Hewlett Packard Enterprise

Business continuity for HPE ConvergedSystem for SAP HANA

Automated high availability and disaster tolerance with HPE Serviceguard

Contents

Technical white paper

Executive summary

HPE ConvergedSystem for SAP HANA® comes with the optional HPE Serviceguard for automated environments. It also offers unattended high availability (HA) and disaster tolerance (DT) capabilities for SAP HANA environments. The HPE Serviceguard solution is SAP® certified. With a rich 15-year history of innovation, it offers customers business continuity and data protection for mission-critical workloads.

This white paper explores the benefits for including HPE Serviceguard for business continuity and data protection as part of your HPE ConvergedSystem for SAP HANA deployment. It provides an overview of the entire product portfolio along with the new capabilities introduced with the latest version of HPE Serviceguard for Linux. The potential costs of downtime and the factors that you should bear in mind are included as guidance for your strategy to extend the high availability and disaster tolerance capabilities of your SAP HANA solution.

Target audience

This document is aimed at chief information officers (CIOs), chief technology officers (CTOs), data center managers, and others wishing to learn more about minimizing downtime. A working knowledge of server architecture, networking architecture, and storage design is recommended.

Document purpose

This white paper describes best practices and key considerations for automating HA and DT solutions with HPE Serviceguard software running on HPE ConvergedSystem for SAP HANA.

Introduction

A common misconception is that HA and DT are primarily technical requirements. They are often sold to customers as a simple adjunct to an SAP HANA system, much like you would choose the color of a new car. This can lead to two very undesirable situations:

- Customers purchase a solution that they do not need, inflating acquisition costs, and increasing total cost of ownership over the lifespan of the implementation
- Customers are alarmed at the cost of the solution and decide to forgo it, putting their business at risk

When considering what to do about HA and DT, the most important question that you should ask yourself is, "What would be the impact to my business, stated in dollars (or your local currency), if it had to **shut down for one hour**? Or, one day? Or, one week?" The answer to this question about business shutdown is called the target recovery time objective (RTO) and will be your best guide to whether you need HA or DT. An HA or DT design that delivers an RTO of 30 minutes is very different from a design that delivers an RTO of two days, both in complexity of the architecture and cost of the solution.

Another important question to ask is, "What would be the impact to my business if I were to **lose five minutes of data**? Or, one hour? Or, one day?" The answer to this question is called the target recovery point objective (RPO) for your HA and DT solution. It will drive considerations, such as frequency of database backups, whether some form of replication is required, etc.

It is very important for the IT department to work closely with the business that needs the SAP HANA system to frame the responses to these questions in monetary terms. That way you can accurately assess whether the cost of a proposed HA and DT approach is reasonable for the use case.

HPE Solutions for SAP HANA

The HPE ConvergedSystem for SAP HANA is a portfolio of pre-built, factory-integrated systems that are optimized for the high performance, high availability and unmatched scalability demanded by HANA. The systems are designed to deliver proven performance—from the HANA database through the application layer—and faster time to value. And these systems are ready for SAP's next-generation business suite, S/4HANA—optimizing and modernizing the IT environment for your next move.

HPE ConvergedSystem 500 for SAP HANA

Powered by Intel® Xeon® E7 v4 architecture, these scale-up and scale-out appliances support analytics and data warehousing workloads, as well as smaller application environments. With configurations from 128 GB to 68 TB, these systems offer best-in-class price/performance for SAP HANA.

HPE ConvergedSystem 900 for SAP HANA

Powered by Intel® Xeon® E7 v4 architecture, this scale-up appliance supports large, mission-critical application environments. Configurations ranging from 0.5 TB to 16 TB give you massive capacity and amazing flexibility.

HPE Solutions for SAP HANA Tailored Data Center Integration (TDI)

HPE TDI Compute Blocks for SAP HANA provide customers with a solution that offers the flexibility to use hardware components from preferred compute, storage, or networking vendors to deploy SAP HANA, which requires a custom and consultative deployment, integration, and support model. Optional Datacenter Care for SAP HANA TDI service is available, providing context-aware remote support services by SAP HANA trained engineers for the HPE SAP HANA TDI infrastructure.

HPE Serviceguard

HPE Serviceguard is a cluster software, which provides HA and disaster tolerance (DT) capabilities, for applications deployed in distributed environments. It has served the HA and DT needs of enterprise customers for many years on HP-UX and Linux® operating systems. This product has consistently been updated to meet the various deployment and application integration needs including SAP HANA to provide automated mechanisms to detect failures and initiate recovery procedures to ensure continuous availability of application services. Additionally, it employs precise control measures to protect the integrity of application data during the execution of remedial procedures in multi-node cluster configurations.

HA and DT architectures that are based exclusively on SAP System Replication rely on the system administrator to make the determination that a failure has occurred and initiate the failover to the secondary system. The administrator must assess the failure and decide on appropriate recovery action. They must take enough precaution not to perform any steps that can result in data loss, or even worse corrupt the data. This dependence on human intervention can result in significant delays before the secondary system can take over for the primary system, in case of a catastrophic failure and are prone to administrator mistakes that can further worsen the situation.

Enterprise class HA and DT architecture with Serviceguard: Using HPE Serviceguard with the SAP System Replication on the HPE ConvergedSystem for SAP HANA configuration provides a significant improvement over using SAP System Replication by itself. In a HPE Serviceguard HANA-clustered configuration, when there is a catastrophic failure of the primary (production) system, HPE Serviceguard performs an automatic, unattended failover to a secondary system. Based on the type of failure, HPE Serviceguard takes appropriate recovery actions as part of a failover operation. Since HPE Serviceguard integrates with SAP System Replication, the failover just needs to promote the already running secondary instance to primary role. This significantly reduces downtime as there is no need to restart the HANA database at the secondary system.

Additionally HPE Serviceguard also fails over the IP address used to access the HANA database to the secondary system and the clients can now continue to access the database by just reconnecting. When a primary system recovers after a failure, HPE Serviceguard will start it in secondary role so that HA and DT are restored and the database is protected continuously without any manual intervention.

Protection from Database corruption: HPE Serviceguard cluster with its advanced data access control mechanism, protects the data integrity which is extremely important as prevention is a much better proposition over cure for very large corrupted database. There are several opportunities for data corruption in a HA and DT cluster, with the split-brain scenario being one of the most critical. Split brain is a condition that can occur if the both primary and secondary instances are running as primary instance at the same time, which can result in data corruption.

In case of a manual HA and DT solution, the administrator can inadvertently cause this situation during recovery. When using HPE Serviceguard, if the network communication between the primary and secondary system breaks down, the HPE Serviceguard cluster will have to handle the failure without running into a split-brain condition. HPE Serviceguard makes use of a quorum server to eliminate the risk of split brain, making it possible to robustly automate the failover to a secondary system.

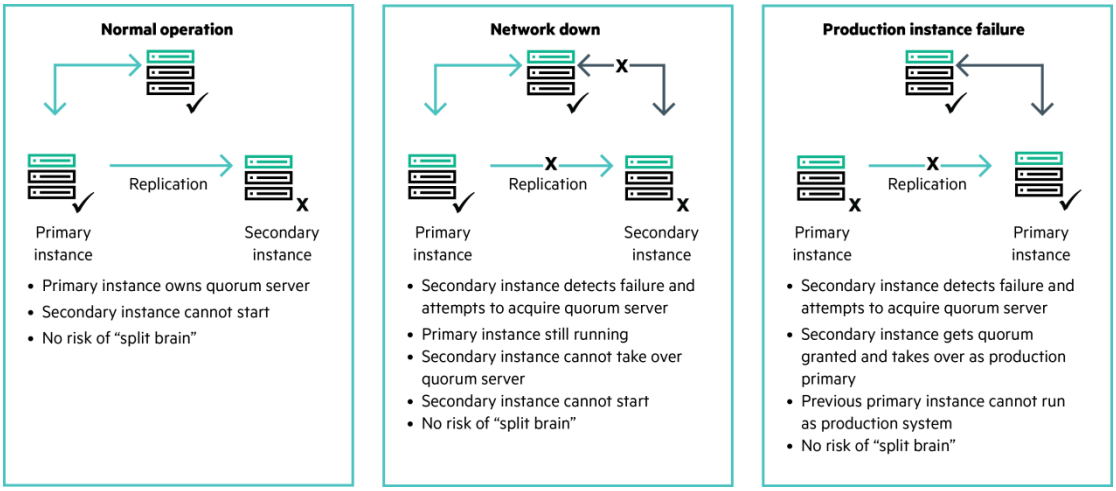

Figure 1. HPE Serviceguard for SAP HANA and quorum server prevent split brain

Significant advancement in HA and DR protection for Scale out deployments: The A.12.00.20 release of HPE Serviceguard software introduces a new feature, called Site Aware Disaster Tolerant Architecture (SADTA), which extends the DT capabilities to include scale-out HANA systems. Serviceguard software makes use of "sites" to manage failover of application processes spanning across multiple systems from one site to other.

SADTA enables coordination between scale-out HANA nodes running on separate servers at a given site such that the site failover is invoked only when sufficient number of servers have failed to cause a database outage and in proper sequence. SADTA also allows the failover of HANA partition instances within a site to provide various active-standby configuration options available to increase the protection from failures at site level. This is a significant advanced feature in HPE Serviceguard, making HPE ConvergedSystem for SAP HANA the only HANA appliance portfolio with a fully automated HA and DT solution, available for every size of implementation.

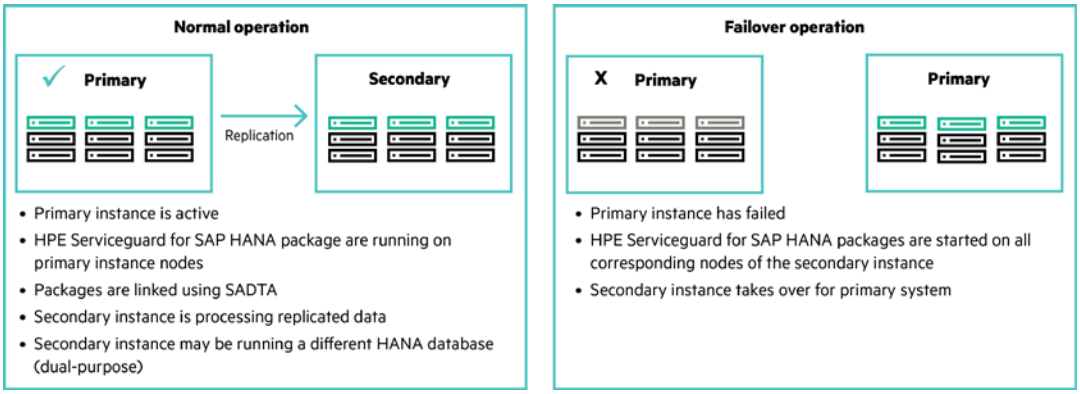

Figure 2. HPE Serviceguard for SAP HANA with SADTA

Increase uptime in case of site failures with unique Smart Quorum feature: The 12.00.30 release of Serviceguard software introduces Smart Quorum feature, which increases the availability of critical workloads. This can be deployed only in clusters configured with site-aware failover capability. With this feature, the quorum server grants the quorum to a site running the critical workloads in an event of a network split that occurs between the sites configured in a cluster. This mechanism helps to prevent failover of an active workload thus, it increases the availability of primary HANA instances and avoids unnecessary failovers.

Competitive cluster solutions usually rely on majority-based quorum provisioning. The combination of SAP auto host failover incidents and a subsequent site failure cannot be handled correctly in this case. Despite the existence of a cluster, unplanned production downtime can be the consequence. The Smart Quorum provides proper co-existence with SAP's built-in HANA auto host failover mechanism and allows the combination of SAP High Availability with HPE Serviceguard Disaster Recovery technologies.

For more information on how to configure this feature, please refer "Managing HPE Serviceguard for Linux" and "Managing HPE Serviceguard Extension for SAP"

Improve effective utilization of DR systems with dual-purpose capability: One of the features that is most in demand by customers who are considering a DT solution, is dual-purpose capability. This feature means that the standby system can be used for some other purpose, when it is not used to run the production system (e.g., as a test or development system). The main requirement for a dual-purpose standby system is separate storage subsystems for the copy of the production database(s) that will be active during normal operation.

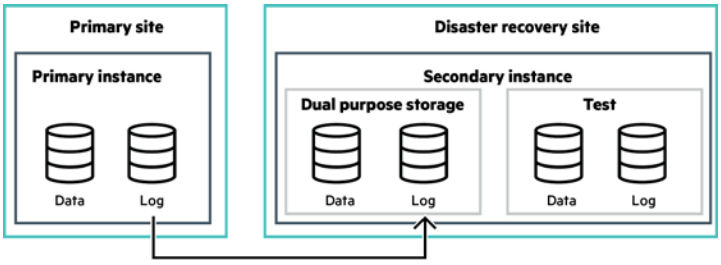

Figure 3. Dual-purpose standby system

While a dual-purpose standby system can significantly reduce the cost to implement a DT solution, you should consider the following points very carefully:

- Dual-purpose standby causes significantly higher RTO compared to dedicated standby. This results from two factors: You lose the benefit of applying log file updates directly to an in-memory database, due to the fact that the log file updates must be written to disk only, since the memory is being used by the non-production system. If a failover has to take place, the running applications must be shut down before the production system can start up.
- Dual-purpose standby may introduce undesirable dependencies. As an example, one of the benefits of HPE Serviceguard for SAP HANA and SAP System Replication is that it enables rolling upgrades. This is a situation where you voluntarily failover to the standby system so that that you can perform maintenance, including operating system or software updates on the production system without incurring any application downtime. If you have implemented a dual-purpose standby, then you can only make use of this feature if you are willing to shut down the normally running applications while you do the maintenance on the production system.

Serviceguard takes care to shut down non-critical dual purpose HANA instances as part of a production takeover operation. Serviceguard also supports multiple production scale-up HANA systems in the same cluster. They can failover independently. Figure 4 shows some usable concepts realized with this feature. A combination of the concepts is possible.

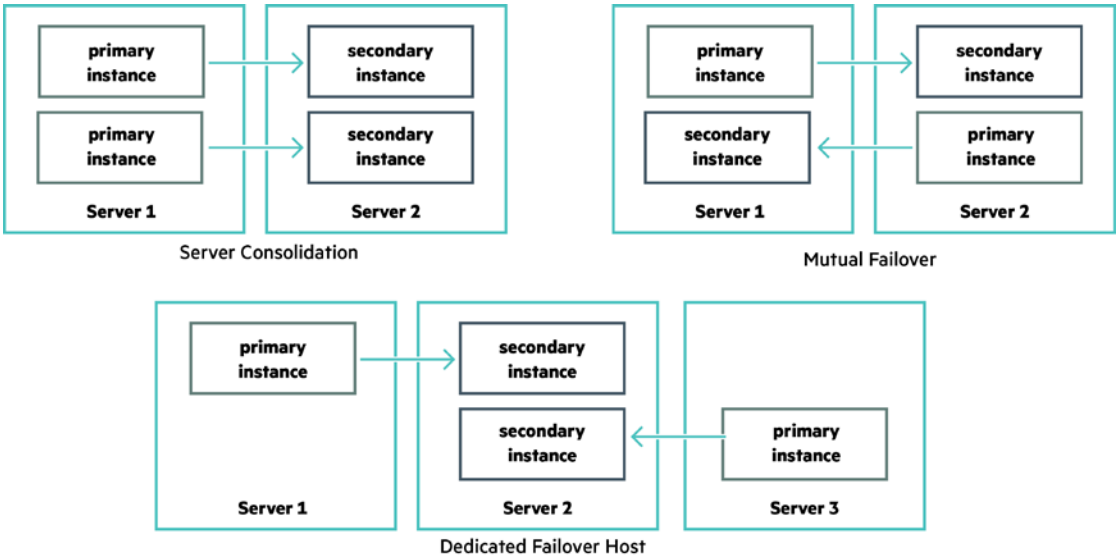

Figure 4. Different HANA Multi-SID cluster topologies

Networking Recommendations for Serviceguard

- HPE recommends that you dedicate a LAN for the heartbeat and as well as configure heartbeat on other subnets as well, including the data subnet. This increases protection against multiple faults at no additional cost.
- HPE recommends you use channel bonding in each critical IP subnet to achieve highly available network services. HPE recommends to bond ports from different cards. For more information on different supported bonding modes, please refer "Managing HPE Serviceguard for Linux".

HPE Technology Services for Serviceguard

Additional services will be included for—Serviceguard for SAP HANA HA scenarios and Serviceguard for SAP HANA HA and DT scenarios—to ease the effort of Serviceguard and system replication implementation for SAP HANA. These services will accelerate your time to value and thus positively impact return on investment (ROI) and total cost of ownership (TCO).

The HPE consultant will collect the necessary technical information and configure the HPE ConvergedSystem for SAP HANA in a HA or HA and DT environment. Key core deliverables that set HPE apart include:

- HPE consultant acts as the single point of contact during the HA or HA and DT implementation of the HPE ConvergedSystem 500 or 900 for SAP HANA or TDI
- System replication solution configured according to your requirements and in line with the HPE and SAP recommendations
- A Serviceguard HA or HA and DT solution configured according to customer's requirements and in line with the HPE and SAP recommendations
- Correctly configured HA SAP HANA appliance
- Customer knowledge sharing

Buyer's guide

Serviceguard for Linux for the ConvergedSystem appliances and TDI deployments—providing HA, which is the solution for your local HA needs; and providing HA and DT, which is the solution for DT across two sites. And the best part, Serviceguard comes as a bundled product with the HPE ConvergedSystem for SAP HANA appliances, which means while ordering your system, just choose Serviceguard as an in-built option and it comes to you factory integrated. For more details, visit hpe.com/info/sap/hana.

The reasons why you should choose Serviceguard over the other options available in the market, and specially for your SAP HANA appliances, are:

- HPE Serviceguard has emerged as a pioneer in the SAP HANA landscape as it supports the unattended failover for both SAP HANA scale-up and scale-out systems.
- HPE Serviceguard gives enhanced availability without compromising on utilization. It fully leverages the SAP HANA dual-purposing model, Multiple Database Containers (MDC tenants) and consolidated Multi-SID installations, giving you more ROI from the total HA and DT setup.
- HPE Serviceguard has only one timeout value to be configured and can be installed and configured in just three commands. A simple 2-node cluster is setup and can be easily extended up to 32 nodes without any major changes to cluster parameters. Whereas, Linux distribution native and in-built HA options available in the market, use disparate open source software and require multiple inter-related timeouts to be configured appropriately to arrive at a resilient cluster design. This can be a daunting task and whenever you make changes to your cluster by adding or removing nodes, it may be required to again fine tune the cluster design.
- HPE Serviceguard employs algorithms and interfaces that are time tested over a period of over two decades in mission-critical environments. On the other hand, the Linux distribution in-built HA options are evolving products, and change from version to version. They may not always preserve backward compatibility and at times may even require reconfigurations. In this aspect HA add-on software are still not ready for mission-critical environments.
- HPE Serviceguard provides advance features to make administration of clusters easier, such as cluster simulation, command preview, and cluster verification.
- With HPE owning the complete stack—for your HANA databases, right from the appliances, the OS, and the clustering software, for all your support needs—it is just one vendor that you need to call. HPE being a global company has sales and support available across the globe. It is easy for a customer to get information about our products and address their problems, as HPE corporate sales and support processes are robust enough to get the customer problems resolved when they really need it anytime 24x7x365.
- HA is a critical business need and Serviceguard product development is aligned with HPE server and storage platform development cycles. A comprehensively tested and optimized Serviceguard product would be immediately available for newly launched HPE hardware products resulting in the highest levels of quality of the integrated solution with best-in-class performance.

Implementing a proof of concept

As a matter of best practice for all deployments, HPE recommends implementing a proof of concept using a test environment that matches as closely as possible to the planned production environment. In this way, appropriate performance and scalability characterizations can be obtained. For help with a proof of concept, contact an HPE Services representative or your HPE partner, and visit hpe.com/services/sap.

Learn more at

hpe.com/info/sap/hana
hpe.com/servers/sglx

Sign up for updates

4AA5-7724ENW, September 2016, Rev. 1

Hewlett Packard Enterprise