Hewlett Packard
Enterprise

Technical Reference

HPE Serviceguard for Linux Certification Matrix

Enterprise Edition

Feb 2019

Contents

How to use this document
Other Resources
1 HPE Serviceguard for Linux A.12.xx.xx
1.1 Linux Distributions and Errata
1.1.1 Red Hat Enterprise Linux
1.1.2 SUSE Linux Enterprise Server
1.2 Servers
1.2.1 HPE Servers
1.2.2 Non HPE Servers
1.3 Hyperconverged Systems
1.4 Storage
1.4.1 HPE Storage
1.4.2 Non HPE Storage
1.5 Virtualization Hypervisors
1.5.1 VMware
1.5.2 Linux Virtualization
1.5.3 Windows Virtualization
2 Quorum Server
3 Serviceguard Releases and Patch information

4 Serviceguard for Linux Toolkits
4.1 Serviceguard for Linux Toolkit for Oracle
4.2 Serviceguard for Linux Toolkit for Sybase ASE and SAP Sybase Replication
4.3 Serviceguard for Linux Toolkit for Enterprise DB PPAS
4.4 Serviceguard for Linux Toolkit for IBM Db2
4.5 Serviceguard for Linux Toolkit for Microsoft SQL Server on Linux
4.6 Serviceguard for Linux Toolkit for KVM

5 Serviceguard for Linux Disaster Recovery Solutions
5.1 Extended Distance Clusters (XDC)
5.2 Serviceguard for Linux Toolkit for Oracle Data Guard
5.3 Serviceguard Metrocluster with 3PAR Remote Copy
5.4 Serviceguard Metrocluster with Continuous Access EVA
5.5 Serviceguard Metrocluster with EMC SRDF
5.6 Serviceguard Metrocluster with XP Continuous Access

© Copyright 2001, 2018, 2019 Hewlett Packard Enterprise Development LP.

The information contained herein is subject to change without notice. The only warranties for Hewlett Packard Enterprise products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. Hewlett Packard Enterprise shall not be liable for technical or editorial errors or omissions contained herein.

Confidential computer software. Valid license from Hewlett Packard Enterprise required for possession, use, or copying. Consistent with FAR 12.211 and 12.212, Commercial Computer Software, Computer Software Documentation, and Technical Data for Commercial Items are licensed to the U.S. Government under vendor's standard commercial license.

Acknowledgments

Linux® is the registered trademark of Linus Torvalds in the U.S. and other countries.

Red Hat® is a registered trademark of Red Hat, Inc. in the United States and other countries.

SUSE® is a registered trademark of SUSE AG, a Novell Business.

VMware and vCenter Server are registered trademarks or trademarks of VMware, Inc. in the United States and/or other jurisdictions.

Intel® Xeon® is a trademark of Intel Corporation in the U.S. and other countries.

Oracle® and Java™ are registered trademarks of Oracle and/or its affiliates.

SAP® and SAP HANA are trademarks or registered trademarks of SAP SE in Germany and in several other countries.

How to use this document

This document describes OS, Server, Storage and Virtualization technologies support with the listed version of HPE Serviceguard for Linux (SG/LX), and refers to HPE Serviceguard for Linux support only. All other hardware and software components must be supported together independent of HPE Serviceguard for Linux. This matrix lists certified configurations for HPE Serviceguard for Linux versions A.12.00.00 and its updates. This certification applies to all three editions: Base, Advanced and Enterprise of HPE Serviceguard for Linux.

Certified configurations with HPE Serviceguard for Linux A.11.20.00 and its minor updates can be found in the document: "*HP Serviceguard for Linux Certification Matrix A.11.20.00*'" available at http://www.hpe.com/info/linux-serviceguard-docs

Serviceguard for Linux and Serviceguard Manager new features information and compatible versions of required Linux software for A.11.20.00 can be found in the document: "HP Serviceguard/SGeRAC/Storage Management Suite/Serviceguard Manager Plug-in Compatibility and Feature Matrix - HP-UX and Linux", available at http://www.hpe.com/info/linux-serviceguard-docs

For HPE Serviceguard Contributed Toolkit Suite certification matrix please refer "HPE Serviceguard Toolkit Compatibility Matrix (HPUX and Linux)" at http://www.hpe.com/info/linux-serviceguard-docs

Some browsers may cache a copy of this file, so if data seems to not be up to date, please refresh the page. The most recent version of this matrix can be found at http://www.hpe.com/info/linux-serviceguard-docs.

Other Resources

- HPE Serviceguard for Linux website: www.hpe.com/servers/sglx. Visit this site for access to all technical information, commercial information, manuals, white papers, data sheets, and customer references.
- Before upgrading to a higher version of Serviceguard for Linux please, read the target Serviceguard for Linux version's release notes (*HP Serviceguard for Linux Base Version XX.YY.ZZ Release Notes , or HP Serviceguard for Linux Advanced Version XX.YY.ZZ Release Notes , HP Serviceguard for Linux Enterprise Version XX.YY.ZZ Release Notes*) from http://www.hpe.com/info/linux-serviceguard-docs
- Serviceguard extension for SAP for Linux (SGeSAP) - available with Serviceguard for Linux Advanced edition - new features and supported SAP Netweaver and SAP HANA versions please refer to corresponding SGeSAP release notes: "*Serviceguard Extension for SAP Version B.xx.yy Release Notes for Linux*" available at http://www.hpe.com/info/linux-serviceguard-docs
- 90 days FREE trial of HPE Serviceguard for Linux Enterprise Edition Software available at https://myenterpriselicense.hpe.com/cwp-ui/evaluation/SGLX-DEMO

1 HPE Serviceguard for Linux A.12.xx.xx

1.1 Linux Distributions and Errata

The following Operating System distributions and kernel errata are supported with Serviceguard for Linux. The following conditions apply:

- Only x86_64 bit Operating Systems supported
- Serviceguard for Linux does not support Secure Boot.
- All the erratas are supported unless explicitly specified within one month of its release.
- For RHEL 5 Serviceguard for Linux A.12.00.00 is the Market Release (MR).
- All cluster nodes must have the same OS distribution.

1.1.1 Red Hat Enterprise Linux

The following Red Hat Enterprise Linux OS versions are supported with Serviceguard for Linux.

Table 1 Supported Red Hat Enterprise Linux OS Versions

Serviceguard for Linux	Linux (x86_64)	JAVA Runtime Environment	Volume Managers & File Systems[1]	Jetty	Browser[2]
A.12.30.00 A.12.20.00 A.12.10.00	RHEL 7 *7.0 to 7.6*	Open Java 7 Update 9 to 191 Open Java 8 update up to 181	LVM, VxVM ext3, ext4 NFS, XFS, VxFS	Bundled with product	Internet Explorer Version 9,10,11 Firefox Version 30, 42, 45, 53, 56, 60, 61 Chrome version 35 to 67
	RHEL 6 *6.1 to 6.10*	Open Java 7, Update 9 to 181 Open Java 8 update up to 171	LVM, VxVM ext2,ext3,ext4 NFS, XFS, VxFS		
A.12.00.51 A.12.00.50 A.12.00.41 A.12.00.40 A.12.00.30	RHEL 7 *7.0 to 7.3*	Open Java 7 Update 9 to 111 (Only with A.12.00.51) Open Java 7 Update 9 to 91 (with A.12.00.XX)	LVM, VxVM ext3, ext4 NFS, XFS, VxFS	9.2.0 to 9.2.16 9.1.0 to 9.1.5 8.1.2 to 8.1.17	Internet Explorer Version 9,10,11 Firefox Version 30, 42, 45 Chrome version 35 to 49
	RHEL 6 *6.1 to 6.8*	Open Java 7 Update 9 to 91 Oracle Java 7, Update 2 to 79	LVM, VxVM ext2, ext3, ext4 NFS, XFS, VxFS		
	RHEL 5 *5.7 to 5.11*	Oracle Java 7, Update 2 to 79			
A.12.00.22 A.12.00.21 A.12.00.20	RHEL 6 *6.1 to 6.8*	Open Java 7 Update 9 to 91 Oracle Java 7, Update 2 to 79			Internet Explorer Version 9, 10, 11 Firefox Version 30,31 Chrome Version 35 to 40
	RHEL 5 *5.7 to 5.11*	Oracle Java 7, Update 2 to 79			
A.12.00.10 A.12.00.00	RHEL 6 *6.1 to 6.4*	Open Java 7 Update 9 to 91 Oracle Java 7, Update 2 to 79		8.1.2 to 8.1.17	Internet Explorer Version 9, 10, 11 Firefox Version 30,31 Chrome Version 35, 36
	RHEL 5 *5.7 to 5.11*	Oracle Java 7,Update 2 to 79			

[1] VxVM and VxFS supported only on physical cluster nodes

[2] Serviceguard Manager requires minimum screen resolution of 1024 x 768 pixels for best experience

1.1.2 SUSE Linux Enterprise Server

The following SUSE Linux Enterprise Server OS versions and kernel errata are supported with Serviceguard for Linux.

Table 2 Supported SUSE Linux Enterprise Server OS Versions

Serviceguard for Linux	Linux (x86_64)	JAVA Runtime Environment	Volume Managers & File Systems[1]	Jetty	Browser[2]
A.12.30.00 A.12.20.00	SLES 12 *up to SP3*	Open Java 7 Update 9 to 181 Open Java 8 Update up to 144 IBM Java 7 up to 1.7.0_sr9.20 1.7.1_sr3.20	LVM, VxVM ext2, ext3, NFS, XFS, btrfs, VxFS, ext4(SLES12 only)	Bundled with product	Internet Explorer Version 9, 10, 11 Firefox Version 30, 42, 45, 53, 56, 60 Chrome version 35 to 66
	SLES 11 *SP4, SP3, SP2*	IBM Java 7 up to 1.7.0_sr9.20 1.7.1_sr3.20			
A.12.10.00	SLES 12 *up to SP2*	Open Java 7 Update 9 to 141 Open Java 8 Update up to 131 IBM Java 7 up to 1.7.0_sr9.20 1.7.1_sr3.20	LVM, VxVM ext2, ext3, NFS, XFS, btrfs, VxFS, ext4(SLES12 only)	Bundled with product	Internet Explorer version 9, 10, 11 Firefox Version 30, 42, 45, 53 Chrome version 35 to 57
	SLES 11 *SP4, SP3, SP2*	IBM Java 7 up to 1.7.0_sr9.20 1.7.1_sr3.20			
A.12.00.51	SLES 12 *up to SP2*	Open Java 7 Update 9 to 111 IBM Java 7 up to 1.7.0_sr9.20 1.7.1_sr3.20		9.2.0 to 9.2.16 9.1.0 to 9.1.5 8.1.2 to 8.1.17	Internet Explorer version 9, 10, 11 Firefox Version 30, 42, 45 Chrome version 35 to 49
	SLES 11 *SP4, SP3, SP2*	Oracle Java 7 Update 2 to 79 IBM Java 7 up to 1.7.0_sr9.20 1.7.1_sr3.20			
A.12.00.50	SLES 12 *up to SP1*	Open Java 7, Update 9 to 91 IBM Java 7 up to 1.7.0_sr9.20 1.7.1_sr3.20			
	SLES 11 *SP4, SP3, SP2*	Oracle Java 7 Update 2 to 79 IBM Java 7 up to 1.7.0_sr9.20 1.7.1_sr3.20			
A.12.00.41 A.12.00.40 A.12.00.30	SLES 12	Open Java 7 Update 9 to 91 IBM Java 7 up to 1.7.0_sr9.20 1.7.1_sr3.20			
	SLES 11 *SP4, SP3, SP2*	Oracle Java 7 Update 2 to 79 IBM Java 7 up to 1.7.0_sr9.20 1.7.1_sr3.20			
A.12.00.22 A.12.00.21 A.12.00.20	SLES 11 *SP3, SP2*	Oracle Java 7 Update 2 to 79	LVM, VxVM ext2, ext3, NFS, XFS, btrfs, VxFS		Internet Explorer version 9, 10, 11 Firefox Version 30, 31 Chrome version 35 to 40
A.12.00.10 A.12.00.00				8.1.2 to 8.1.17	Internet Explorer version 9, 10, 11 Firefox Version 30, 31 Chrome version 35, 36

[1] VxVM and VxFS supported only on physical cluster nodes

[2] Serviceguard Manager requires minimum screen resolution of 1024 x 768 pixels for best experience

1.2 Servers

The following section provides details of x86 servers that are supported and compatible with Serviceguard for Linux 12.xx.xx with the following conditions:

- Servers must be of architecture x86_64.
- Only Linux OS supported by both the server and Serviceguard for Linux must be used.
  - For Linux OS supported by Serviceguard refer to Linux Distributions and Errata in this document.
  - Red Hat Enterprise Linux Certification and Support: https://techlibrary.hpe.com/us/en/enterprise/servers/supportmatrix/redhat_linux.aspx#.VmZ-gHnovho
  - SUSE Linux Enterprise Server Certification and Support: https://techlibrary.hpe.com/us/en/enterprise/servers/supportmatrix/suse_linux.aspx#.VmZ-eXnovho
  - VMware Certification and Support: https://techlibrary.hpe.com/us/en/enterprise/servers/supportmatrix/vmware.aspx#.VmZ_p3novho
- Unless specifically stated, all configurations of any server listed are supported as long as the general Serviceguard configuration requirements are met. For configuration requirements and other details refer to "Managing HPE Serviceguard for Linux A.12.xx.xx" in www.hpe.com/info/linux-serviceguard-docs

1.2.1 HPE Servers

Serviceguard for Linux 12.xx.xx is supported on the following Hewlett Packard Enterprise server

Table 3 Supported HPE Servers

HPE Servers	Models	Generations	Remarks
HPE Integrity Superdome X	Any	Any	Requires A.12.00.10 or above
HPE Integrity MC990 X	Any	Any	Requires A.12.00.40 or above
All HPE Servers (ML, DL, Synergy, Superdome Flex, etc.)	Any	Any	Any HPE manufactured Linux x86_64 servers (Intel & AMD 64-bit x86 architecture) with SGLX 12.xx.xx.
All HPE appliance that are based on any of the above listed servers	Any	Any	Any HPE appliance that is built using any HPE manufactured Linux x86 severs.

1.2.2 Non HPE Servers

HPE Serviceguard for Linux 12.xx.xx is compatible with any Linux x86-64 servers (Intel & AMD 64-bit x86 architecture) with the below mentioned conditions:

- HPE will resolve defects that are reproducible on HPE servers.
- HPE does not test Serviceguard products on 3rd party hardware. HPE may not be able to resolve issues that have a dependency on access to 3rd party hardware

1.3 Hyperconverged Systems

Hyperconverged System	Serviceguard Version	Remarks
HPE Simplivity	A.12.30.00 or above	• Supported only with VMware hypervisor with VMFS volumes. • Quorum Server is only supported arbitration method.

1.4 Storage

The following section provides details of Storage Array's that are supported and compatible with Serviceguard for Linux with the following conditions:

HPE Serviceguard recommends that customers check the Linux/Storage vendor's latest hardware specification and/or hardware compatibility matrix as appropriate to ensure compatibility and optimum functionality. Certification of storage will only be valid till the published support life of the arrays itself.

---

1. Storage array has to be SCSI-3 Compliant. Refer to Storage Vendor documentation to verify and enable SCSI-3 compatibility.
2. Serviceguard automatically configures SCSI-3 Persistent Reservation Type 5 (WERO) based IO fencing for all shared storages in a package. The only exception is a cluster that comprises only VMware virtual machines as nodes and uses VMware VMFS datastore volumes for shared storage (*Dynamically linked storage*). Customers must never disable SCSI-3 Persistent Reservation from cluster/package configuration or on the storage without prior agreement from HPE. If disabled without prior agreement with HPE, the configuration is unsupported.
3. Only Block Storage and NFS is supported, Object Storage is not supported.
4. HPE FlexFabric is supported for shared storage access with following conditions:
    a. FlexFabric Mezzanine adapter, FlexFabric LOM and FlexFabric CNA ports supported
    b. Fibre Channel (FC) and Fibre Channel (FCoE) protocols are supported
    c. iSCSI on FlexFabric ports are supported only on physical nodes in the cluster.
5. iSCSI devices are supported as shared storage with following conditions:
    a. iSCSI Software Initiator is supported in clusters with virtual machines and/or physical server nodes.
    b. iSCSI Hardware Initiator is supported in clusters with only physical server nodes
6. Device Mapper (DM-Multipath) storage multi-pathing is supported for shared storage with following conditions:
    a. DM-Multipath is not supported with VMware ESXi guests in a cluster, however other physical nodes in the cluster can use DM-Multipath (Please upgrade to A.12.00.40 or higher to use VMware NMP)
    b. DM-Multipath is supported with KVM guests using FC devices for shared storage (requires A.12.00.30 or above)
    c. On Red Hat Enterprise Linux 7 (RHEL7) only user friendly named mapper device are supported.
    d. Device Mapper Multipathing is supported with HPE 3PAR iSCSI devices only when there are 2 iSCSI ports on the array.
7. HPE EVA supported with firmware v3.01 or later.
8. SAP's host auto-failover for HANA scale-out can only be configured under the condition that the storage technology uses one of SAP's default HANA storage connectors for fibre-channel connectivity (fcclient or fcclientLVM). Storage in CS500 and CS900 appliance configurations fall under that category. HANA scale-up clusters have no specific restrictions with regards to the storage setup.

Cluster Lock LUN

1. Cluster Lock LUN is supported only when all the nodes in the cluster have read write access to a common disk (shared disk), being presented from a single, non-virtualized, and non-replicated array.
2. Cluster Lock LUN is not supported with any other array based technologies that do not satisfy above the criteria (point 4 mentioned above). Including but not limited to Multi array virtualization, Multi array based replication.
    Ex: HPE XP7 HA mode, HPE 3PAR- Peer Persistence, DELL EMC VPLEX etc.
3. The cluster will fail if the time it takes to acquire the disk lock exceeds 0.2 times the MEMBER_TIMEOUT. This means that if you use a disk-based quorum device (Lock LUN), you must be certain that the nodes in the cluster, the connection to the disk, and the disk itself can respond quickly enough to perform 10 disk writes within 0.2 times the MEMBER_TIMEOUT
4. VMFS Volumes are not supported for Lock LUN
5. Device Mapper (DM-Multipath) storage multi-pathing is supported for Lock LUN with following conditions:
    a. DM-Multipath must be used for Lock LUN access on all nodes in the cluster.
    b. When using DM Device Alias Names for Lock LUN, the alias name must be the same on all nodes.
    c. On Red Hat Enterprise Linux 7 (RHEL7) only user friendly named mapper device are supported
    d. On Red Hat Enterprise Linux 7 (RHEL7) the cluster Lock LUN cannot have an alias name ending with a number

The following tables depict the requirements that satisfy Serviceguard High Availability and Extended Distance Cluster (XDC) needs.

Table 4 Supported Storage Connectivity Models for Cluster Shared Storage and Lock LUN

Purpose / Supported Connectivity	FC	FCOE	iSCSI	NFS	SAS
Cluster Shared Storage	Yes	Yes	Yes	Yes	No
Cluster Lock LUN	Yes	Yes	No	No	No
Non Shared storage • SAP HANA HSR *	Yes	Yes	Yes	Yes	Yes
Non Shared storage • Oracle Data guard • SQL Server on Linux AOAI	Yes	Yes	Yes	NA	Yes

* All the SAP supported connectivity for Non-shared storage is supported.

1.4.1 HPE Storage

Storage supported for SG/LX A.12.10.00 and later

HPE Serviceguard for Linux is supported with any Hewlett Packard Enterprise Storage Array that satisfy the criteria listed out in 1.3 Storage with below mentioned conditions

Table 5 Supported HPE Storage for Cluster Shared Storage and Lock LUN for A.12.10.00 and later

Type of Storage	Array	Model	Cluster Shared Storage	Cluster Lock LUN
Any HPE Block Storage (XP, 3PAR, EVA, MSA, Store Virtual, Nimble)	Any	Any	Yes	Yes
NFS Filer	Any	Any	Yes	No
Others (Ex: Object)	Any	Any	No	No

Table 6 Supported Software based virtual storage solutions for Cluster shared storage

Vendor	Software	Cluster Shared Storage	Cluster Lock LUN	Remarks
Hewlett Packard Enterprise	Store Virtual VSA Software	Yes	No	Supported only with iSCSI Supported with Network RAID 10 Configuration. Multi-Site configuration is not supported

Storage supported from A.12.00.00 to SG/LX A.12.00.51

Table 7 Supported HPE Storage for Cluster Shared Storage and Lock LUN from A.12.00.00 to A.12.00.51

Vendor	Array	Model	Remarks
Hewlett Packard Enterprise	3PAR StoreServ 20000	20850, 20800, 20450	Device Mapper Multipathing is supported with 3PAR iSCSI devices only when there are 2 iSCSI ports on the array.
	3PAR StoreServ 10000	10800, 10400	Device Mapper Multipathing is supported with 3PAR iSCSI devices only when there are 2 iSCSI ports on the array.
	3PAR StoreServ 8000	8450, 8440, 8400, 8200	Device Mapper Multipathing is supported with 3PAR iSCSI devices only when there are 2 iSCSI ports on the array.
	3PAR StoreServ 7000	7450, 7400, 7200	Device Mapper Multipathing is supported with 3PAR iSCSI devices only when there are 2 iSCSI ports on the array.
	3PAR T Class	T800, T400	
	3PAR F Class	F400, F200	
	XP	XP7, XP24000, XP20000, P9500	
	StoreVirtual	4330, 4130	iSCSI Only
	StorageWorks MSA	P2000 G3, MSA 1040,2040	
	EVA/P6000	HP EVA 4x00 / 6x00 / 8x00, HP EVA 6300/P6350, HP EVA P6500/P6550	HPE EVA supported with firmware v3.01 or later.

1.4.2 Non HPE Storage

Compatible Non HPE Storage supported for SG/LX A.12.10.00 and later

HPE Serviceguard for Linux 12.10.xx and later is compatible with any Storage Array that satisfy the criteria listed out in 1.3 Storage with below mentioned conditions:

- HPE will resolve defects that are reproducible on HPE storage.
- HPE does not test Serviceguard products on 3rd party hardware. HPE may not be able to resolve issues that have a dependency on access to 3rd party hardware

Table 8 Compatible Non HPE Storage for Cluster Shared Storage and Lock LUN for A.12.10.00 and later

Type of Storage	Vendor	Array	Model	Cluster Shared Storage	Cluster Lock Lun
Block	Any	Any	Any	Yes	Yes
NFS Filer	Any	Any	Any	Yes	No
Others (Ex: Object)	Any	Any	Any	No	No

Compatible Non HPE Storage supported up to SG/LX A.12.00.51

Table 9 Compatible Non HPE Storage for Cluster Shared Storage and Lock LUN up to A.12.00.51

Vendor	Array	Model	Remarks
EMC	Symmetrix	Symmetrix DMX: 6, 6.5, 7.0 Symmetrix VMAX & VMAXe Series (All arrays with microcode level 5874.xx.xx or later)	
	VNX Series	VNX 5K, VNX7K	Block Storage Only
	CLARiiON	CX, AX	
Hitachi	Universal Storage Platform	VM, V, VSP, H24000, H20000	
	TagmaStore	USP11000, USP600, USP100, NSC55	
	Virtual Storage Platform	G1000, VX7, VP9500	
NetApp	NetApp FAS	FAS2000, FAS 3000, FAS 6000, FAS 8000	Only NFS (filer) option supported
IBM	SAN Volume Controller		iSCSI Not Supported

1.5 Virtualization Hypervisors

HPE Serviceguard for Linux supports configuring Virtual machines as cluster nodes. Virtual Machines created using VMware ESXi, Red Hat KVM, Red Hat Enterprise Virtualization and Hyper-V hypervisors are supported. HPE Serviceguard for Linux can installed on virtual machines (guests) running Red Hat Enterprise Linux or SUSE Linux Enterprise Server operating systems.

HPE Serviceguard recommends that customers check the Hypervisor vendor's latest compatibility matrix as appropriate to ensure compatibility and optimum functionality.

The following conditions apply:

- Cluster with Virtual Machines as nodes, from different types of hypervisors are not supported
- Hybrid Clusters with mix of both physical servers as nodes and virtual machines as nodes are supported

1.5.1 VMware

Table 10 Supported VMware Features and Versions

VMware Features	Minimum SG/LX Version required	Minimum ESX/ESXi Version required	Quorum Mechanism	Notes
vMotion	A.12.00.00	ESX/ESXi 4.1	Quorum Server	• The latest supported ESX/ESXi version is 6.7 • For VMFS volumes the supported JRE versions can be referred at Linux Distributions and Errata Note: When using IBM Java, use IBM Java 1.7.1_sr3.0 and above only) • Serviceguard depends on JAVA to communicate with vCenter/ESXi. Please check the VMware documents to verify the supported JAVA versions for a given ESXi/ vCenter version. • VMFS volumes with ESX/ESXi version 6.7 are supported from Serviceguard version A.12.00.50 and later. • VMware NMP and DRS is supported only with VMFS Volumes -Dynamically linked storage(DLS) • VMFS Volumes - Dynamically linked storage (DLS) is not supported with RHEL7.6
RDM - Statically linked storage. (SLS)	A.12.00.00	ESX/ESXi 4.1	Quorum Server Cluster Lock LUN	
VMFS Volumes - Dynamically linked storage. (DLS)	A.12.00.40	ESX/ESXi 5.5	Quorum Server Cluster Lock LUN (RDM Devices)	
VMware NMP	A.12.00.40	ESX/ESXi 5.5	Quorum Server	
DRS	A.12.00.40	ESX/ESXi 5.5	Quorum Server	
SRM	A.12.10.00	ESX/ESXi 5.5	Quorum Server Cluster Lock LUN (RDM Devices)	

- iSCSI devices is also one of the supported shared storage. iSCSI devices can be directly presented to guests.
- All Linux OS supported by Serviceguard for Linux as listed in Linux Distributions and Errata are supported as Guest OS for Serviceguard Nodes.
- For more details on using SG/LX in VMware environments please refer to "Using Serviceguard for Linux with VMware Virtual Machines" Whitepaper at http://www.hpe.com/info/linux-serviceguard-docs.
- To configure shared storage with VMware virtual machines please refer to "Managing HP Serviceguard for Linux A.12.00.40", Section 3.7.5 "Using VMware Virtual Machine File System Disks", available at http://www.hpe.com/info/linux-serviceguard-docs

1.5.2 Linux Virtualization

Table 11 Supported Red Hat KVM, SLES KVM and RHEV Versions

Linux Virtualization	Supported Host OS Version	Supported Guest OS as Serviceguard Nodes	Minimum SG/LX Version required on Guest	Supported Shared Storage	Quorum Mechanism	Multipathing
Red Hat KVM Version	RHEL 7.1 to 7.5	All Linux OS supported by Serviceguard[1], except SLES 12	A.12.00.30	iSCSI, FC	Quorum Server Cluster Lock LUN	Yes
	RHEL 6.3 to 6.10		A.12.00.00	iSCSI	Quorum Server	No
SLES KVM Version	SLES 12 up to SP3	All Linux OS supported by Serviceguard[1].	A.12.00.30	iSCSI	Quorum Server	No
Red Hat Enterprise Virtualization	6.5	RHEL 6.5	A.12.00.00	iSCSI	Quorum Server	No

- Only “Hypervisor default, e1000, rtl8139 and virtio” are supported as Guest Network Interface “Device Model”
- Live Migration is not supported.
- Please refer to whitepaper “HPE Serviceguard for Linux with Red Hat, SUSE Linux Enterprise Server KVM and RHEV guests” at www.hpe.com/info/linux-serviceguard-docs for installation and configuration details

1.5.3 Windows Virtualization

Table 12 Supported Hyper-V Versions

Supported Host OS Version	Supported Guest OS as Serviceguard Nodes	Minimum SG/LX Version required on Guest	Supported Shared Storage	Quorum Mechanism	Multipathing
Windows Server 2012 R2	All Linux OS supported by Serviceguard[1].	A.12.20.00	iSCSI	Quorum Server	No

[1] For list of all Linux OS supported by Serviceguard for Linux refer Linux Distributions and Errata.

2 Quorum Server

The following section provides compatibility information for the Serviceguard Quorum Sever (QS) software. This software is bundled with Serviceguard for Linux Base, Advanced and Enterprise editions.

- One QS can provide arbitration services for multiple Serviceguard for Linux and Serviceguard for HP-UX clusters (300 Nodes).
- The QS software can run on any x86_64 Server and x86_64 Hypervisor based Virtual Machine running in Traditional Data Center and Cloud (Private or Public).

NOTE: When deploying ensure that the Quorum Server network latency parameters are configured appropriately. Refer Quorum Server specific parameters under "Cluster Configuration Parameters" section in Managing HPE Serviceguard for Linux available at http://www.hpe.com/info/linux-serviceguard-docs

Table 13 Quorum server compatibility

Serviceguard Quorum Server(QS) Version	Compatible Base OS	Notes
A.12.00.30 or later	RHEL 7.x RHEL 6.1 and later RHEL 5.7 and later SLES 12 (SP0 and later) SLES 11 (SP2 and later)	• Smart Quorum is supported from A.12.00.30 and later. • Smart Quorum is supported with clusters running Serviceguard for Linux A.12.00.30 (Enterprise Edition only) and later. • Following are the compatible Serviceguard versions, o Serviceguard for Linux A.11.18 to A.12.00.xx o Serviceguard for HP-UX A.11.16 to A.11.20
A.12.00.00	RHEL 6.1 and later RHEL 5.7 and later SLES 11 (SP2 and later)	

3 Serviceguard Releases and Patch information

Serviceguard for Linux versions up to A.12.10.00 are available as patch releases. In addition, versions 12.00.00, 12.00.30 and 12.10.00, which are also called Market Release. Going forward, releases having only the defects fixes will be released via patches and release containing enhancements will be available through update releases.
Update releases can be found at any of the following locations,

- HPE Software Updates and Licensing Portal http://www.hpe.com/downloads/software
- HPE Software Delivery Repository http://downloads.linux.hpe.com/SDR/project/sglx/

The table below provides details about the patch releases for Serviceguard for Linux Base, Advanced and Enterprise bundles.

Serviceguard for Linux	Base Patch	Advanced Patch	Enterprise Patch
A.12.10.00	SGLX_00537	SGLX_00538	SGLX_00539
A.12.00.51	SGLX_00534	SGLX_00535	SGLX_00536
A.12.00.50	SGLX_00529	SGLX_00530	SGLX_00531
A.12.00.41	NA	SGLX_00527	SGLX_00528
A.12.00.40	SGLX_00524	SGLX_00525	SGLX_00526
A.12.00.30	SGLX_00518	SGLX_00519	SGLX_00520
A.12.00.22	NA	SGLX_00516	SGLX_00517
A.12.00.21	SGLX_00509	SGLX_00510	SGLX_00511
A.12.00.20	SGLX_00494	SGLX_00495	SGLX_00496
A.12.00.10	SGLX_00489	SGLX_00490	SGLX_00491

4 Serviceguard for Linux Toolkits

Serviceguard Advanced Edition provides out-of-box toolkits to deploy different applications in Serviceguard cluster. Following toolkits are available with Serviceguard,

- Toolkits for Databases
  - Oracle
  - Sybase ASE and SAP Sybase Replication
  - Enterprise DB PPAS
  - IBM Db2
  - Microsoft SQL Server
- Toolkits for Virtualization
  - KVM (Kernel-based Virtual Machine)

4.1 Serviceguard for Linux Toolkit for Oracle

<table>
<tr><th>Application Version</th><th>Serviceguard for Linux Advanced Edition</th><th>Notes</th></tr>
<tr><td>12c [R1, R2], 18c</td><td>A.12.00.20 and later</td><td rowspan="3">• Support for ASM mirroring (with 11gR2 and above) from Serviceguard 12.20.00 and later
(With Serviceguard Enterprise Edition Only)

12c[R1, R2], 18c:
• Support for HPE Application Tuner Express (ATX) version 1.0.1-84 or later (Compatible with SGLX A.12.00.51 or later).
• Support for failover of Oracle 12c Multitenant Container Database (CDB) on failure of specified critical Pluggable databases configured in CDB.
• Support for Multitenant Container Database(CDB) with oracle 12c
Note: The CDB can have multiple Pluggable Databases (PDB). Serviceguard will start, stop and monitor the PDB's. In case of PDB failure Serviceguard will only issue log warnings and e-mail alerts (if configured). No failover will be initiated. Failover will be initiated only in case of CDB failure.
• Support for Easy Deployment from SG Manager with oracle 12c

11gR2:
• Support for Oracle 11gR2 single instance databases.
• Support for Oracle 11gR2 ASM storage layout.</td></tr>
<tr><td>11g [R1, R2]</td><td>A.12.00.00 and later</td></tr>
<tr><td>10g [R1, R2]</td><td>A.12.00.00 and later</td></tr>
</table>

4.2 Serviceguard for Linux Toolkit for Sybase ASE and SAP Sybase Replication

Application Version	Serviceguard for Linux Advanced Edition	Notes
Sybase ASE 16	A.12.00.00 and later	• Sybase ASE Standalone (single instance, non-Cluster Edition) supported. • Integrating Sybase Replication Server with Serviceguard is supported only with coexistence of SGeSAP with Sybase ASE.
Sybase ASE 15.7.0, 15.7.1 ESD#2 ESD#3 or ESD#4 or SP110 and SP120 Sybase Replication Server 15.7.1 ESD#2	A.12.00.00 and later	

4.3 Serviceguard for Linux Toolkit for Enterprise DB PPAS

Application Version	Serviceguard for Linux Advanced Edition	Notes
9.5 9.4 9.2 9.1.x, 9.0.x	A.12.00.00 and later	NA

4.4 Serviceguard for Linux Toolkit for IBM Db2

Application Version	Serviceguard for Linux Advanced Edition	Notes
10.5	A.12.20.00 and later	NA
11.1	A.12.20.00 and later	

4.5 Serviceguard for Linux Toolkit for Microsoft SQL Server on Linux

Application Version	Serviceguard for Linux Advanced Edition	Notes
SQL Server 2017 on Linux	A.12.20.00 and later	• Supported with GA release. • Support for AlwaysOn Failover Cluster Instances(AOFI) for SQL Server on Linux • Support for AlwaysOn Availability groups(AOAI) for SQL Server on Linux (With Serviceguard Enterprise Edition)

4.6 Serviceguard for Linux Toolkit for KVM

Application Version	Serviceguard for Linux Advanced Edition	Notes
RHEL7	A.12.00.50 and later	• Live Migration not supported
RHEL6	A.12.00.50 and later	
SLES12	A.12.00.50 and later	

5 Serviceguard for Linux Disaster Recovery Solutions

Serviceguard for Linux support several Disaster Recovery solutions with the Enterprise Edition.
Following solutions that are offered,

- DR Solutions based on Host Based Mirroring
  - MD (Multiple Devices) device driver
  - LVM mirroring
  - VxVM mirroring
- DR solutions based on DB Native replication
  - Oracle Data Guard
  - Microsoft SQL Server (AlwaysOn Availability groups)
  - Oracle ASM mirroring
- DR solutions based on Array based replication
  - 3PAR Remote Copy
  - Continuous Access EVA
  - EMC SRDF
  - XP Continuous Access

Notes:
The only supported cluster arbitration mechanism is Quorum Server or arbitrator nodes at the Third Site. Cluster Lock LUN, Cluster Lock Disk, Dual Lock Disk is not supported.

5.1 Extended Distance Clusters (XDC)

The following section provides compatibility information about various host based mirroring software that can be used for replication in a Serviceguard Extended Distance Cluster (XDC). The Serviceguard XDC functionality is available with the Serviceguard for Linux Enterprise edition.

Table 16 Extended Distance Cluster mirroring software compatibility

Mirroring Technology	Serviceguard for Linux Enterprise Edition	Notes
MD RAID RAID 1	A.12.00.00 and later	• MD RAID with A.12.00.21 is supported only upto RHEL 6.5 • On RHEL 7.3, LVM RAID1 Mirroring is supported from A.12.00.51 and later • LVM RAID1 Mirroring is supported from RHEL 6.6 and later • VxVM RAID1 is supported only on physical systems.
LVM RAID 1	A.12.00.21 and later (RHEL only)	
VxVM RAID 1	A.12.00.00 and later	

5.2 Serviceguard for Linux Toolkit for Oracle Data Guard

Application Version	Serviceguard for Linux Enterprise Edition	Notes
Oracle 12c [R1, R2]	A.12.00.50 and later	Support for HPE Application Tuner Express (ATX) version 1.0.1-84 or later

5.3 Serviceguard Metrocluster with 3PAR Remote Copy

<table>
<tr><th>3PAR Inform OS</th><th>Serviceguard for Linux Enterprise Edition</th><th>Notes</th></tr>
<tr><td>3.3.x</td><td>A.12.00.51 and later</td><td rowspan="4">Supported HPE 3PAR features
3PAR Synchronous Long Distance(SLD) replication with A.12.30.00 and Inform OS 3.3.x
3PAR Peer Persistence with A.12.00.40 and later
3PAR Asynchronous Streaming Mode
Synchronous Replication mode
Fully Provisioned and Thinly Provisioned Virtual Volumes
3PARVirtual Domains
Support for Asynchronous Periodic Replication mode
N-1 or 1-N Remote Copy Configuration with below mentioned condition:
In a N-1 or 1-N Remote Copy topology, 3PAR allows only one of the pairs to be bi-directional, rest of the pairs will be unidirectional. 3Par recommends not to use the unidirectional pairs for Disaster Recovery. So, one can configure Metrocluster or Continentalclusters only between the arrays that are in a bi directional configuration within a N-1 or 1-N Remote Copy setup.
3PAR Remote Copy Failsafe mode is supported from Inform OS version
SGLX Specific Notes
Support for use of VMware Virtual Machine File System (VMFS) based storage in 3PAR Metrocluster packages.
Support for Recovery Point Objective (RPO) Sensitive failover with 3PAR Metrocluster packages
Easy Deployment of Metrocluster Packages using Serviceguard Manager B.12.00.00
cmpreparestg command over 3PAR Remote Copy Volume Group disks
Restrictions & Unsupported Configurations
RHEL 5.7 to 5.11 Not Supported with Inform OS 3.3.1
HPE 3PAR Inform OS CLI required only with RHEL 5.x
Asynchronous streaming remote copy mode not supported with Inform OS 3.2.2 & earlier.
Unidirectional Remote Copy configuration
3PAR Remote Copy volume groups configured withfail_wrt_on_err policy.
RHEL 6 KVM – Guest as Serviceguard Metrocluster Node not supported
Command preview “cmdrprev” not supported
3.1.3 onwards. (Note: With Inform OS 3.2.1 HP Serviceguard Metrocluster for 3 PAR requires MU1 or later to support failsafe mode).</td></tr>
<tr><td>3.2.x</td><td>A.12.00.00 and later</td></tr>
<tr><td>3.1.x</td><td>A.12.00.00 and later</td></tr>
<tr><td>2.3.1 mu2</td><td>A.12.00.00 and later</td></tr>
</table>

1. This table represents what has been certified and is supported. If other storage, firmware or software versions are available but not indicated in this table, it is currently not supported by Metrocluster with 3PAR Remote Copy. The table will be updated when new versions are certified.
2. Refer to 3PAR documentation to get information on supported versions of HP 3PAR Inform OS CLI on respective Operating Systems.
3. Note: mu refers to maintenance update.
4. Note: HP Metrocluster 3PAR package will have impact if the HP 3PAR storage system is upgraded to any of the following 3PAR OS versions
   2.3.1 MU5 Patch35
   3.1.1 MU3 Patch27
   3.1.2 MU3 Patch16

   Please refer the respective release notes for more details.
5. Note: 3PAR arrays allow a maximum 64 to 256 CLI connections based on array model and InformOS version. Metrocluster for Linux uses CLI for array communication. Each Metrocluster package needs at least one CLI session. Please refer to your 3PAR array documentation for maximum supported CLI sessions. Ensure that sufficient CLI sessions will be available for Metrocluster packages during failover. Refer to the sections "Managing CLI Connections to 3PAR array" in the manual for more information.
6. When using 3PAR Inform CLI Version 3.1.2, there may be a considerable increase in the failover times of the Metrocluster packages. This is owing to a known faulty behavior during client connections with 3PAR OS Inform CLI version 3.1.2. This issue has been fixed in 3PAR OS Inform CLI version 3.1.3. Customers are advised to move to 3PAR OS Inform CLI version 3.1.3.

5.4 Serviceguard Metrocluster with Continuous Access EVA

EVA Firmware	Serviceguard for Linux Enterprise Edition	Software on Windows Management Server	Notes
XCS 1000X000	A.12.00.00 and later	• CV EVA v9.4 SMI-S EVA v9.4 • P6000 CV v10.0 SMI-S P6000 v10.0 • P6000 CV v10.1 SMI-S P6000 v10.1 • P6000 CV v10.2 SMI-S P6000 V10.2 • P6000 CV v10.3 SMI-S P6000 V10.3	• Synchronous Replication mode • Enhanced Asynchronous Replication mode The following features are not supported with in A.12.00.00: • Configuring Metrocluster package with secure connection to Management Server is not supported on RHEL 6.1. • VxVM and VxFS
XCS 11001100	A.12.00.00 and later	• CV EVA v9.4 SMI-S EVA v9.4 • P6000 CV v10.0 SMI-S P6000 v10.0 • P6000 CV v10.1 SMI-S P6000 v10.1 • P6000 CV v10.2 SMI-S P6000 V10.2 • P6000 CV v10.3 SMI-S P6000 V10.3	
XCS 11200000	A.12.00.00 and later	• CV EVA v9.4 SMI-S EVA v9.4 • P6000 CV v10.0 SMI-S P6000 v10.0 • P6000 CV v10.1 SMI-S P6000 v10.1 • P6000 CV v10.2 SMI-S P6000 V10.2 • P6000 CV v10.3 SMI-S P6000 V10.3	

5.5 Serviceguard Metrocluster with EMC SRDF

<table>
<tr><th>Solution Enabler Versions</th><th>Serviceguard for Linux Enterprise Edition</th><th>Notes</th></tr>
<tr><td>V 8.x</td><td>A.12.00.50 and later</td><td rowspan="2">All features as supported by B.01.00.00
SRDF Synchronous & Asynchronous data replication on DMX, DMX-3, DMX-4 and VMAX series (Asynchronous replication on Symmetrix DMX requires microcode level 5671 or higher)
Support for RDF (Remote Data Facility) group numbers > 64
SRDF Consistency Groups (for M by N configurations), Synchronous and Asynchronous data replication
SRDF Control Operations: Disaster restart – failover, Disaster recovery failback
SRDF Swap : R1/R2 personality swap on static and dynamic RDF devices
SRDF Domino mode
Use of BCV protection
DWDM up to 300km
Support for Data Replication Storage Failover
Support for controlled failback.
Support for Cross-Subnet Configurations
Support for SONET/SDH as heartbeat and SRDF links
Support for Virtual Provisioning Volumes Persistent Reservations (PR)
Following Features not supported 12.00.50:
Cannot be deployed on Virtual Machines(VMware, KVM, RHEV)
cmpreparestg command over SRDF Device Group disks
Notes:
MxN configurations not supported with Symmetrix 3
R1/R2 swapping not supported with Symmetrix 3, 4, 4.8
M by N configurations cannot be used with R1/R2 swapping</td></tr>
<tr><td>V.7.6.1.0</td><td>A.12.00.50 and later</td></tr>
</table>

Notes:
microcode versions listed below are supported unless stated explicitly

- Symmetrix VMAX Series: microcode 5874, 5875, 5876, 5977 or later
- Symmetrix “7” (DMX3 and DMX4 Series): microcode 5771, 5772, 5773
- Symmetrix “6”(DMX Series): microcode 5670
- For SRDF/A: microcode 5671 or later
- For Consistency Group support: microcode 5267.42.29 or later
- For R1/R2 personality swap: microcode 5567.52.29 or later

5.6 Serviceguard Metrocluster with XP Continuous Access

RAID Manager Version[1]	Serviceguard for Linux Enterprise Edition	Notes
XP Arrays: - 01.22.06 or later	A.12.00.00 and later	• Continuous Access Synchronous replication • Continuous Access Journal replication • Continuous Access Asynchronous replication with XP arrays • Device Group Monitor • Data Replication Storage Failover Preview (cmdrprev command) • Remote Command Device • Virtual Command Device Not supported: • Site Controller packages in A.12.00.00 • Three Data Center Disaster Recovery (3DC DR) solution • VxVM and VxFS is not supported in A.12.00.00
P9500 arrays: - 01.24.13 or later[2]	A.12.00.00 and later	

Notes:

[1]This table represents what has been certified and is supported. If other storage, microcode or Raid Manager versions are available but not indicated in this table, it is currently not supported by Metrocluster with Continuous Access for P9000 and XP. Following XP/P9000 Platform & Microcode are supported,

- XP20000/XP24000: 60-04-04-00/10 or later
- P9500: 70-01-04-00/00 or later
- XP 7: 80-01-24-00/00 or later

[2]The following features introduced in HP Storage P9000 RAID Manager are not supported with Metrocluster: Virtual Command Device via LAN, Copy Group configuration based on RAID, User Authentication based on Command Device. The User Authentication for the Command Device Security must be disabled in a Metrocluster environment.