Building a Trusted SAP HANA Datacenter

Cisco and EMC and SAP offer years of trust and reliability for the SAP Datacenter Infrastructure Platforms

Building a Trusted SAP HANA Data Center

Cisco, EMC, and SAP offer years of trust and reliability for the SAP data center Infrastructure platforms

Executive Summary

SAP®HANA™ is a next-generation database platform for real-time analytics and applications. Although the in-memory, columnar relational database debuted only recently (in June 2011), it has quickly become the fastest growing product in the history of SAP AG. Already proven enormously successful for analytics, SAP HANA now supports SAP Business Suite, SAP's flagship enterprise resource planning (ERP) application. It has also been identified as the focus for innovation for SAP. To prepare for this eventuality, enterprises are considering ways to make SAP HANA "data center-ready."

SAP has certified a limited number of hardware appliances as suitable platforms for SAP HANA. In this white paper, we will demonstrate the ways that Cisco®, EMC®, and VCE have partnered with SAP to build SAP HANA-certified appliances that integrate best-of-breed technologies to deliver industry-leading scalability and performance. We will also show how these proven Cisco and EMC technologies can substantially reduce business risk by ensuring that enterprises achieve the data protection, high availability (HA), disaster tolerance, and continuous access required for their business-critical applications and information.

cisco EMC² VCE

Introduction: The Business Case for a Reliable and Robust SAP HANA Platform

SAP HANA is the future direction for SAP innovation. The database combines transactional data processing, analytical data processing, and application logic processing functionality—all in memory. This design allows enterprises to perform real-time online application processing (OLAP) analysis on an online transaction processing (OLTP) data structure.

In addition to being the fastest growing product in the history of SAP AG, SAP HANA is also the fastest product, period. For analytics applications, SAP HANA performs as much as 1,000 times faster than conventional databases. The market has been so impressed that SAP signed more than 1,500 customers across 25 verticals in the first two years since the product's launch. These enterprises are primarily employing SAP HANA to support SAP Business Warehouse (BW) analytics applications that allow them to respond to real-time events, improve operational efficiencies, meet or exceed service level agreements (SLAs), and respond swiftly to real-time market conditions.

In an important new development, SAP HANA now supports SAP Business Suite, SAP's flagship enterprise resource planning (ERP) application. SAP is encouraging its customers to run their real-time transactional systems on it, as SAP HANA will eventually evolve into a foundational element of SAP's enterprise computing roadmap.

SAP's journey will have a massive impact on enterprise IT infrastructures. After all, it's a significant leap to move from using SAP HANA for analytics to depending on it for the day-to-day operations of a business. Both are important. However, while most enterprises can continue operations if an analytics application is unavailable for an hour or even a day, it would be disastrous to lose a real-time transactional system for even a short period of time. Choosing the right hardware platform to make SAP HANA data center ready is therefore critical.

Figure 1 lists the five essential capabilities businesses need when choosing a SAP HANA-ready hardware platform, and documents the technical requirements and business results.

Cisco and EMC together offer several SAP HANA appliances that possess all these capabilities and more. By choosing an SAP HANA appliance built using Cisco Unified Computing System (UCS) servers and EMC storage infrastructure (VNX), enterprises can minimize deployment risk while taking advantages of SAP innovation.

FIGURE 1: THE FIVE ESSENTIAL CHARACTERISTICS OF A SAP HANA HARDWARE PLATFORM

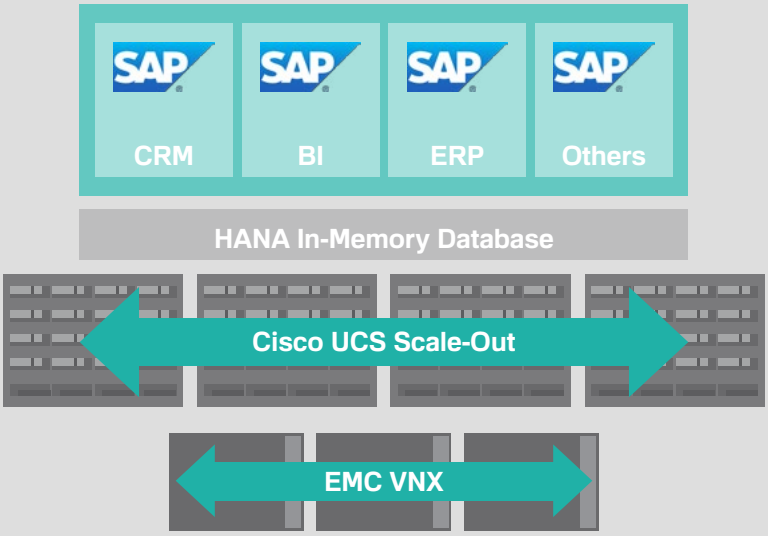
	Definition	Technical Requirement	Business Result
Persistence	Ensuring persistence for booting and fallback in case of in-memory data failure.	Low-latency and high reliability to efficiently protect the gold copy of data	Meet compliance, governance, and business objectives
High Availability Inside the Datacenter	Redundant components, manageability (IIPA), and node failover make the server reliable within the data center	Seamless failover on all components within the datacenter	Meet service level agreements (SLAs); business continuity
Disaster Tolerance Between Datacenters	Protects from complete server failure within and between data centers with EMC Replication	Automatic failover across campus, metropolitan, and other boundaries	Meet SLAs; business continuity
Disaster Recovery	Protects from complete data center disaster using backup and recovery with Data Domain and remote fail-over	High-speed recovery of all protected data between sites	Business continuity
IT Process Administration	Reliable automation of essential management tasks and corrective actions	Automated operational processes ensure timely response and minimize human errors	Reduce systems downtime and reduce IT labor costs

Meeting SLA and Business Continuity Challenges with SAP HANA

Given the business value of data that is increasingly being stored in SAP HANA databases, protecting SAP HANA environments from system failures or disasters is a critical requirement for SAP customers. Enterprises depending on SAP HANA for business-critical applications will require sophisticated server and storage solutions to maintain persistence of data and business continuity.

The alliance between SAP, Cisco, EMC, and VCE makes for an optimal solution. All are leadering firms in their respective markets. Together, they offer a flexible, multipurpose, data-source agnostic, in-memory appliance in an integrated stack. This collaborative solution includes the SAP HANA in-memory database, Cisco Unified Computing System (UCS) blade servers, and EMC storage infrastructure (VNX). This combination of leading technologies allows enterprises to perform real-time analysis on big-data files—both structured and unstructured—for real-time decision-making (see Figure 2).

FIGURE 2: FIGURE 2: SAP HIGH-PERFORMING ANALYTICAL APPLIANCE



SAP HANA HIGHLIGHTS

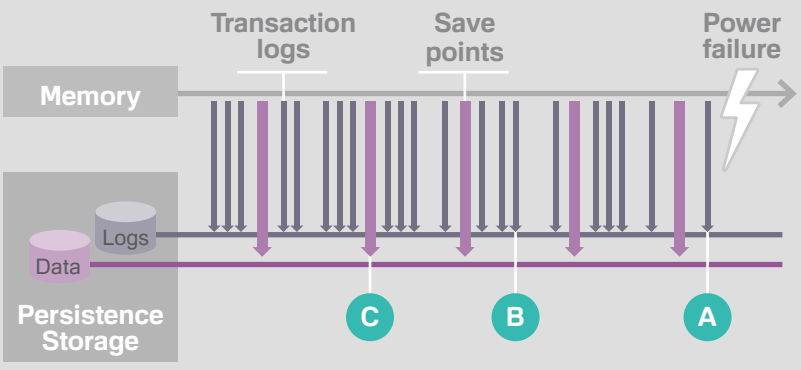
- SAP HANA is a high-performance database that runs in memory.
- SAP HANA employs memory speed and columnar data store to run analytics thousands of times faster than from disk.
- SAP HANA's compression technologies can extend its database capacity four to five times.
- SAP HANA is deployed only on SAP-approved appliance configurations that are pre-assembled and pre-loaded by the server vendor.
- SAP HANA deployments typically use two to three appliances for production, test, and development.

Data Persistence

With SAP HANA, the database and its transaction log reside in memory. This configuration accelerates performance, but what happens when there is a failure? Is data in memory lost?

No. The transaction log tracks all changes made to the in-memory database. When a transaction is committed, or when the transaction log becomes full, the log is written to persistent storage on the EMC storage device(s) using sequential writes in 1MB blocks. By creating a save point, the system ensures the entire in-memory database image is stored to disk. This copy can be read in the event of a failure to restart the application and environment. Save points occur regularly (by default, every five minutes) to ensure database consistency (see Figure 3).

FIGURE 3: SAP HANA PERSISTENCE

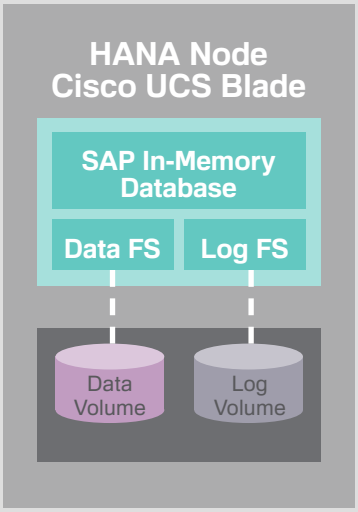


Recover options:

- A Until the latest point in time (Latest backup + log entries)
- B Until a specified point in time (Backup + log entries)
- C Using specified backup (Without logs)

EMC storage is the persistence layer. A copy of the appliance software, database save points, log files, and snapshots are all maintained; in case of failure, they can all be retrieved without loss of data. Persistence is managed by the SAP Block API (application programming interface) to ensure exclusive access to persistence. The SAP HANA persistence layer resides on either internal disks (single node) or on shared storage (multi-node cluster) and uses two volumes, Data and Log (see Figure 4).

FIGURE 4: SAP HANA PERSISTENCE LAYER



High Availability Inside the Data Center

All data center systems must be resilient and capable of self-healing in the event of an outage, whether caused by infrastructure failure or unforeseen external events. This requires that the systems contain redundant networks and components and be configured in clusters, with no single points of failure.

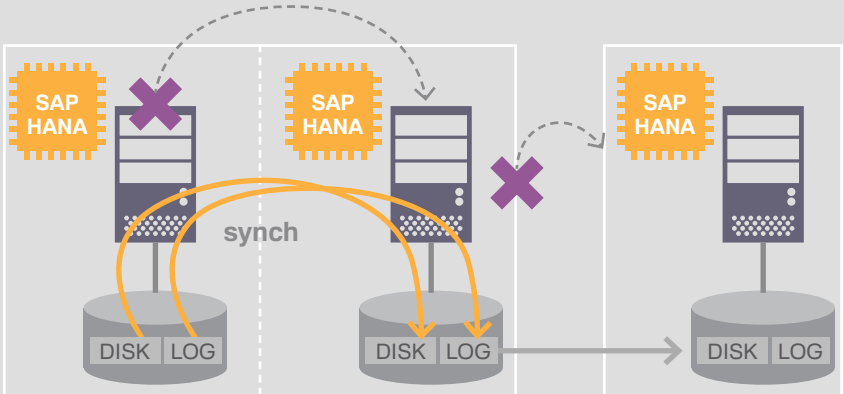
Such high availability (HA) is critical when deploying SAP HANA for real-time transaction systems. SAP HANA appliances achieve this by using a combination of Cisco UCS' architecture with No Single Point of Failure, EMC's 99.999-percent-available EMC VNX 5300 Array, and EMC's implementation of the SAP Block API, (which it co-developed with SAP) to enable non-disruptive failover.

All components in the solution—blade servers, storage systems, and networking components—are highly available, and in many cases, redundant. Because the Cisco and EMC appliances use Cisco stateless blade servers, a failed blade server can be replaced in minutes. The operating system, profiles, and data all reside in storage and are managed by Cisco UCS Manager. The Cisco UCS unified fabric interconnect can allocate any switch port to any job at any time, which allows failing storage ports to be repaired in minutes. Cisco UCS Manager provides real-time monitoring, and the EMC storage systems offer exceptional high availability features.

Storage area network (SAN)/block storage is the dominant choice for protecting SAP data, ensuring high availability and fast disaster recovery. Cisco and EMC were among the first vendors to deliver block-based offerings. Block storage eliminates the restriction on unattended high availability and is based on industry standard file systems that leverage the block I/O API co-developed by SAP and EMC.

Additionally, EMC VNX series storage systems use a mirrored write cache for improved data availability. Battery backup allows for an orderly shutdown, and caches are flushed to vault disks to help protect data in the event of a power failure. The storage systems support RAID (Redundant Array of Independent Disks) 0, 1, 1+0, 3, 5, and 6; different areas of the array can use different RAID levels. The storage system has redundant data paths, power supplies, drive connections, and storage processors, and supports hot sparing. All components can be replaced without disruption. Continuous system monitoring, call-home notification, and advanced remote diagnostics help administrators identify, find, and fix potential issues faster (see Figure 5).

FIGURE 5: DISASTER TOLERANCE WITH SYSTEM PLUS STORAGE REPLICATION



Let's take these points one by one:

- **Server hardware infrastructure availability profile.** Cisco UCS is the first data center platform that integrates industry-standard, x86-architecture Intel® Xeon® processor-based servers with networking and storage access into a unified system. Server, networking, storage, and intelligent management resources work together in a self-aware, self-

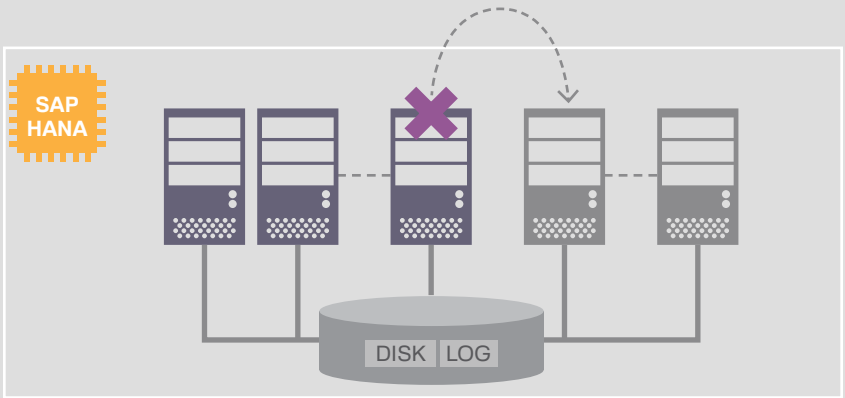
integrating, and self-healing system. This design delivers greater computing density and network simplicity in a smaller footprint that reduces operating costs. A unified fabric is supported by a single, distributed virtual switch that interconnects all server resources. It delivers high availability (HA) for the database through complete redundancy of all components. Failure of any one component, whether a network component or power and cooling capabilities, is instantly and automatically replaced by another unit in the system so no transaction or data is lost.

- **SAP HANA persistence layer and storage array availability profile.** The persistence layer is where the system software and a current copy of data are stored. It is the first line of defense against power failure, system crashes, and operator errors. It is also the source of data for a node failover, so the persistence layer must be fast for instantaneous failover and absolutely reliable to avoid disruption. While there may be other sources of data in the configuration, these sources have recovery time in the range of minutes or hours; in contrast, recovery from the persistence layer is instantaneous.
- **Server node failover.** The EMC / Cisco redundant configuration eliminates single points of failure through the use of "standby" nodes that are configured to recover from node failures. Redundant components and nodes, as well as the ability to maintain a consistent state, are built into the appliance; individual components or nodes are automatically and transparently failed over to provide continuous service to users and applications. All active computing nodes in the solution access data and log devices using the SAP HANA Storage Connector API for Block (see page 13). Corresponding data is read into memory and SAP HANA log files are applied, if necessary, to ensure that the system reflects the latest, consistent state. By distributing data processing, the EMC / Cisco solution can scale beyond a single server and eliminates the server as a single point

of failure. In case of failure, the standby node assumes the workload. Once the failed node is restored, it becomes the new "standby" (see Figure 6).

- **SAP Block API.** This is a fully supported industry-standard API co-developed by EMC and SAP. Cisco and EMC are among the first certified vendors to implement the SAP's Block API, which is the leading method for protecting data within an SAP environment. Persistence is controlled by the SAP HANA nameserver using the SAP Block API. This ensures exclusive access to persistence using SCSI-3 PGR (persistent group reservations);. This ensures that only the owning node has access to the persistence layer as well as and has persistence mounted on it. Data is automatically stored in the UCS cluster to other nodes in the system for non-disruptive failover in case of a component failure. This also removes restrictions for unattended high availability operations within the system and accelerates the disaster recovery process.

FIGURE 6: SERVER NODE FAILOVER



Disaster Tolerance Between Data Centers

Organizations must consider the possibility that a natural disaster or building emergency can cause the temporary or permanent loss of an entire data center. Enterprises need automated disaster tolerance—defined by SAP as failover between data centers—to provide continuity of service. A standby system, in a separate but nearby physical location, can be configured and managed to take over operations from a failed data center. Both the primary and the standby systems must have the ability to maintain consistency and to fail over automatically. In normal operation, the standby system can be used to run local applications or test/development. In case of an emergency and the loss of the primary data center, applications from the primary system can resume on the standby system, while non-essential applications can be put on hold.

System replication is implemented inside SAP HANA to provide active/active disaster tolerance. During a failure of either system, the synchronous mode ensures that there is no data loss and production is maintained with the other active system. The key advantage to system replication is that failover only takes about five minutes. The disadvantage is that a complete second system is required as a dedicated standby.

Another solution is available: storage replication in an active/passive configuration. In this scenario, MirrorView/S replicates data onto EMC VNX storage at a second location. The backup system can be used for test /development or other non-critical activities in normal operation. If the primary system suffers an outage for any reason, activities on the backup system are stopped, profiles from the replicated remote disks are loaded, and production continues on the remote site. Though failover may take a little longer, this is a more cost-effective solution overall.

As mentioned previously, the Cisco / EMC solution has built-in redundancy that removes single points of failure. The system continues to operate even in the event of a component failure, such as the failure of a switch or fabric interconnect.

With EMC storage, enterprises get a much shorter recovery time objective compared with a solution that uses only backups. Cisco UCS' innovative scalable deployment infrastructure is also a critical part of the solution. By using UCS Service Profiles, the appliance has the ability to manage an individual server identity as a single object, resulting in a much greater ROI for the solution. A server at a remote site can operate as a test / development environment under normal circumstances and seamlessly switch to a production environment in the event of an outage on the primary site; the same servers can be used interchangeably for both functions.

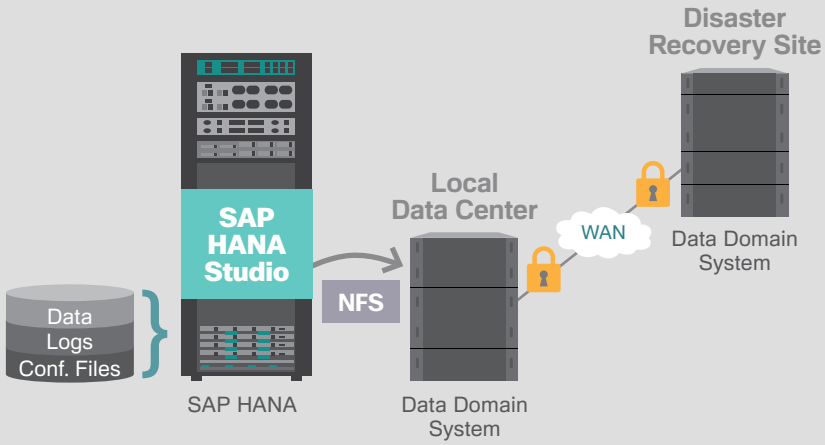
Backup and Disaster Recovery

Defined by SAP as a rebuild of a server, disaster recovery can happen rapidly with a Cisco / EMC or VCE SAP HANA platform.

SAP HANA appliances are protected on many levels, as discussed previously. However, a disaster can occur that outstrips the capabilities of persistence and high availability measures. For that reason, enterprises must always deploy backups in the event that SAP HANA is unable to start after a failure.

As seen in Figure 7, both Cisco / EMC and VCE SAP HANA appliances have backups that can be orchestrated through SAP HANA Studio to EMC Data Domain via Network File System (NFS), enabling a simplified single-step backup and restore.

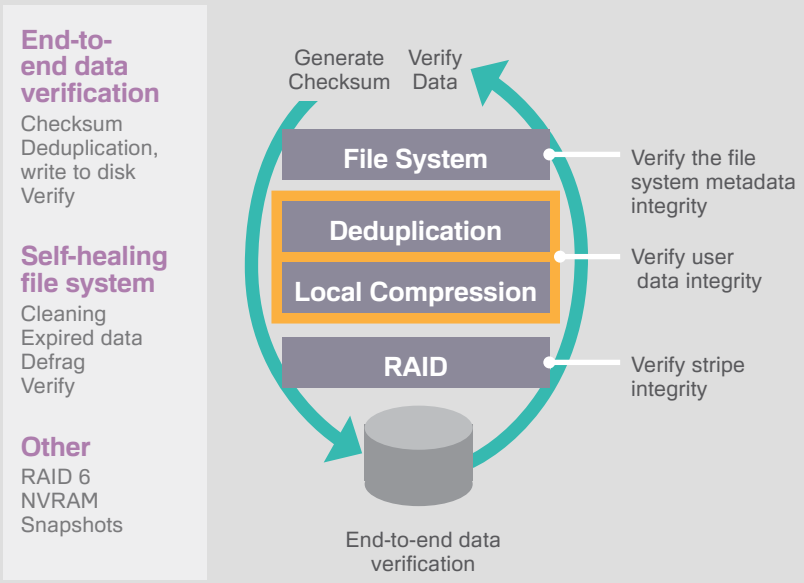
FIGURE 7: DATA DOMAIN NFS FOR SAP HANA BACKUP SOLUTION



Backups can be activated by SAP HANA Studio, SQL script commands, or third-party tools. These backups, however, will not be automatically started by the SAP HANA system. Thus enterprises need to architect a backup strategy with their hardware vendor (such as Cisco) to ensure they have the right hardware.

When it comes to data backups, EMC Data Domain deduplication storage systems significantly reduce backup storage requirements with inline deduplication and enable fast, secure disaster recovery through efficient local backup. Data Domain can provide further protection by replicating to a remote disaster recovery site. The Data Domain Data Invulnerability Architecture ensures reliable recovery with end-to-end data verification, continuous fault detection, and self-healing (see Figure 8).

FIGURE 8: DATA INVULNERABILITY ARCHITECTURE



Data Domain systems also integrate easily into existing environments. They allow enterprises to take advantage of the benefits of deduplication across workloads, infrastructure, and backup and archiving applications.

Recovering an SAP HANA database is achieved using SAP HANA Studio. Using an active/passive configuration, MirrorView/S delivers a disaster recovery configuration by writing data to two EMC VNX systems in separate locations using mirrors of source logical unit numbers (LUN) and their corresponding destination LUNs. By using this process, enterprises can be assured that the second copy of the data associated with the source LUNs will be up to date as of the last transaction and is available at the destination site after a MirrorView/S failover.

Cisco IT Process Administration

To help enterprises transition to SAP HANA smoothly and manage it more efficiently after adoption, Cisco offers Cisco IT Process Administration (ITPA). Cisco ITPA provides end-to-end management capabilities that create visibility and enable the monitoring and automated remediation of physical servers, storage, and network devices for SAP HANA. It saves SAP administrators' time and makes it easier to manage the solution through automation. Cisco ITPA for SAP HANA combines a knowledge base of SAP HANA best practice operations with automated corrective actions to repair problems before they can impede the business. Cisco ITPA for SAP HANA provides the following benefits that are essential for any company deploying SAP HANA:

- Helps companies implement SAP HANA best practices right from the start
- Performs system and infrastructure health checks for increased availability and better user experience
- Performs automated corrective actions, with IT checkpoints and full audit tracking
- Enables full management visibility across SAP HANA operations
- Automates routine operations tasks for SAP HANA
- Enhances low-touch, plug-and-play SAP HANA operations

When implemented along with other Cisco ITPA automation packs, Cisco ITPA for SAP HANA makes it possible for companies to introduce SAP HANA while lowering administration costs and freeing resources to focus on expediting new enterprise services.

SAP Customers Have a Choice of Deployment Options with SAP HANA

Enterprises have a choice when it comes to buying an industry-leading SAP HANA appliance for SAP HANA. They can either purchase a Cisco / EMC integrated solution from Cisco, or they can buy an appliance from VCE that uses Cisco and EMC components (see Figure 12).

Vblock™ Specialized System for SAP HANA. VCE, ranked No.1 by Gartner, IDC, and 451Group in integrated infrastructure systems, is ideally suited for moving SAP Landscapes and SAP HANA to a virtual environment. Optimized for SAP HANA software and certified by SAP, the Vblock™ Specialized System for SAP HANA represents best-of-breed compute, network, and storage components from Cisco and EMC. By bringing together all of the necessary components for SAP HANA into a single, standardized converged infrastructure system, the Vblock™ Specialized System for SAP HANA ensures maximum performance

at scale even with high data volumes. The combination of leading technologies allows customers to bring SAP HANA into production with the trusted predictable performance, one-stop customer support, and security that are consistently delivered across the entire Vblock™ family. Enterprises that have committed to the Vblock™ converged architecture, or those that want to pursue a converged architecture, would find this option attractive.

Cisco UCS with EMC Storage for SAP HANA. The Cisco® / EMC® solution makes it easy to add more compute and storage building blocks as demand rises. Built-in automation enables configurations to be deployed quickly, easily, and accurately. Cisco UCS, combined with EMC VNX5300 storage systems, provides persistent storage for SAP HANA and real-time data consumption for business warehousing. Scale-out capabilities, combined with high-performance EMC storage and the balanced resources of Cisco UCS, enable users to get more performance from their SAP HANA implementations. The capability to distribute data processing enables SAP HANA implementations to scale beyond a single server and removes single points of failure that would negatively affect timely results. End-to-end management provides visibility and enables the monitoring and automated remediation of physical servers, storage, and network devices.

Benefits of the Cisco, EMC, and VCE Alliance for SAP HANA

By moving to the SAP HANA platform with EMC and Cisco, enterprises can substantially reduce business risk to the application environment. Through VCE, the solution is validated, pre-tested, and provides enterprises with the confidence to deploy SAP HANA without worry.

What the Cisco-EMC Alliance Offers

- **Scale on Demand.** The Cisco and EMC solution makes it easy to add more compute and storage building blocks as demand rises.
- **Deploy Infrastructure Faster.** Built-in automation enables configurations to be deployed quickly, easily, and accurately.
- **Handle Big Data.** Cisco Unified Computing System (Cisco UCS®), combined with EMC® VNX storage systems, provides persistent storage for SAP HANA and real-time data consumption for business warehousing.
- **Accelerate SAP HANA Performance.** Scale-out capabilities, combined with high-performance EMC storage and the balanced resources of Cisco UCS, enable users to get more performance from their SAP HANA implementations.
- **Deliver High Availability.** The capability to distribute data processing enables SAP HANA implementations to scale beyond a single server and removes single points of failure that would negatively affect timely results.
- **Simplify Management.** End-to-end management provides visibility and enables the monitoring and automated remediation of physical servers, storage, and network devices.

Trust Cisco

Cisco, which has been a leading networking company for more than 30 years, introduced the Unified Computing System (UCS) server platform in 2009. According to IDC, Cisco UCS holds the No. 2 worldwide market share for x86 blade servers and the No. 3 position in the world for all servers. Cisco UCS is the first truly unified data center platform that combines industry-standard, intelligent Intel Xeon processor-based servers with unified management, networking, and storage access. The system is a smart infrastructure that is automatically configured through integrated, model-based management to simplify and speed deployment of enterprise-class applications and services running in bare-metal, virtualized, and cloud-computing environments.

Cisco servers, combined with a simplified, unified architecture, drive better IT productivity and superior price / performance for lower total cost of ownership (TCO). Only Cisco servers integrate with Cisco UCS, and only Cisco integrates rack and blade servers into a single unified system.

Building on Cisco's strength in enterprise networking, Cisco UCS is integrated with a standards-based, high-bandwidth, low-latency, virtualization-aware unified fabric. The system is wired once to support the desired bandwidth and carries all Internet protocol, storage, inter-process communication, and virtual machine traffic with security isolation, visibility, and control equivalent to physical networks. The system's 10GB Ethernet network meets the bandwidth demands of today's multi-core processors, eliminates costly redundancy, and increases workload agility, reliability, and performance.

The Cisco Unified Computing System was developed with the same reliability, scalability, and serviceability that has existed in Cisco core networking products and IT data centers for years. Since 80% of SAP customers already use Cisco products in their IT data centers, application data center managers have

developed the same trust and confidence in the UCS platform that they have in the Cisco core networking products. As a result of the trust and reliability of application data center managers, Cisco UCS is quickly becoming the preferred platform of choice for mission-critical applications.

Trust EMC

EMC is the world's leading developer and provider of information infrastructure technology and solutions that enable organizations of all sizes to transform the way they compete and create value from their information, and is the market leader in backup and recovery.

EMC and SAP have been global technology partners for more than 16 years and have 20,000 mutual clients. Through close collaboration, EMC and SAP solve customers' greatest challenges and help reduce risk and infrastructure costs, meet service level agreements (SLAs), and improve flexibility, agility, and end-user experience so SAP can run better. According to IDC, SAP is deployed more frequently on EMC systems than those of any other storage vendor. EMC, SAP, and Cisco are working together to accelerate SAP customers' journey to hybrid cloud computing to improve business agility and lower IT costs. EMC has unique ties to SAP HANA; it co-developed storage Block API with SAP and is a founding member of the Hasso Plattner Institute, which supported the development of SAP HANA. What's more, EMC's own IT department runs SAP HANA.

EMC storage products offer the following advantages:

- Designed with simplicity in mind, the EMC VNX family of storage systems combines powerful and flexible hardware with advanced efficiency, management, and protection software to meet the stringent demands of SAP HANA deployments. EMC storage is the #1 storage choice for SAP implementations (Source: IDC Worldwide Quarterly Server Tracker, Q1 2013 Revenue Share, May 2013).
- Uses unified storage architecture to satisfy SAP HANA deployment requirements: multi-protocol, multi-purpose support in a single system that scales from entry-level solutions to high-performance, high-capacity configurations of large-scale deployments.
- EMC Data Domain deduplication storage systems are the market leader in purpose-built backup appliance. Data Domain delivers industry-leading performance and scale for the protection of SAP HANA databases, and the Data Invulnerability Architecture ensures reliable recovery of SAP HANA data every time.

Ecosystem Partners

Enterprises can work with Cisco and EMC partners such as Deloitte, Accenture, Optimal, Bluefin, Canopy, and others if they require assistance from a systems integrator to deploy SAP HANA for business-critical applications.

Leading Medical Device Company: Witnessing the EMC and Cisco Alliance in Action for SAP HANA

A leading medical device company is mandated by the U.S. Food and Drug Administration (FDA) to regularly submit reports of complaints about its products. Whether that complaint comes through regular email or phone channels, or is informally picked up in a dinner conversation, the company needs to capture and enter it into a SAP BW database specifically designed to track complaint trends.

Because of the size and type of data—largely unstructured text—the firm had previously only tracked complaints on a country-by-country basis. The firm implemented SAP HANA using the Cisco / EMC platform to create a global complaints tracking database. Using text analytics that capture trends faster, the firm was able to detect problems with products much earlier. When moving from SAP BW to SAP HANA, it cut the querying time from 40,000 hours annually to 20,000 hours. Today, queries are answered in minutes instead of tens of minutes. Additionally, moving to SAP HANA has taken a load off the network and freed up other hardware and storage resources.

Next-Generation Hardware for a Next-Generation Database

SAP HANA gains much of its performance advantage from the use of an in-memory database. Analytics applications have already seen unprecedented performance gains. Moving forward, SAP HANA will increasingly become the common platform for not just analytics applications, but core SAP applications as well. IT professionals will require that SAP HANA to be "data center-ready," as protecting SAP HANA environments from system failures or disasters will be an important requirement given the business value of data contained within the SAP HANA environment. The SAP HANA in-memory database, while essential for performance, requires sophisticated server and storage solutions to maintain persistence of data and business continuity. Cisco and EMC together offer such solutions, which dramatically reduce business risks for enterprises that have chosen SAP as their strategic database vendor.

For more information, go to:

https://community.emc.com/community/connect/everything_sap

www.emc.com/platform/sap.htm

www.cisco.com/en/US/docs/unified_computing/ucs/UCS_CVDs/ds__C78-713329_v4.pdf

www.sap.com/SAP HANA

www.vce.com/products/specialized/sap-SAP HANA

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