

Considering the Move to SAP HANA: An Enterprise Storage Impact Analysis

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Enabling you to make the best technology decisions



Executive Summary

The ideal computational system keeps all data in the fastest accessible place—typically the system memory. However, memory volatility and cost have traditionally limited the feasibility of such an architecture. Thankfully, the same kinds of technology advancements that are driving the flash storage revolution are also quietly driving significant changes in the ways that computer system memory is implemented and used as persistent storage. It is now economically feasible to run an entire database, for example, in server memory, which is a significant technological advancement that promises to alter the way computing systems are designed and implemented, which is now known as in-memory computing.

SAP follows this trend with the introduction of HANA, an in-memory data platform and its S/4HANA business suite built on HANA technology. This paper reviews some of the critical considerations for choosing the infrastructure supporting SAP HANA, while focusing on storage as a key component. NetApp's storage solutions are highlighted to offer real-world examples of how storage plays a key role in these considerations.

The Move to SAP HANA

There are two separate but related trends within businesses: the desire to attain increased business agility coupled with the need to retain increasing amounts of data and make decisions based on that data more rapidly. While these goals are clear, the resulting actions can have a significant impact on organizations and, in particular, on their information technology (IT) operations. Agility in choosing application deployments that use traditional data centers, along with public, private, and hybrid clouds, is critical to the success of enterprise transformation. But these new application environments also need to conform to business continuity (BC), security, and data integrity mandates.

SAP has been at the heart of business processes and decision making. At the same time, it has grown to conform to enterprises' IT policy mandates. Now, one of the platforms that is helping to drive decision making from weekly or monthly planning sessions into real-time processes is SAP S/4HANA. SAP S/4HANA applications use the HANA database for real-time processing of information, at speeds significantly faster than alternative financial and enterprise resource planning (ERP) software can achieve.

The implications for deploying SAP HANA are far reaching, both for the potential to transform existing business processes and for the impact on an organization's IT operations, policies, and infrastructure. Thus, it is important to choose the right IT components for operating SAP HANA, which will continue to be as central as they are today to many operations using previous SAP versions.

Storage is a critical aspect of applications due to the need for data protection features, along with the impact on scaling applications and meeting performance criteria. SAP HANA can impact storage requirements in several ways, including:

- Low-latency storage for SAP's highly random input/output (I/O) profile

- High throughput during load and recovery operations
- Continual data protection, including backup and BC/disaster response (DR) capabilities

As a result, storage infrastructure plays a key role in meeting application service-level objectives. Storage infrastructure also represents a significant portion of a project's acquisition costs, along with ongoing operational considerations.

The Role of Storage in Surviving a HANA Transition

Using SAP S4 in conjunction with the HANA database enables companies to modernize their processes, enhanced by the ability to make real-time decisions due to SAP HANA's real-time processing capabilities. However, transitioning major business applications and their user groups from traditional SAP platforms to HANA will have profound implications for the entire organization.

Choosing the right storage platform to support this transition will go a long way toward reducing the impact. Storage is a key component of any infrastructure, particularly for critical business applications like SAP S4 HANA. Beyond merely meeting the basic requirements, best in-class storage systems often provide additional features to address data protection and DR, as well as addressing operational cost and complexity.

For critical-business applications, it is important for the supporting storage platform to flexibly meet business needs, while providing the best underlying technology for the operation of SAP HANA. Although not identical for every company, the requirements outlined below provide a solid foundation for analyzing storage choices and options available. These requirements may be used to evaluate potential solution offerings, including how well a solution meets IT's particular needs:

- **Performance Architecture:** Implementing performance for optimal business operations with the ability to scale performance, with no impact on data protection or DR operations
- **Application and Data Availability:** Integrating multiple components to ensure operational reliability, including high-availability (HA) storage capabilities, DR options, and data protection processes
- **Cloud Compatibility:** Assuring that the HANA storage environment is compatible with enterprise cloud objectives and evolving cloud infrastructure (i.e., hybrid/multi-cloud)
- **Budget Impact:** Minimizing software licensing, implementation, and ongoing operational costs by selecting the most appropriate storage
- **SAP Certified and Solution Support:** Adhering to SAP's tailored datacenter integration (TDI) certification process

Performance Architecture

SAP HANA is one of the most successful examples of in-memory computing, which loads the entire database from storage into system memory. Somewhat paradoxically, however, the move to higher speed computing actually drives a need for higher performing storage in order to support these applications. The requirement for higher storage performance is being met by a similar evolution in

technologies, from mechanical disk drives to flash-based storage, and more recently with emerging non-volatile memory media and access technologies like non-volatile memory express (NVMe).

SAP S4 HANA's unique in-memory architecture can eliminate processing delays caused by waiting for data from storage. However, these delays can still occur when loading or processing data as it is flushed from memory to storage. Additionally, backup and data protection can impact application processing, adding to delays or even requiring application downtime. In order to provide high performance for SAP, while running the application without degradation during data protection or BC protection, it is important to choose storage that goes beyond basic SAP HANA requirements.

For storage performance, latency is one of the most important aspects of a storage system. Adding additional capacity or scale cannot lower latency, it must be a part of a system's design from the outset. Thus, it is critical that a storage solution not only meet HANA's requirements, but also can deliver industry-leading performance across multiple locations, while protecting data.

Application and Data Availability

Application availability is perhaps the most important consideration, regardless of where an application runs, including on-premise or public or hybrid cloud deployments. Therefore, the HANA storage system must assure this bedrock capability, with SAP providing application-based methods for creating backups, replicating data to secondary sites, and coordinating failovers. While these methods work independently of storage, they may not be the most efficient or effective mechanisms for protecting a HANA application. Storage-based data services, such as snapshots and replication, can supplement SAP's application-based services in ways that enhance application availability and recoverability.

Cloud Compatibility

Cloud computing will play an increasingly important role in businesses with impacts on application deployment locations and operations, as well as financial and security concerns. Top executives want the flexibility to run applications in a public, private, or hybrid cloud environment without being locked into any specific model. SAP HANA is a leading application for cloud computing with business and IT executives.

Any S4 storage solution must now fit in with enterprise IT's cloud objectives. Evaluator Group regularly conducts primary research into a variety of topics, including cloud and hybrid cloud storage used by enterprise IT organizations. Based upon survey and follow-up discussions, Evaluator Group saw that more than 50% of companies are currently using hybrid clouds for BC/DR.¹ Additionally, these enterprises intend to increase spending for cloud services over the next 2 years, with Tier 1 applications and BC/DR the top two categories planned for hybrid cloud storage spending.

¹ Evaluator Group Research, "Hybrid Cloud Storage for Enterprise," published August 2018.

According to Evaluator Group research, cloud computing plays a significant role in companies' IT operations and its use will continue to grow. For enterprises implementing business-critical applications, the ability to leverage cloud storage for operations, backup, and BC/DR is a key consideration.

Budget Impact

Licensing can be complex and may include individual users and application access to SAP S4 data for business processing, along with vertical industry and other options available. One of the primary components of cost for SAP HANA is database capacity, with licenses allocated by capacity. Therefore, the size of the database is a key aspect in understanding both the required system architecture and the resulting implementation and ongoing maintenance costs.

Along with significant costs for application licensing, there are often associated implementation, conversion, and operational costs. As a result, businesses that are implementing S4 HANA or upgrading an existing system want to ensure their critical application is highly available and has appropriate application resiliency, data protection, and BC options available. Moreover, due to the critical role of SAP HANA and the financial implications, using a best-of-breed storage solution that can provide application resiliency, flexibility, and complexity reduction is an important factor for success.

SAP Tailored Datacenter Integration Certification

SAP provides users with its TDA infrastructure certification process for SAP HANA. SAP's TDI certification guides users to vendors and products that are able to reliably meet the needs of an S4 HANA installation. For storage, this means that application performance levels can be met by the underlying storage system that meets TDI certification. SAP has developed extensive performance criteria and certification testing to validate that a specific application has sufficient compute, storage, and other resources to meet processing requirements. This certification is part of becoming qualified to provide TDI storage as part of an overall SAP S4 HANA solution.

Choosing Partners for the Transition

Critical business processes rely on the availability of SAP. At some point in transition planning, enterprise SAP and IT administrators have to evaluate and come to conclusions regarding real-world infrastructure componentry and vendor support for HANA. Carefully considering and choosing the right infrastructure partners will help to assure a smooth transition. Below, Evaluator Group considers NetApp and its ONTAP storage platform in this light.

NetApp for HANA

NetApp has established a significant presence in enterprise data center storage. It already supports a sizable percentage of enterprise SAP implementations with its ONTAP-based storage systems. NetApp is now ready to bridge its existing SAP storage environments to HANA with multiple data management and performance-centric capabilities that include a data fabric architecture for hybrid cloud, scalable all-

flash arrays, data protection and DR capabilities, and partnerships to assist with a smooth HANA transition.

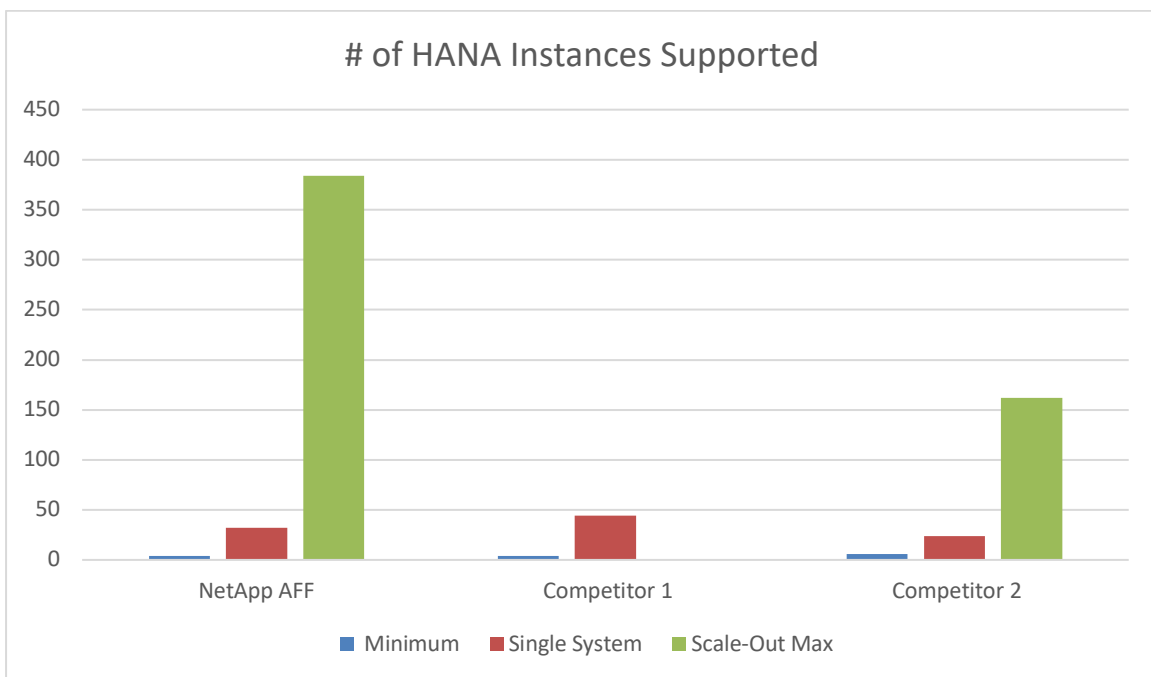
Data Fabric for Cloud Flexibility

NetApp's Data Fabric offers a consistent enterprise data management layer across private, hybrid, and multiple public cloud environments. Of particular interest to prospective HANA users is the ability to migrate and synchronize data for SAP transitions, as well as to manage data throughout the Data Fabric, whether on private or public clouds, with extensible orchestration tools.

As a result, a Data Fabric delivered by NetApp helps SAP customers run applications wherever they want. Perhaps even more importantly, customers retain the ability to change their deployment options, without needing to change storage vendors or lose enterprise features.

Scalable Performance

Performance is an important consideration for all business-critical applications, particularly for SAP S4 HANA. NetApp's ONTAP-based storage systems provide the industry's most scalable SAP HANA solution, supporting up to 384 HANA application instances simultaneously (see Figure 1 below), which is more than 2X that of the nearest competitor.² Just as importantly, ONTAP solutions scale down just as effectively, with the mid-range All Flash FAS 200 systems providing all of the same enterprise data protection and availability solutions as the largest configurations.



² SAP HANA published TDI storage results as of 9/27/19: NetApp AFF Cluster 384 SAPs versus EMC PowerMax 162
<https://www.sap.com/dmc/exp/2014-09-02-hana-hardware/enEN/enterprise-storage.html>

Figure 1: HANA Requirements Delivered by NetApp ONTAP

NetApp's all-flash ONTAP systems have some of the best performance characteristics across a mixture of applications, including low latency as a result of using non-volatile memory cache, along with the latest I/O technologies, including NVMe storage, and server-to-storage access using the NVMe over Fabric (NVMe-oF) protocol.

Performance is a key reason for deploying SAP HANA, and application performance depends upon the storage system. NetApp provides both ultra-low latency and a highly scalable architecture to enable rapid SAP processing, and together with NetApp's advanced data services, performance is not impacted during application backup or DR operations.

The ability to economically match storage performance to the size of the application deployment is another important consideration when selecting storage for HANA. The enterprise storage market offers large-scale systems that can deliver high performance, along with advanced services for data protection and recovery. However, these systems may be larger than required for an initial deployment, leading to the inefficient use of resources. In other instances, a mid-range storage system may provide appropriate capacity and performance, but may not offer the availability and data protection features desired.

NetApp's scalable design provides customers with a choice of platforms for deployment, including mid-range and large enterprise systems, along with private and public cloud options like Cloud Volumes, ONTAP, and Azure NetApp Files. As performance or capacity needs change, these systems can be scaled as required, without any change in the advanced data protection features available.

ONTAP Availability and Data Protection

Data protection is measured by recovery time objectives (RTOs), or how long it takes to recover, and recovery point objectives (RPOs), which is a measure of how far back in time data may be recovered. NetApp ONTAP-based storage provides multiple features that help create, retain, and recover HANA data via a centralized, policy-based management interface. As a result, it is possible to substantially improve both RTO and RPO levels using these facilities, rather than traditional backup and recovery tools.

The foundation for NetApp's data protection is ONTAP Snapshots, which create HANA database backups without performance impact to production applications. NetApp Snapshots are space efficient and they also serve as the basis for additional data protection, including local and remote replication and long-term retention of snapshot backups on secondary systems.

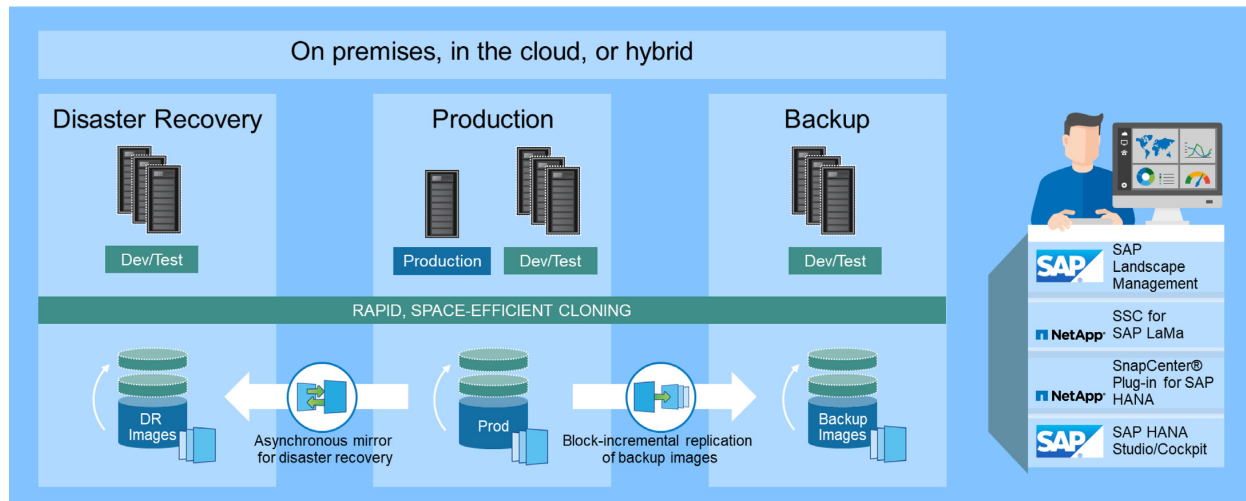


Figure 2: NetApp Data Protection and Disaster Response Options (Source: NetApp)

NetApp SnapCenter delivers data protection management and integration with SAP HANA Studio, giving visibility from within the SAP toolset. SnapCenter helps to create and manage data protection points and provides the ability to recover protection points using either SnapCenter or SAP HANA Studio, providing additional flexibility for IT and database administrators. Local copies enable rapid recovery, and NetApp SnapVault snapshot backups are sent to remote systems.

For BC/DR, SnapCenter also serves as the focal point for managing data protection and initiating recovery operations. Replication via NetApp SnapMirror provides both synchronous and asynchronous local and remote mirroring capabilities. NetApp SnapCenter delivers a data protection catalog of protection points, along with SAP HANA integration. SnapCenter can manage Snapshot copies created by SnapVault and SnapMirror, as well as a restoration of the database with SnapRestore.

The time needed to recover a database depends upon several factors, including the amount of data changed in the database transaction logs since the data protection point was created. By creating more frequent recovery points, fewer transactions in the logs must be applied in order to restore the database, resulting in faster recovery operations. SnapRestore software enables the restoration of an entire database using any available Snapshot point-in-time copies, either locally or on secondary systems or sites.

Moreover, NetApp provides multiple features for HANA data protection, along with tools for BC/DR, such as NetApp Snapshots and the HANA SnapCenter plugin to provide policy-based management of data protection points across multiple locations. SnapMirror provides multiple replication options for metro and long-distance DR, including support for public and hybrid clouds, along with management via the NetApp SnapCenter plugin.

In summary, NetApp data protection and BC/DR options for HANA include:

- Storage backups using NetApp SnapCenter plug-in for HANA creates consistent Snapshot backups via interface to SAP HANA
 - Space-efficient Snaps may be created / restored in minutes
- SnapVault software enables Snapshot copies to be moved from primary to secondary storage using SnapCenter
 - Backup retention policies can be defined for primary and secondary storage using the SnapCenter plugin for HANA to manage retention, including the backup catalog, and to block integrity checks
- Disaster Recovery
 - SnapCenter plugin can also be used for asynchronous mirroring with NetApp SnapMirror to replicate to a DR site
 - MetroCluster provides synchronous mirroring for HA failover
- FlexClone provides space-efficient test / development copies

Final Considerations

When considering the move to HANA, IT administrators are thinking about the impact in terms of cost, complexity, and the potential for disruption to critical business processes. Thoughtful consideration of the data environment should also be uppermost in their minds. Evaluator Group believes that there are multiple reasons for considering NetApp's Data Fabric and storage platforms in this context, which are outlined in Table 1 below:

| HANA Requirements | NetApp Features | Customer Benefit |
|---|-------------------------------|--|
| Traditional and Cloud Computing Options | Data Fabric | Flexibility to deploy and operate on-premise or across hybrid cloud environments |
| High Performance | ONTAP scalability | Scale from 6 to 385 SAPs, widest range of any enterprise storage vendor |
| Multiple Backup Options | Snapshot and SnapVault | Rapid application protection to local and remote sites without disruption |
| BC / DR Flexibility | ONTAP SnapMirror | Replication across private, public, and hybrid clouds |
| Application Performance and Protection Visibility | SAP / NetApp tool integration | Simplified operations, consistent protection and performance |
| Rapid ROI | SAP Platinum Partner | Reduced time to deployment with certified partners and architectures |

Table 1: HANA Requirements Delivered by NetApp ONTAP

NetApp's storage solutions for SAP HANA, when acquired in conjunction with leading business partners, provide multiple deployment options, all with consistent data protection and BC features, regardless of solution size or deployment in a private or public cloud. Using NetApp's ONTAP storage enables companies to choose multiple public or hybrid cloud deployments, while still retaining the ability to protect and migrate data to meet changing business needs.

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