

# VIRTUAL SAP HANA® DISASTER RECOVERY ON VMWARE VSPHERE® USING EMC RECOVERPOINT

Proof of Concept for Business Continuance with Virtualization of SAP HANA on VCE Vblock™ and TDI over longer distances

## ABSTRACT

An international team of Deloitte, EMC, VMware, and Cisco functional and technical experts worked together to identify the challenges of SAP HANA Disaster Recovery over longer distances (greater than 500 km). Through this Proof of Concept, named Project RUBICON, this cross-functional, multi-company team explored the possibilities and results of performing HANA Disaster Recovery through the use of HANA on VMware and RecoverPoint.

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## EXECUTIVE SUMMARY

Cloud adoption across the enterprise is a growing reality but much of the usage is in addition to on-premises systems, and not as a replacement for them. As a result, customers have increasingly deployed SAP in cloud environments, primarily in private or hybrid clouds.

Using VMware vCloud® Suite, Deloitte's Cloud ServiceFabric™ offers organizations a rapidly deployable, on-demand, on premise private cloud offering, eliminating the use of disparate resources. Cloud ServiceFabric™ delivers pre-configured private cloud technology that is tested and ready to use – now.

Disaster Recovery for Virtualized SAP HANA is one capability being offered within Deloitte's Cloud ServiceFabric™. There has been great interest in the ability of running SAP HANA on a virtual platform in Production with the recent SAP and VMware announcement of support for Virtualized SAP HANA in Productive mode on VMware vSphere, which brings the following benefits:

- Increased flexibility and agility by quickly adjusting to changing demands
- Built-in functionalities for virtual application high availability
- Better efficiencies in resource management, automation, and IT process simplification which leads to cost reductions
- Simplified Disaster Recovery operating practices

To demonstrate how VMware virtualization technologies used in conjunction with SAP HANA can be a powerful enabler in implementing SAP HANA disaster recovery over longer distance, Deloitte, EMC, VMware and Cisco engaged in a collaborative Proof of Concept (POC) demonstration with 'real-world' client-based use cases that include:

- Addressing the challenges of the SAP HANA Disaster Recovery
- Measuring and testing the results of Disaster Recovery for SAP HANA on VMware over longer distances
- Demonstrating the benefits of Disaster Recovery for HANA via data replication using EMC RecoverPoint's integration with VMware at distances over 500km
- Identifying reductions in TCO that can be achieved through implementation of Virtualized HANA on a Vblock or on a Cisco, EMC and VMware infrastructure.

SAP HANA is making real-time computing and business analytics available to customers who need to achieve faster queries with up-to-the-second data in order to make more accurate business decisions. As a result, it is becoming vital for companies to have proven Disaster Recovery capabilities built into their implementations of SAP HANA and to be able to reliably plan for RTO (Recovery Time Objective) and RPO (Recovery Point Objective) with this business-critical solution.

This POC includes multiple business scenarios for Disaster Recovery using SAP HANA as a Data Mart and as SAP Suite on HANA, and the following results were achieved: restart of sizeable SAP HANA virtual machine at the remote site could be done under 15 minutes, replication of significant amounts of logs, snapshot data could be done over a VPN WAN tunnel at a distance of 550km without any issue, and much more...

This POC also provided valuable lessons learned on optimizing Disaster Recovery Plans for Virtualized SAP HANA with VCE Vblock and V+C+E (VMware+Cisco+EMC) infrastructure on TDI over distances longer than 500km. This White Paper describes the POC objectives, the architectural landscape, and the outcomes achieved.

# INTRODUCTION

## Purpose

To provide proof points for addressing the Disaster Recovery challenges of running SAP HANA over longer distances in Production by using VMware Suite and EMC RecoverPoint and for gathering useful metrics on RTO and RPO

To demonstrate that the sequential restart of a Virtualized SAP HANA environment at the remote site can be automated with VMware SRM (Site Recovery Manager) integration with RecoverPoint

To validate that cost effective WAN connections can be established over longer distance due to RecoverPoint's data compression capabilities

To confirm that a simulation of Disaster Recovery can be performed for testing purposes at the remote site without affecting Production systems

To show that maintenance cycles such as hardware resource upgrades can be completed with very little down time compared to typical physical appliance maintenance

## Scope

This white paper serves the following objectives:

- Describes a Proof of Concept for business continuance with Virtualization of SAP HANA on VCE Vblock and SAP HANA in TDI (Tailored Datacenter Integration) mode over longer distances
- Outlines architectural descriptions of critical components for Disaster Recovery
- Identifies key measurements for RTO and RPO
- Offers outcomes and lessons learned from completed POC

## Audience

This White Paper is intended for customers and partners, specifically technology architects and business line decision-makers looking to implement virtualized SAP HANA in Production.

## OBJECTIVES OF VIRTUAL SAP HANA DISASTER RECOVERY POC

- To identify the specific challenges of running a Disaster Recovery environment on Virtualized SAP HANA over longer distances
- To address these challenges by performing HANA Disaster Recovery Proof of Concept using Virtualized HANA on VMware and RecoverPoint
- To showcase the benefits of Disaster Recovery for HANA via data replication using VMware and RecoverPoint at a distance over 500km
- To demonstrate the value add and show how VMware working with RecoverPoint can reduce TCO and increase ROI for customers
- To test and measure how to optimize RTO and RPO performance for SAP HANA in Production on VMware vSphere with EMC RecoverPoint

### What is SAP HANA?

SAP HANA, short for "High-Performance Analytic Appliance" is an in-memory, column-oriented, relational database management system which allows customers to dramatically accelerate analytics, business processes, and predictive capabilities.

Simply put, SAP HANA is an In-Memory data platform for real time business insight, which has improved performance of SAP applications by running business queries and delivering results thousands of times faster than before.

SAP HANA combines database, data processing, and application platform capabilities in-memory to provide advanced capabilities such as predictive text analytics, spatial processing, and data virtualization on the same platform which further simplifies application development and processing across big data sources and structures.

### Proof of Concept (POC) Overview

An international team of Deloitte, EMC, VMware, and Cisco functional and technical experts worked together to identify the challenges of SAP HANA Disaster Recovery over longer distances (greater than 500km). Through this POC, named Project RUBICON, that cross-functional, multi-company team explored the possibilities of performing HANA Disaster Recovery through the use of HANA on VMware and RecoverPoint.

## PROJECT SCOPE

### Challenges Addressed by the POC

There are specific challenges that apply to the planning and implementation of any Disaster Recovery project. For this POC, they included:

- Avoiding costs (both time and money) to set-up standby equipment at a Disaster Recovery site on a non-virtual platform which is not needed for virtualized environments on VMware
- Achieving reasonable Recovery Point Objectives (RPO) and Recovery Time Objectives (RTO) over long distances (asynchronously at 550km or greater)
- Minimizing network bandwidth and associated costs

### Business & Technical Benefits of the POC

The Project RUBICON POC addressed these specific challenges of Disaster Recovery for SAP HANA via data replication using VMware and RecoverPoint at a distance of over 500km (between the Deloitte DC in Georgia and the EMC DC in North Carolina) by taking the following steps:

- With Virtualized SAP HANA there is no need for separate stand-by equipment to provision and support a Disaster Recovery site since existing hardware, already being used for development, testing, or other workloads, could be leveraged to avoid significant costs for set-up and maintenance of separate stand-by DR equipment
- With VMware Distributed Resource Scheduler (DRS), rules can be created and enforced to make sure that the SAP HANA VMs are only restarted on certified ESX hosts, with the right CPU and memory configurations. With DRS, SAP HANA infrastructure aligns with business goals while dynamically allocating compute resources and guaranteeing performance levels for peak workload processing
- With a carefully orchestrated restart of a virtualized SAP HANA environment over long distance, this POC demonstrated that the remote site can have automated Disaster Recovery with VMware SRM integration using RecoverPoint to achieve reasonable RTO and RPO
- With the use of RecoverPoint data compression capabilities (see NOTE below) and by configuring the POC network from Suwanee, Georgia to Durham, North Carolina as a simple VPN WAN tunnel, this POC was able to minimize WAN costs between those two Data Center sites

Project RUBICON has identified other important benefits of Virtualized SAP HANA and this White Paper describes several Test Scenarios with associated Use Cases where these virtualized environments can create significant value for the business and technical leadership of a company as well as provide specific metrics and lessons learned in Disaster Recovery.

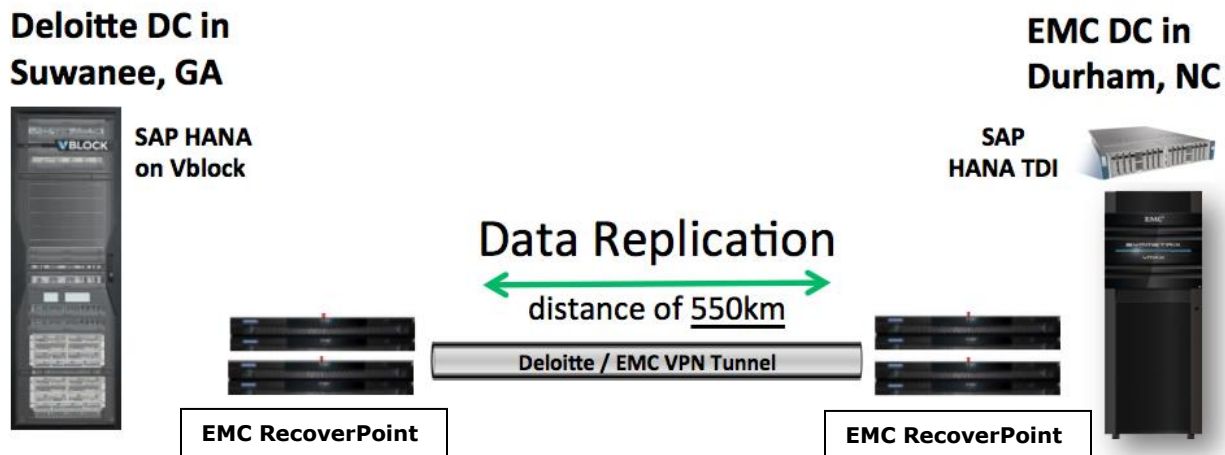
This POC also demonstrated that simulation of Disaster Recovery for testing purposes can be performed at a remote site without affecting the actual Production systems. And finally, this team was able to show that maintenance cycles such as hardware resource upgrades could be completed with very little down time when using virtualized systems, as compared to maintenance of physical appliances.

## POC Methodology

The POC Landscape diagram below shows the SAP environment built by Deloitte in Suwanee, Georgia (as the primary site) and the one built by EMC and Cisco in Durham, North Carolina (as the secondary site), linked over a VPN WAN tunnel.

Each of these SAP environments in Georgia and North Carolina have similar Data Volume capabilities and Log Volume capabilities. Data stores are replicated asynchronously over a distance of 550km using EMC RecoverPoint.

VMware SRM is used to orchestrate the orderly Restart of the entire SAP environment at the secondary site in the event of a failover due to a disaster or for any other operational reasons such as hardware maintenance or system upgrades.



**Figure 1. Diagram of POC Landscape between Georgia & North Carolina**

## POC Landscape

This high level diagram of the Project RUBICON POC Landscape further describes how cost-effective WAN connections can be implemented due to RecoverPoint's data compression capabilities over long distances.

This approach lowers bandwidth utilization while also enabling a fully automated and more aggressive recovery strategy by leveraging VMware SRM integration with EMC RecoverPoint.

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**NOTE: RecoverPoint Appliance (RPA) Performance: Each GEN5 RPA has the capacity for 110 MBps of output, according to EMC's RecoverPoint 4.0 Performance Guide.**

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In this POC between Suwanee, GA and Durham, NC, an asynchronous VPN WAN connection was established and was configured with 2 RPAs that provide 220 MBps of output capacity. RecoverPoint continues to be a well-proven EMC technology with thousands of customers in Production.



## DELOITTE CLOUD SERVICEFABRIC™ DESCRIPTION

Cloud adoption across the enterprise is a growing reality, but much of the usage is in addition to on-premises systems — not in replacement. As a result, these cloud services increasingly require integration back to core internal systems: legacy financials, order management, inventory, HR, manufacturing, and other enterprise systems. Companies are connecting clouds — in strings, clusters, storms, and more — and cobbling together discrete services to create end-to-end business processes. Tactical adoption of cloud is giving way to the need for a coordinated, orchestrated strategy—and for a new class of cloud offerings built around business outcomes.

Integration, data management, and enterprise architecture have long been aspirations for IT. With cloud, these practices have become more complex. And they have shifted from leading practices to critical core disciplines. Virtually every enterprise should be developing a strategy to integrate, aggregate, and orchestrate its collection of cloud and on-premises assets.

Deloitte announced on May 1, 2014 in San Francisco a new private cloud solution - Cloud ServiceFabric™ - which streamlines and accelerates the implementation of an on premise private cloud.

Using VMware vCloud® Suite, the solution offers organizations a rapidly deployable, on-demand, on premise private cloud offering, eliminating the use of disparate resources. Cloud ServiceFabric™ delivers pre-configured private cloud technology that is tested and ready to use – now. VMware vCloud® Suite is a comprehensive and integrated suite of cloud infrastructure and management software that enables customers to build and operate vSphere®-based private clouds based on a software-defined data center architecture.

Cloud ServiceFabric™ comes pre-loaded with self-service automation tools, scripts and support for out of the box Showback of IT service costs. Cloud ServiceFabric™ also adds service catalog integration of four key service management processes – request, change, event and capacity – along with a cloud operating model (organization structure, job descriptions and RACI models) and governance framework.

“Clients using this new solution can benefit from the deep knowledge of Deloitte’s consulting professionals combined with leading virtualization and cloud solutions from VMware,” said Eric Openshaw, vice chairman, Deloitte LLP and U.S. technology, media and telecommunications leader. “Deloitte is offering a unique pre-configured private cloud capability that maximizes internal IT resources while reducing implementation and operating costs.”

Cloud ServiceFabric™ is easily configured using Deloitte’s “Cloud-Factory” toolset to rapidly reconfigure vCloud® Suite so it aligns with specific industry and client requirements, strategic business goals, and the operating nuances and details of an individual organization. The result is a potent, streamlined approach that can be deployed within weeks, with reduced costs and risk, and a more immediate positive impact on service performance.

“As organizations continue to realize the benefits of a software-defined data center architecture, we are pleased to work closely with Deloitte to empower a diverse set

of customers to rapidly deploy and scale a dynamic private cloud solution,” said Dan Smoot, senior vice president, Global Customer Operations, VMware. “Cloud ServiceFabric with VMware vCloud® Suite will offer a powerful and robust private cloud solution to enable organizations to realize greater agility, cost savings and flexibility.”

## The issue

Many of the challenges previously associated with Private Cloud are rooted in a highly customized, do-it-yourself approach – one in which in-house technology leaders create a detailed inventory of business requirements, assess and select the technology components to deliver those capabilities, and begin a highly customized implementation often trying to fit a highly automated on-demand solution into current built-to-order infrastructure. Initiatives like these tend to expand in ways that are difficult to anticipate – and are even tougher to contain. That’s when costs begin to skyrocket, milestones get pushed back, and expectations must be managed down.

## The solution

Deloitte has developed Cloud ServiceFabric™ (CSF), a Private Cloud solution that enables clients to rapidly deploy service improvements thereby accelerating the journey to a true IT as a service (ITaaS) capability. Our approach, developed on a foundation of VMware vCloud Enterprise Suite, begins with a preconfigured solution, with the ability to easily tailor the software configuration to align with unique industry requirements, strategic business goals, and the operating details of the organization. In addition to the technology stack, the solution consists of integrated service management functions with tightly aligned organizational and governance structures to support a fast, cost-effective, streamlined, and low risk deployment of a functional Private Cloud for a prompt impact to improve service performance.

## The impact

Our clients are now positioned to experience a:

- Rapid deployment of an on premise Private Cloud platform with similar functionality to leading public cloud offerings
- Accelerated and cost effective deployment of agile resources and services – true Cloud
- Greenfield Cloud capability which is free from the burden of current processes and practices
- Cloud capability governed by operational processes and organizational competency

## Who can benefit from CSF?

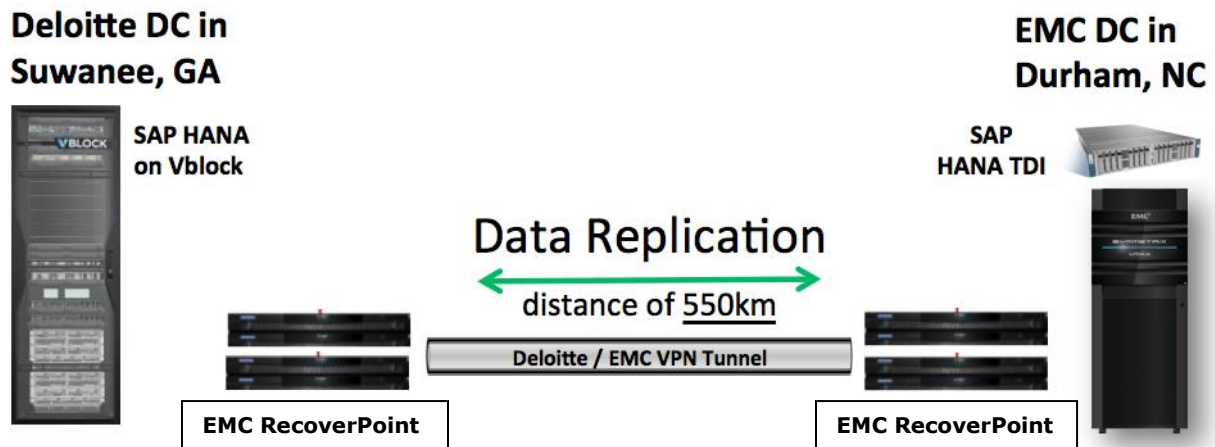
Deloitte’s Private Cloud solution is targeted at clients who have concluded that Private Cloud is the preferred alternative to improve service delivery with on-demand self-service, cost transparent infrastructure, platform and software services on the road towards ITaaS.

## The bottom line -- Private Cloud delivered in weeks

- A comprehensive fully functional pre-configured Private Cloud solution
- Integrated organizational, process and governance structures
- Lower cost, lower risk, reduced time to results and benefit

## ARCHITECTURAL OVERVIEW

The diagram and chart below describe the high-level architectural overview and specific components used in this POC for Virtualized SAP HANA environments running on a Vblock in the Deloitte datacenter in Suwanee, GA, while in the EMC datacenter in Durham, NC, the Virtualized SAP HANA environment is on V+C+E infrastructure in TDI mode of operation.



**Figure 2. Diagram of Architectural Overview**

### Architecture Components:

- VMware vSphere ESXi v5.5.0
- VMware SRM v5.5.1
- VMware vCenter v5.5.0
- Cisco UCS B440 servers (1TB RAM)
- Cisco UCS B230 servers (512GB RAM)
- Cisco Nexus 5548 Ethernet switches
- Cisco MDS 9148 Fibre Channel SAN switches
- EMC VMAX 20K Storage Array
- EMC RecoverPoint GEN5 Appliances

## Architecture Component Descriptions:

**VMware vSphere ESXi 5.5** (formerly VMware Infrastructure) is VMware's cloud computing virtualization operating system.

**VMware SRM** (Site Recovery Manager) is a disaster recovery management product that ensures the reliable disaster protection for all virtualized applications.

**VMware vCenter Server** provides centralized visibility, proactive management and extensibility for VMware vSphere—all from a single console.

The **Cisco UCS B440 M2** High-Performance Blade Server extends the Cisco Unified Computing System by offering new levels of performance, scalability, and reliability. With the Intel® Xeon® processor E7-4800 product family, the 4-socket Cisco UCS B440 M2 Blade Server platform.

The **Cisco UCS B230 M2** Blade Server utilizes the Intel® Xeon® processor E7-2800 product. This 2-socket Cisco UCS B239 M2 Blade Server platform delivers high performance and density in a compact, half-width form factor.

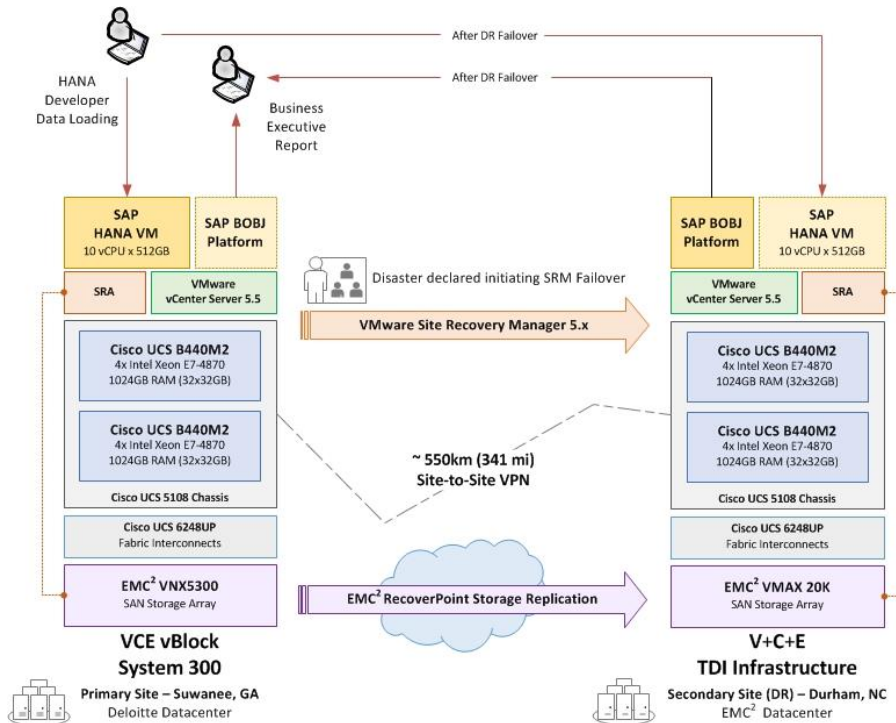
The **Cisco Nexus 5548** switches are modular network switches designed for the data center. Nexus switches provide a high speed, low latency network based upon 10 and 40 GB Ethernet. Nexus switches also support the concept of a Unified Fabric where IP and storage traffic (via FCoE) are carried over a single network providing lower TCO (Total Cost of Ownership) and faster ROI (Return on Investment).

**Cisco MDS 9148 SAN** switches help lower the total cost of ownership (TCO) of storage environments by combining robust, flexible hardware architecture with multiple layers of network and storage-management intelligence. The Cisco MDS SAN Series helps build highly available, scalable storage networks with advanced security and unified management.

**EMC VMAX Storage** delivers smart storage solutions for data centers using purpose-built software with high-availability, security, and tiering, while reducing total cost of ownership in hybrid cloud environments. VMAX also provides the industry's highest levels of consolidation, performance, and scalability.

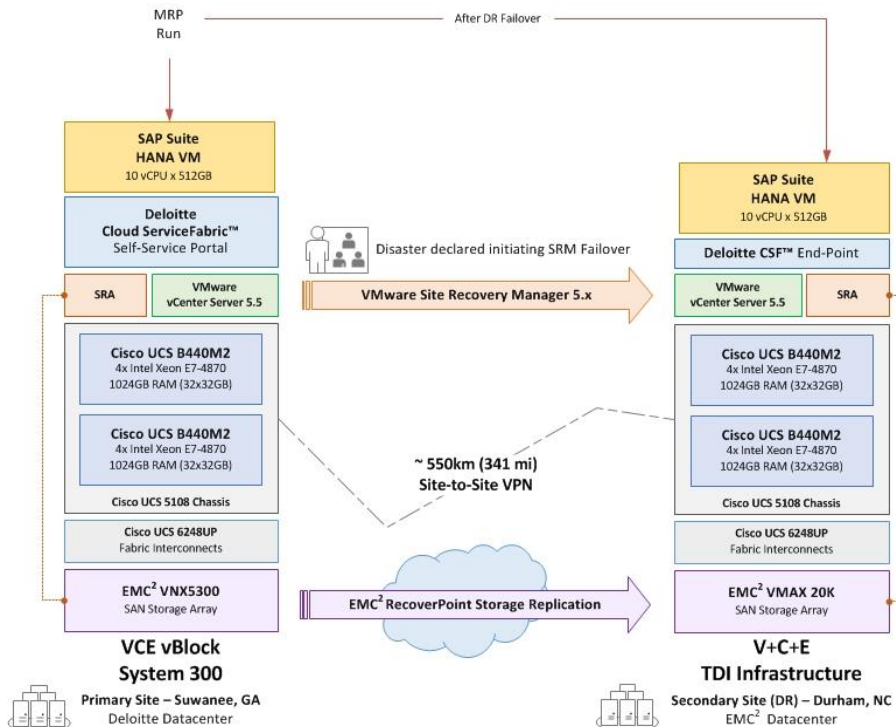
**EMC RecoverPoint** provides continuous data protection with multiple recovery points to restore applications instantly to a specific point in time.

## Architectural Overview of HANA Data Mart Use Case:



**Figure 3. Diagram of Data Mart Use Case**

## Architectural Overview of Business Suite on HANA Use Case:

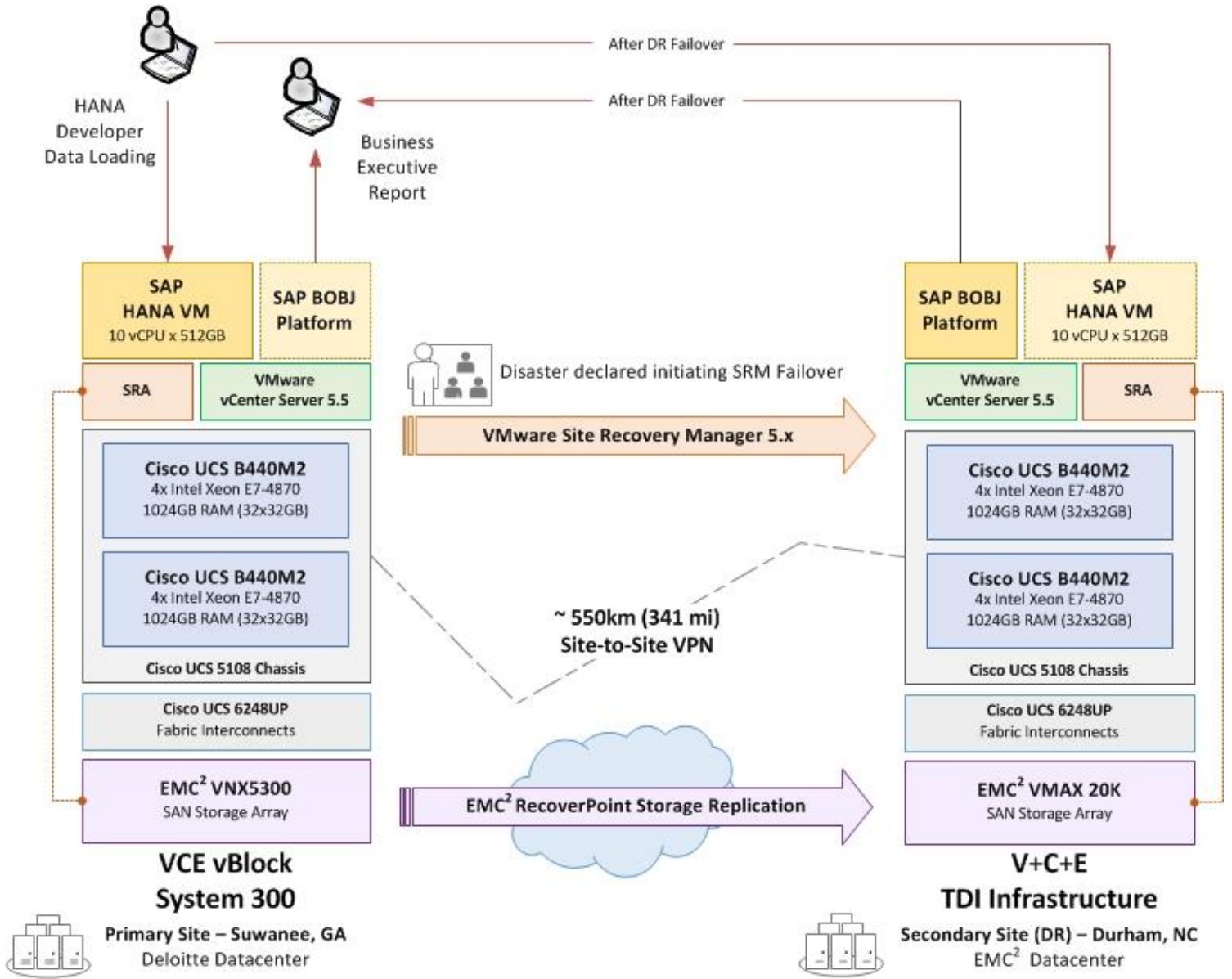


**Figure 4. Diagram of Business Suite Use Case**

In this diagram, the SAP HANA VM is hosted by the Cisco B440 with 1TB RAM while the SAP BOBJ VM is hosted by a second Cisco B440 with 1TB RAM, and they are part of a larger Deloitte Cloud ServiceFabric (CSF) implementation complete with a self-service portal. Both servers are part of a Vblock in the Deloitte data center in Suwanee, GA, with EMC VNX5300 as the storage center in the EMC data center in Durham, NC, they use standard Cisco blade servers on a rack in a TDI mode configuration with a VMAX 20K. The Cisco Fabric Interconnect is used at both sides. The storage volumes for this POC on the VNX5300 in Georgia are replicated by a pair of Gen5v RecoverPoint appliances over a VPN WAN link to the VMAX 20K in North Carolina. VMware vSphere 5.5 is the hypervisor used for all VMs, along with vCenter and VMware SRM with the SRA plug-in for integration with EMC RecoverPoint.

In this diagram, the SAP HANA VM is hosted by the Cisco B440 with 1TB RAM, and it is part of a larger Deloitte Cloud ServiceFabric (CSF) implementation complete with a self-service portal. This server is part of a Vblock in the Deloitte data center in Suwanee, GA, with EMC VNX5300 as the storage platform, while in the EMC data center in Durham, NC, it is a standard Cisco blade server on a rack in a TDI mode configuration with a VMAX 20K. The Cisco Fabric Interconnect is used at both sides. The storage volumes for this POC on the VNX5300 in Georgia are replicated by a pair of Gen5v RecoverPoint appliances over a VPN WAN link to the VMAX 20K in North Carolina. VMware vSphere 5.5 is the hypervisor used for all VMs, along with vCenter and VMware SRM and the SRA plug-in for integration with EMC RecoverPoint.

# USE CASE DESCRIPTION FOR SAP HANA DATA MART



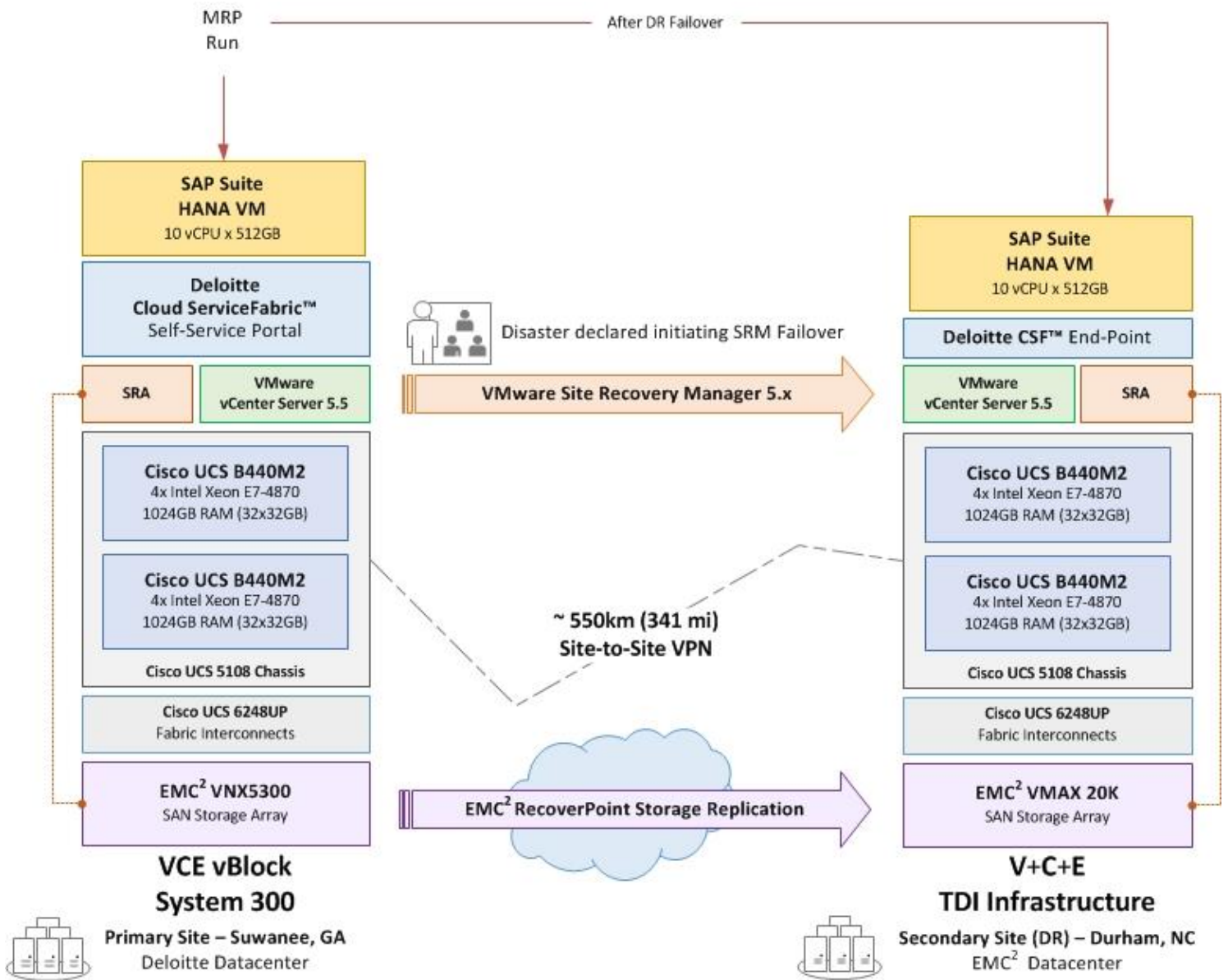
**Figure 5. Diagram of Use Case Description for SAP HANA Data Mart**

## Key Metrics & Business/Technical Perspectives of the HANA Data Mart Use Case:

Activity	Activity or Process, Tested and Performed	Purpose: Why Do This Activity or Process?
1	<ul style="list-style-type: none"> <li>- Initial data, around 200 million records are loaded into the HANA database table in memory</li> <li>- Full backup of HANA database is carried out</li> <li>- Initial data loaded into HANA is replicated to HANA in site 2</li> <li>- First BOBJ report is run against the 200 million records loaded into the HANA table which is in memory and time taken to run the report is recorded</li> <li>- Delta data around 150 million records, are loaded from the flat file (csv file) into same HANA database table, which is loaded into memory</li> <li>The total number of records loaded is recorded</li> </ul>	<p>To test the time taken to replicate the baseline HANA and BOBJ to site 2</p> <p>To test and measure the RPO and RTO numbers</p>
2	For every 1000 records loaded, delta data is explicitly committed, to force the data from memory to disk as logs	So that, delta data loaded is replicated to site 2 asynchronously
3	As soon as data is written to disk as logs, it is picked up by the RecoverPoint device, compressed and transferred to the secondary DR site asynchronously	So data can be recovered during a DR
4	After 2 minutes of delta data loading, the HANA VM server is brought down to simulate DR scenario	To simulate an actual DR scenario
5	VMware Site Recovery Manager (SRM) orchestrates restart to HANA VM and the SAP BOBJ (SAP's Business Objects Reporting Tool which is responsible for creating reports in HANA) While restarting, HANA applies the backup taken and applies the redo logs to build the recent delta changes	To start the recovery process
6	<p>Once HANA and BOBJ are up and running in site 2 following is done</p> <ul style="list-style-type: none"> <li>a. Login to HANA is tested, which provides the RTO</li> <li>b. BOBJ report is run again and total time taken is measured and compared with the run time in step # 1 This measures the latency for the data to be loaded</li> <li>c. Total records in HANA table is counted, which provides the RPO</li> </ul>	To test and measure the RTO and RPO

**Figure 6. Chart of Key Metrics/Technical Perspectives for Data Mart**

# USE CASE DESCRIPTION FOR BUSINESS SUITE ON HANA



**Figure 7. Diagram of Use Case Description for Business Suite on HANA**



## Key Metrics & Business/Technical Perspectives of Business Suite on HANA Use Case:

Activity	Activity or Process, Tested and Performed	Purpose: Why Do This Activity or Process?
1	Full backup of HANA database is carried out	To test and measure the RPO and RTO numbers
2	MRP run is executed by running transaction MD01 in the ERP on HANA system	To test the RTO
3	While the MRP run is being executed, SAP ERP and HANA is brought down by the scripts	To simulate a real Disaster Recovery scenario
4	VMware Site Recovery Manager (SRM) orchestrates restart of ERP and HANA database	To start the recovery process
5	Once ERP and HANA database are running in site 2, Login to ERP on HANA is tested, and the interrupted MRP run is started again, which provides the RTO	To test and measure the RTO

**Figure 8. Chart of Key Metrics/Technical Perspectives for Business Suite**

## OUTCOMES & RESULTS\* FROM USE CASES

From Whose Perspective:	What We Looked At:	Results or Outcomes Achieved from Use Cases
CEO	How long did it take to log into HANA at the DR site and to restart a report? (RTO)	Under 15 minutes
CEO	How fast was a report running at the DR site as compared to the baseline?	Initially 29 seconds, and after load into memory 18 seconds compared to 10 seconds in primary site
CEO	How recent was the loaded data that can be used in the report? (RPO)	Disaster caused less than 5% of in-flight data loss
HANA Developer	How fast was login performed into HANA to resume data load?	Under 15 minutes
IT/Basis Team	Could we validate that all systems were stable at DR site?	Yes, environment is very stable and all validation tests passed

**Figure 9. Chart of Outcomes & Results**

### \*See notes below for clarifying context about the above Results:

#### Result line #1

Fail over time for the HANA Data Mart was measured from the time the disaster was declared and the VMware SRM failover was initiated until the HANA VM was running at the DR site and users were able to run reports against the Data Mart.

#### Result line #2

After the HANA Data Mart VM was started at the DR site, there was no data stored in the in-memory database. The initial report run took 29 seconds, as compared to 10 seconds at the primary site, because data had to be read from the Persistence Layer (disk) and loaded into memory. A subsequent run of a report took 18 seconds as some of the needed data was already loaded into memory. Performance continues to improve as additional data is loaded into memory.

#### Result line #3

The DR tests were run between the two data centers that are 550km apart, requiring the use of asynchronous replication. Asynchronous replication periodically sends data from the Production site to the DR site and data that has not yet been committed to the Persistence Layer (disk) from HANA memory will be lost in the case of a disaster. In the tests that were run, the data loss of uncommitted data was less than 5%.

**NOTE:** All data that was previously replicated to the DR site was unaffected by the disaster. Only data loaded in memory but not yet committed to disk in the production site is at risk. Frequent HANA database commits can minimize the risk of data loss in the case of a disaster. Frequent system snapshots can then be utilized to minimize the time needed for log replay upon HANA system restart in the DR site.

#### Result line #4

The HANA developer was able to log into the system and resume the data load in less than 15 minutes after the disaster was declared. The data load speed, as expected, was unaffected since the data is first loaded to memory and is not affected by disk IO.

#### Result line #5

The IT and Basis teams were able to log into all of the recovered systems and perform business system functional tests after the disaster recovery. No system stability or functional problems were identified.

## LESSONS LEARNED

As the initial phase of an ongoing project, this Proof of Concept will be providing valuable metrics and lessons learned well into the future.

### Customer Issues Addressed

This POC was driven in part by customer feedback and involvement from account teams at Deloitte, EMC, VMware and Cisco. Customers said that they urgently needed to have DR solutions, best practices, and measureable metrics in order to make implementation decisions now and they could not wait for future products and solutions to address their Disaster Recovery planning requirements.

This POC proved recovery at a longer distance remote site could be completed without issues and reasonably quick (under 15 minutes).

This POC proved that initial replication of very large amounts of data (~6TB) is possible in a reasonable amount of time (~16 hours) over a simple VPN WAN connection, and SAP HANA Disaster Recovery supports multi-vendor environments.

This POC demonstrated that SAP HANA Disaster Recovery could be performed through the use of currently available technology with HANA on VMware and EMC RecoverPoint along with technologies from Cisco.

### Business Lessons Learned

- Frequent HANA data commits ensure optimal RPO
- DR for business critical applications requires considerable planning to ensure consistent results
- Proper planning of snapshot intervals of the HANA database helps ensure optimal RTO
- Ensure that any unwanted data is not saved on the HANA Linux virtual machine

### Technical Lessons Learned

- VMware SRM fail over should be manually initiated after the business declares a disaster
- Using a 3<sup>rd</sup> party site for DR is possible over a VPN WAN connection but requires careful consideration of security policies to protect each site
- Using a VPN over an existing Internet connection is viable and proved to be a cost-effective solution
- Care must be given to ensure adequate bandwidth of link as well as supporting devices such as firewalls

### Next Steps

Even though we expect more information from the next phases of this POC, our cross-functional, multi-company team did not want to wait to share these early findings. For more information about the remaining phases and what additional information will be made available, please contact your Deloitte, EMC, VMware or Cisco representative.

## REFERENCES, DIAGRAMS & CHARTS

### EMC Documentation:

Find the following EMC documents on: [EMC Online Support](#)

- *Business Continuity Best Practices for SAP HANA Tailored Datacenter Integration with EMC Symmetrix VMAX White Paper*—#H13149 provides a comprehensive set of EMC recommendations and procedures for data protection and availability using SAP HANA with EMC Symmetrix VMAX 10K, 20K, and 40K arrays in a Tailored Datacenter Integration (TDI) deployment. This deployment includes EMC Symmetrix Remote Data Facility (SDRF) and EMC Timefinder.
- *Storage Configuration Recommendations for SAP HANA TDI on EMC VMAX Storage Systems White Paper*—revokes limitations of the current SAP HANA Appliance model. Using Tailored Datacenter Integration (TDI) on EMC VMAX to move SAP HANA into a private cloud and integrate into an existing data center infrastructure.

### SAP Documentation:

Find the following SAP documents at: <http://help.sap.com/hana>

- *SAP HANA Technical Operations Manual (TOM)*—provides an entry point for administering and operating SAP HANA system landscapes.
- *SAP HANA Administration Guide*—describes all administrative tasks for SAP HANA that system administrators perform regularly and on demand.

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