database support	Oracle9i, Oracle 10g, Oracle 10g RAC, Oracle 11g, and Oracle 11g RAC
Network subnets	Single/separate IP subnet per site
Interconnect	Ethernet, FDDI, or token ring
Failover type	Automatic
Bidirectional failover	Yes
Fast failover and failback	Yes
Data replication	MirrorDisk/UX or Symantec Veritas Mirroring
Replication mode	Synchronous
Replication link	Fibre Channel, Dense Wavelength Division Multiplexing (DWDM)
Cluster quorum	Quorum server, arbitrator nodes, or dual cluster lock disks

[3] Maximum distances listed are indicative numbers. The actual distance depends on the latency requirement of HP Serviceguard heartbeat (200 millisecond) and the replication technology, whichever is smaller. Technically, higher distances are possible using networks with less latency.
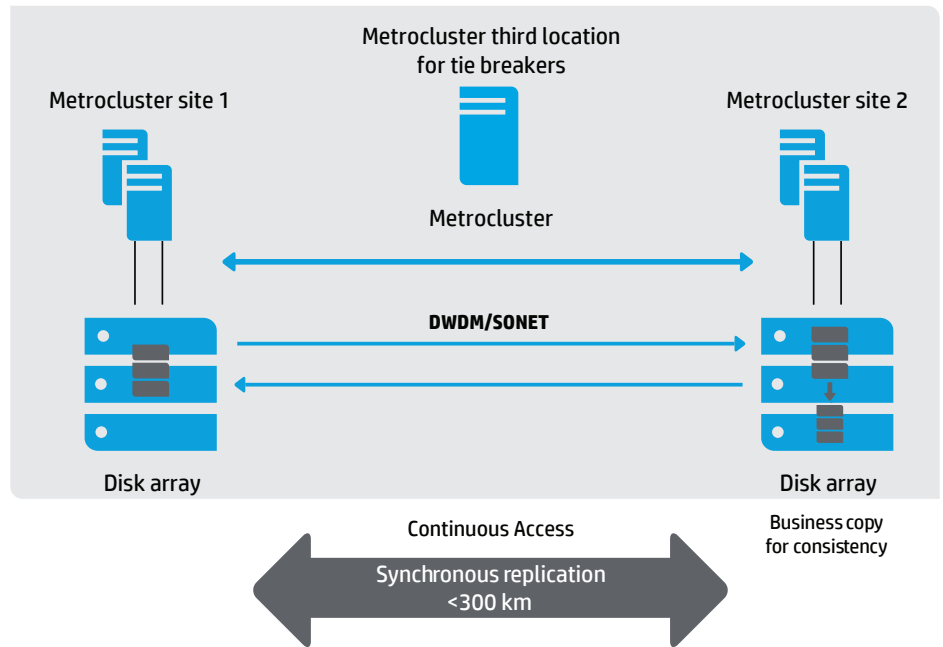[4] Two main data centers and a third location for quorum server or arbitrator nodes.

HP Serviceguard Metrocluster

Extend your disaster recovery capabilities with HP Serviceguard Metrocluster protecting your data centers at distances up to 300 km, while actively verifying the currency and integrity of your data. With this solution, both of your data centers can be active, protected, and capable of providing application failover for each other. HP Serviceguard Metrocluster can act as a single disaster recovery solution for databases as well as other applications. The distinct characteristic of HP Serviceguard Metrocluster is its integration with array-based data replication. Currently, HP Serviceguard Metrocluster encompasses four different solutions:

• HP Serviceguard Metrocluster with HP 3PAR Remote Copy for HP 3PAR storage systems

• HP Serviceguard Metrocluster with Continuous Access XP for HP XP arrays

• HP Serviceguard Metrocluster with Continuous Access EVA for HP EVA arrays

• HP Serviceguard Metrocluster with EMC SRDF for EMC Symmetrix arrays

Figure 4. HP Serviceguard Metrocluster for HP-UX 11i

Metrocluster third location
for tie breakers

Metrocluster site 1

Metrocluster site 2

Metrocluster

DWDM/SONET

Disk array

Disk array

Continuous Access

Business copy
for consistency

Synchronous replication
<300 km

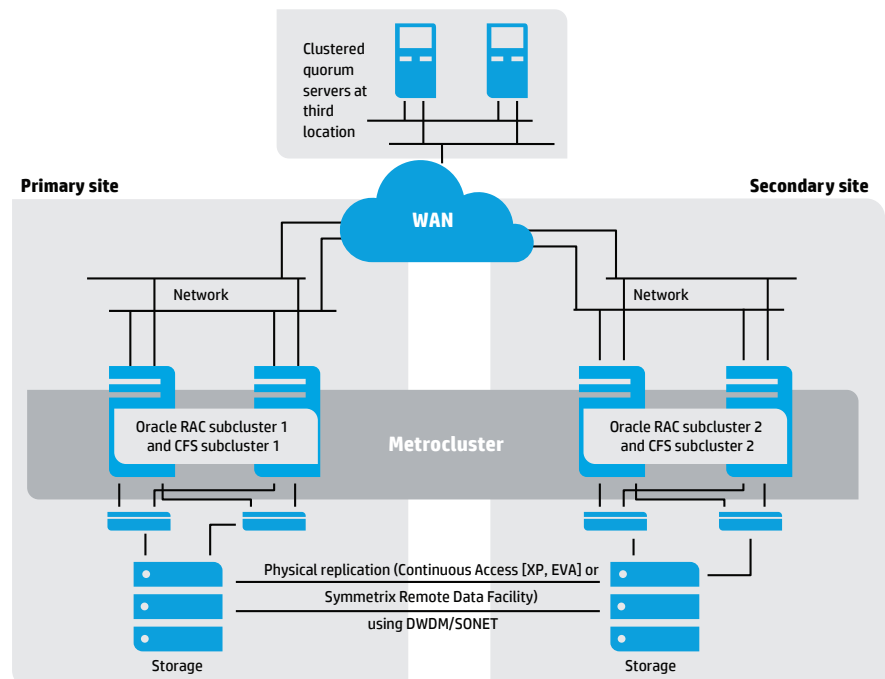**HP Serviceguard Metrocluster for RAC**

Get disaster tolerance to RAC databases without impacting performance, using a functionality called HP Serviceguard Metrocluster Site Aware Disaster Tolerant Architecture (SADTA), which provides support for Oracle RAC databases using novel techniques. The RAC databases can be stacked, allowing flexibility. Both primary and standby sites can have active databases, enhancing utilization. SADTA uses subclustering to provide disaster recovery for Oracle 10g and 11g RAC to provide the following benefits and features:

• Enable automatic, robust failover

• Eliminate impact on RAC performance due to intersite latencies

• Configure active/active for RAC database within a site, and active/passive across sites

• Benefit from a system based on synchronous/asynchronous array-based data replication that is more robust than volume manager-based mirroring

• Simplify management by deploying the CFS configured at each site

• Reduce management complexity with a new component called the Site Controller, which allows you to manage the startup and relocation (static load balancing) of RAC databases

• Speed your operations with multiple stacked RAC databases that can be deployed easily using the SGeRAC integration toolkit

Capabilities
• Single disaster recovery solution for Oracle RAC databases and other applications

• Support for 3DC configurations for any type of workload

• Fully integrated with the HP Serviceguard Solutions portfolio

• No impact on Oracle RAC performance due to intersite distances

• A single solution that integrates high availability and disaster tolerance for Oracle RAC and provides:

 – Local high availability

 – Remote disaster tolerance

 – Static load balancing between sites

 – Dynamic load balancing within a site

• Storage and network flexibility

• Fully integrated and supported by HP, Oracle, and Symantec

Figure 5. HP Serviceguard Metrocluster for RAC

Technical specifications

HP Serviceguard Metrocluster

Maximum distance	300 km[5]
Maximum sites	2[6]
Maximum clusters	1
Cluster size	Up to 16 total nodes
Hardware support	HP Integrity and HP 9000 servers
Operating system support	HP-UX 11i v1, HP-UX 11i v2, HP-UX 11i v3
Oracle database support	Oracle9i, Oracle 10g, Oracle 10g RAC, Oracle 11g, and Oracle 11g RAC
Network subnets	Single or separate IP subnet per site
Interconnect	DWDM
Failover type	Automatic
Bidirectional failover	Yes
Fast failover and failback	No
Data replication	Continuous Access EVA Continuous Access XP Remote Copy for HP 3PAR storage systems EMC SRDF
Replication mode	Continuous Access EVA: synchronous and asynchronous Continuous Access XP: synchronous and asynchronous Remote Copy for HP 3PAR: synchronous and periodic asynchronous EMC SRDF: synchronous and asynchronous
Replication link	Any TCP/IP, dark fiber, ATM, SONET/SDH, DWDM
Cluster quorum	Quorum server or arbitrator nodes

[5] Maximum distances listed are indicative numbers. The actual distance depends on the latency requirement of HP Serviceguard heartbeat (200 millisecond) and the replication technology, whichever is smaller. Technically, higher distances are possible using networks with less latency.
[6] Two main data centers and a third location for quorum server or arbitrator nodes.

Table 7. HP Serviceguard Metrocluster 11.20 cluster

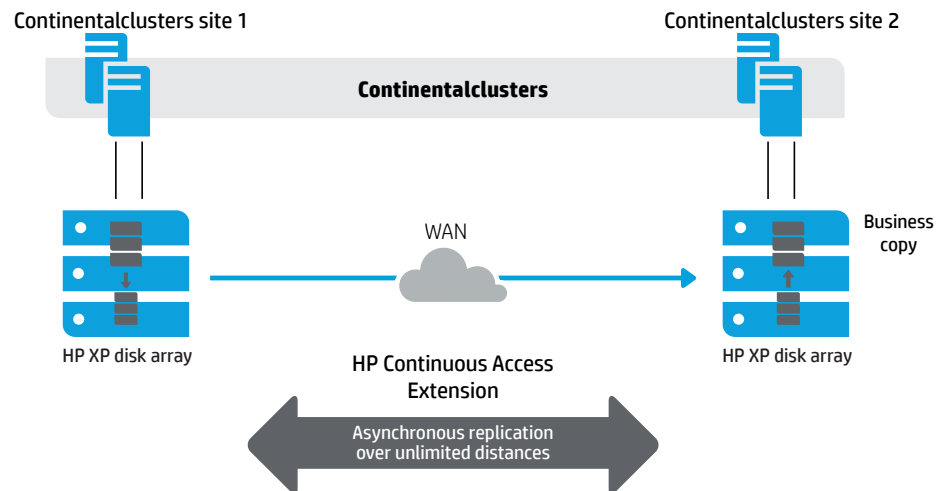| Features	Benefits
HP 3PAR Remote Copy Integration	HP Serviceguard Metrocluster and Continentalclusters now support HP 3PAR Remote Copy for F- and T-Class Storage systems; HP 3PAR Remote Copy provides a host independent, array based mirroring solution that enables affordable data distribution and disaster recovery for applications; copy virtual volumes from one storage array to a second storage array and allocate all data/snapshot on demand using thinly provisioned virtual volumes
Three data center (3DC) enhancements	Supports HP XP P9000 3DC Sync/Continuous Access Journaling (CAJ) and 3DC CAJ/CAJ replication with delta resynchronization in a 3DC solution
Enhanced virtualization support	Supports use of Integrity Virtual Machines either as HP Serviceguard failover packages or HP Serviceguard nodes for multisite protection with HP XP P9000 and EVA P6000 Storage arrays
Easy deployment	Simplifies Metrocluster configuration by reducing manual steps and deploying the Site Controller package in a single step
Cluster verification	Verifies that packages in the cluster are able to fail over, and that the cluster is configured correctly with a single and easy-to-use command that can also be automated to further reduce unplanned failures due to human errors
Support for CFS disk group multiple mount points in a single package	Provides improved manageability with reduced package count with the capability to configure multiple disk groups and mount points through a single modular package
Support for 3DC configurations for all types of workloads (unique to HP)	Enables the configuration of disaster recovery between three separate sites, with the two primary sites configured in a Metrocluster and a third data center configured via Continentalclusters as the recovery site; this enables higher levels of availability, even when the primary zone with the two primary sites becomes unavailable
Support for manual site switching	Allows operator intervention for a Metrocluster failover to a remote site for greater flexibility and greater control of failovers
Integrated with HP Serviceguard Manager	Saves the time and effort required to manage Metrocluster by using the HP Serviceguard Manager GUI-based interface to configure, monitor, and administer packages
Support for modular packages	Allows easier configuration of applications by reducing the number of scripts
Metrocluster with SONET/SDH site interconnect	Delivers low-cost alternative to DWDM, ideal for smaller configurations
Per-core licensing	Makes disaster recovery feasible even for smaller environments. Size your environment as you see fit, then choose either per-core or per-cluster licensing
Support for thin provisioning storage virtualization	Reduces storage management time and costs, and storage acquisition costs, and delivers high availability and disaster tolerance
Single disaster recovery solution for Oracle RAC databases and other applications	Provides a unified "all-in-one" solution for local high availability, remote disaster recovery, stacking of multiple databases, static load balancing between sites, dynamic load balancing within a site, and storage and network flexibility
Robust, automatic failover of entire multi-instance RAC databases between two sites without impact to Oracle RAC performance	Maintains service levels
Fully integrated and supported by HP, Oracle, and Symantec	Enables greater confidence in the resiliency and robustness of your disaster-tolerant environment

HP Serviceguard Continentalclusters

Enhance your IT with the highest level of disaster tolerance. HP Serviceguard Continentalclusters is the most flexible HP Serviceguard Disaster Recovery Solution protecting your data for unlimited distances. Unlike EDC and HP Serviceguard Metrocluster with their single-cluster architectures, HP Serviceguard Continentalclusters uses multiple clusters to provide application recovery. Applications run in the active/standby mode with application data replicated between data centers by either storage array-based data replication products (such as Continuous Access XP, Continuous Access EVA, or EMC SRDF), or software-based data replication (such as HP 3PAR Remote Copy Storage systems, Oracle8i Standby Database and Oracle9i Data Guard). Two types of connections are needed between the two HP Serviceguard clusters in this architecture: one for intercluster communication and another for data replication. Depending on the distance between the two sites, either LAN (that is, single IP subnet) or WAN connections may be used for cluster network communication.

Capabilities

• Provides the ability to monitor an HP Serviceguard cluster and failover mission-critical services to another cluster if the monitored cluster should become unavailable

• Supports mutual recovery, which allows for mission-critical services to run on both clusters, with each cluster configured to recover the mission-critical services of the other

• Supports SGeRAC in addition to HP Serviceguard. In a SGeRAC configuration, Oracle RAC database instances are simultaneously accessible by nodes in the same cluster (that is, the database is only accessible to one site at a time). The Oracle database and data are replicated to the second data center. The RAC instances are configured for recoverability so that the second data center stands by, ready to begin processing in the event of a site failure at the first data center (that is, across sites; this is an active/standby configuration where the database is only accessible to one site at a time).

Figure 6. HP Serviceguard Continentalclusters for HP-UX 11i

Technical specifications

HP Serviceguard Metrocluster

Maximum distance	Unlimited
Maximum sites	4[7]
Maximum clusters	4
Cluster size	Up to 64 total nodes (4 sites)
Hardware support	HP Integrity and HP 9000 servers
Operating system support	HP-UX 11i
Oracle database support	Oracle9i, Oracle 10g, Oracle 10g RAC, Oracle 11g, and Oracle 11g RAC
Network subnets	Single IP subnet for multiple clusters or separate IP subnets per cluster
Interconnect	Ethernet within each data center, LAN, or WAN between data centers
Failover type	Punch-button-style automated recovery
Bidirectional failover	Yes
Fast failover and failback	Yes (only for local failover within a site cluster)
Data replication	Continuous Access EVA Continuous Access XP Remote Copy for HP 3PAR storage systems EMC SRDF Oracle Standby Database
Replication mode	Continuous Access EVA: synchronous and asynchronous Continuous Access XP: synchronous and asynchronous Remote Copy for HP 3PAR: only synchronous is supported EMC SRDF: synchronous and asynchronous Oracle Standby Database: synchronous and asynchronous
Replication link	Any TCP/IP, dark fiber, ATM, SONET/SDH, DWDM
Cluster quorum	Quorum server or cluster lock disk for each cluster

Table 8. HP Serviceguard Continentalclusters A.08.00

Features	Benefits
HP 3PAR Remote Copy Integration	HP Serviceguard Metrocluster and Continentalclusters now support HP 3PAR Remote Copy for F- and T-Class Storage systems; HP 3PAR Remote Copy provides a host independent, array based mirroring solution that enables affordable data distribution and disaster recovery for applications; copy virtual volumes from one storage array to a second storage array and allocate all data/snapshot on demand using thinly provisioned virtual volumes
Enhanced virtualization support	Supports use of Integrity Virtual Machines either as HP Serviceguard failover packages or HP Serviceguard nodes for multisite protection with HP 9000, XP, and EVA Storage arrays
Support for Oracle ASM	Enables flexible storage management options
Cluster-to-cluster failover	Allows failover of an entire cluster
Support for modular packages	Enables configuration of all packages in a Continentalclusters recovery group as a modular package, simplifying the configuration process
Mutual recovery	Allows mission-critical services to run on both clusters, with each cluster configured to recover the mission-critical services of the other
Disaster recovery over unlimited distances	Allows you to choose the location of your data center based on your priorities
Push-button failover	Initiates a failover when you deem fit; provides an automated recovery procedure that is triggered only after a manual confirmation of your intention to recover
Integrated with SGeRAC	Provides disaster tolerance to your Oracle RAC database over unlimited distances

[7] Two main data center sites within each Metrocluster and a third location for quorum server or arbitrator nodes.

HP Serviceguard Storage Management Suite

Experience improved availability, performance, and manageability for Oracle Database and Oracle RAC environments on HP-UX 11i v3 with HP Serviceguard Storage Management Suite (SG SMS). It achieves these enhancements by integrating HP Serviceguard—a tested and proven UNIX® high-availability product—with Veritas Storage Foundation technologies by Symantec. This suite can also accelerate data recovery from hours to minutes, improve manageability, and reduce storage costs. Enhance your existing environment while reducing the chance of human error. Additionally, it offers complete integration with the HP Virtual Server Environment to boost your resource utilization. SG SMS is ideal if you require high levels of availability and outstanding Oracle Database performance, or if you have an application that would benefit from the improved manageability and scalability offered through a clustered file system.

Capabilities

- Integrates HP Serviceguard with Veritas Storage Foundation

- Is available on HP-UX 11i v3

- CFS simplifies application installation and ongoing management, particularly for Oracle RAC databases

- Advanced volume management and file system capabilities improve resource utilization

- Provides a variety of online administration options, including storage reconfiguration, volume and file system creation and resizing, dynamic storage expansion, and dynamic storage reclamation of unused capacity

- Improves database performance significantly, using Oracle Disk Manager—close to "raw-volume" performance

- Dynamic storage tiering reduces storage costs dramatically by enabling administrators to set policies that place files on different classes of devices—for example, inexpensive or expensive devices, or fast or slow devices

- Symantec Veritas FlashSnap creates a database clone or point-in-time copy, such as a duplicate database on a secondary host for off-host processing and backups

- Storage checkpoints provide an instant database backup image that can be taken more frequently and can be beneficial in reducing the effort required to back up a file system—without necessarily involving a storage administrator

- Storage rollback can be used to roll back an entire database image, tablespace, or specific data files, thereby providing a fast restore option for user errors

- Veritas Portable Data Containers promote seamless data migration between platforms

- Dynamic multipathing feature improves performance by allowing you to distribute I/O loads across multiple data paths

- Storage mapping tunes performance of disk arrays

- I/O fencing enables rapid application recovery in the event of a failure by isolating your storage resources from failed nodes that are not part of the cluster

Table 9. HP Serviceguard SMS A.04.00

Features	Benefits
Support rolling upgrade	Avoid bringing down the cluster during SG SMS version upgrades, thereby reducing overall planned downtime
Support both mixed and IPv6 environment	Configure the SG SMS cluster in both mixed and IPv6-only environments to provide desired flexibility
Improve CVM import times for large configurations	Get faster startup time by reducing time in disk group imports
HP Serviceguard integration with CFS	Simplify application installation and ongoing management, particularly for Oracle RAC databases
Advanced volume management and file system capabilities	Improve resource utilization
Integration with Oracle Disk Manager Dynamic Storage Tiering	Improve database performance significantly; reduce storage costs dramatically by enabling administrators to setup policies that segment data
FlashSnap database clones or point-in-time copies	Remove the need to take applications offline for storage management
Storage mapping I/O fencing	Tune performance of disk arrays; enable rapid application recovery in the event of a failure by isolating your storage resources from failed nodes that are not part of the cluster
Complete online administration capabilities	Reduce storage management time significantly
Portable Data Containers	Promote seamless data migration between platforms
Dynamic multipathing	Guard against broken links to storage with tools to monitor the availability of storage

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Technology Services Support for HP Serviceguard Solution

HP Technology Services helps build an infrastructure that is reliable, highly available, and rooted in proven best practices, and offers a support experience that:

• Proactively avoids problems by leveraging automation and online tools

• Provides faster problem resolution with integrated hardware and software support provided by a dedicated team of experts

• Optimizes performance and enhances efficiency with a range of per event services

• Keeps your systems up-to-date with delivery of new updates

HP Technology Services Portfolio
HP Technology Services offers three levels of ongoing support services and a comprehensive family of added-value service offerings that you can deploy as needed.

Customer support services
• Foundation Care—Reactive hardware and software support services provide integrated hardware and software support, and choice of response times, coverage windows, and length-of-term options.

• Proactive Care Services—Innovative, higher-value support services that offer high performance reactive support, proactive support, remote and onsite support, and consultations with HP technology experts for 24x7 availability.

• Datacenter Care—Environmental-level support customized for your unique business needs. This service offers flexible support designed to help you consistently meet your service-level targets and other business objectives.

Service offerings
• Lifecycle Event Services—Per-event services that reduce your time-to-value with deployment services, and help optimize the performance of your IT infrastructure.

• Installation and Deployment Services—Services to ensure your new technology is functional, all the systems work together correctly, and are ready to be integrated into your existing IT infrastructure.

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