Building DR Solutions with VMware Site Recovery Manager

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Problems Addressed

Let's focus on these issues today

Many organizations have components of a Disaster Recovery (DR) solution in place but do not necessarily have confidence that they can successfully execute a failover in the event of an actual disaster.

- No DR plans or inadequate solution.
- DR testing is too painful
- DR Run books involve manual processes
- RPO and RTO are not met

Let's look at building DR solutions based on VMware Site Recovery Manager

Overview

What are we covering today?

Agenda

- The need for DR and common DR challenges
- Solution overview
- Example Design:
  - key requirements
  - high level
  - low level design
- Lessons Learned

Key Take-aways

- Tips on designing a solid DR solution based on Site Recovery Manager (SRM)
- Understanding of the solution components, including SRM, storage based replication and vSphere Replication
- Ideas for leveraging NSX to enable application functionality testing without disrupting production

Disaster Recovery

What is it? Why do we need it?

- Key part of business continuity
- Recovery from failure of
  - full data center
  - Significant portion of a data center
  - Key distributed application
  - Access to a data center
- Root causes:
  - natural disasters
  - power / network outage
  - cyber attacks / ransomware
  - human error

National Archives and Records Administration: 93% of companies suffering significant data loss perish within 5 years

Disaster Recovery

What are the key challenges?

- Complex, sensitive applications
- RPO, RTO
- Production ready recovery site
- Disaster mitigation, DR testing, failback
- Expensive:
  - Bandwidth between data centers
  - Network and hardware infrastructure for a passive site
  - Replication technologies
  - Labor for DR planning and testing

DR Solution Objectives

What are the short comings of your current solution?

It is Inadequate

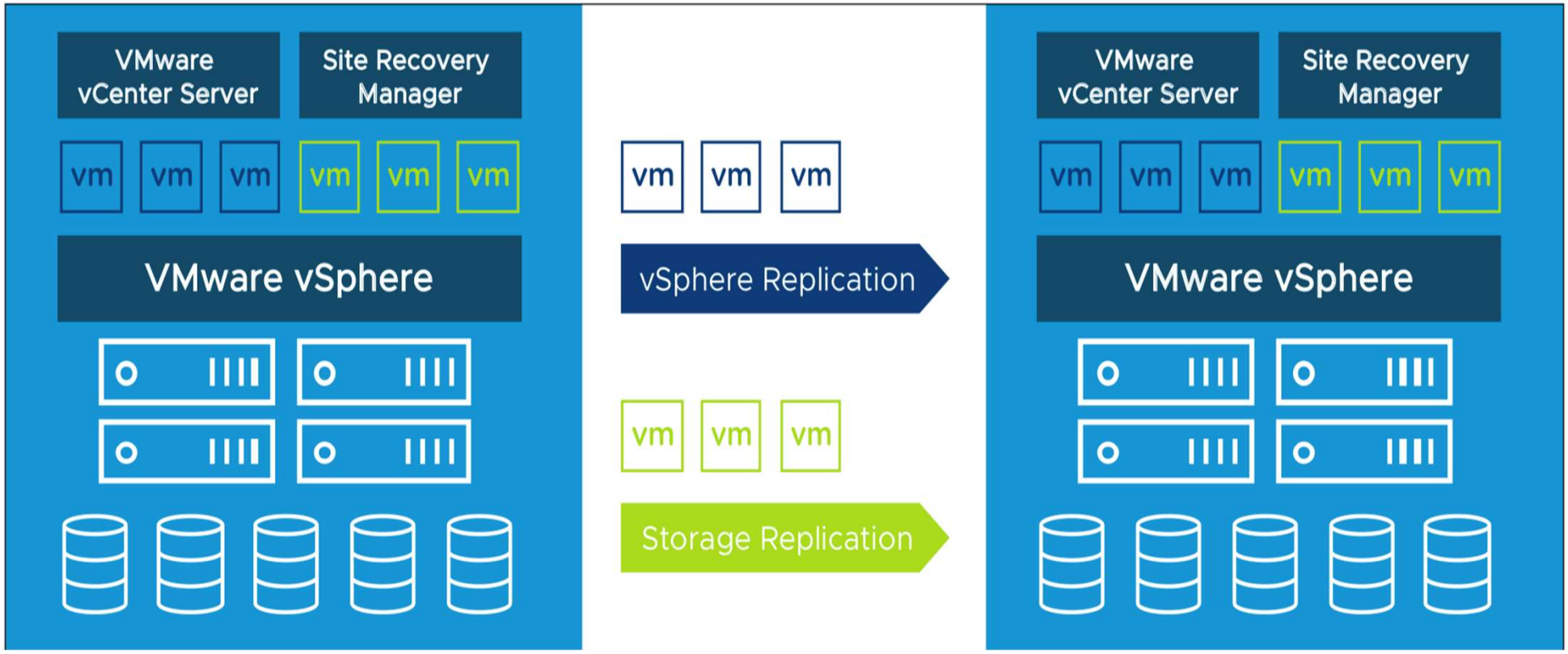
- SLAs (RPO and RTO) are not met
- Limited DR testing
- Recovery data center
  - Not production ready
  - Lacks backup, monitoring, management, etc.
  - Susceptible to same disaster
- Not reliable
- Too expensive
- Does not cover some of my main risks

It Lacks

- Disaster mitigation
- Failback
- Non-disruptive, full application DR testing
- Auditing, reporting
- Proactive monitoring, alerting

VMware Site Recovery Manager (SRM)

Solution Overview



SRM Solution Overview

Why SRM?

Functions

- Planned migration
- Re-protect
- Test recovery
- Disaster recovery
- Failback (re-protect + planned migration)

Features and Benefits

- Application-agnostic
- Recovery plan orchestration
- Frequent, non-disruptive testing
- Centralized management
- Planned migration enables disaster avoidance
- Flexibly for data replication

SRM Use Cases

DR is just one use case, here are some others

Use Cases

- DR protection
- DR testing
- Disaster avoidance
- Failback
- Data center migrations
- Upgrade and Patch testing

More Detail

- SRM Data Sheet: https://bit.ly/2x8L1KE
- SRM 8.1 Technical Overview: https://bit.ly/2O8l7Op

What's New in SRM 8.1?

https://blogs.vmware.com/virtualblocks/2018/04/17/srm-vr-81-whats-new/

- HTML 5 interface (Clarity UI)
- The VR workflow now allows you to add the VM to an existing or new (or no) recovery plan
- SRM 8.1 and VR 8.1 are decoupled from specific VC versions. (compatible with 6.0Ue, 6.5, 6.5U1, 6.7, etc)
- SRM / VR 8.1 can be paired with SRM / VR 8.0
- Config maximums:
  - 500 protection groups
  - 5,000 VMs (500 VMs per protection group)
  - 250 recovery plans (10 concurrently running recovery plans)
  - 2,000 VMs per plan
  - 2000 VMs protected with VR
- Compatible with FT protected VMs (array based replication only, the SRM recovered VM is not FT protected)

Terminology

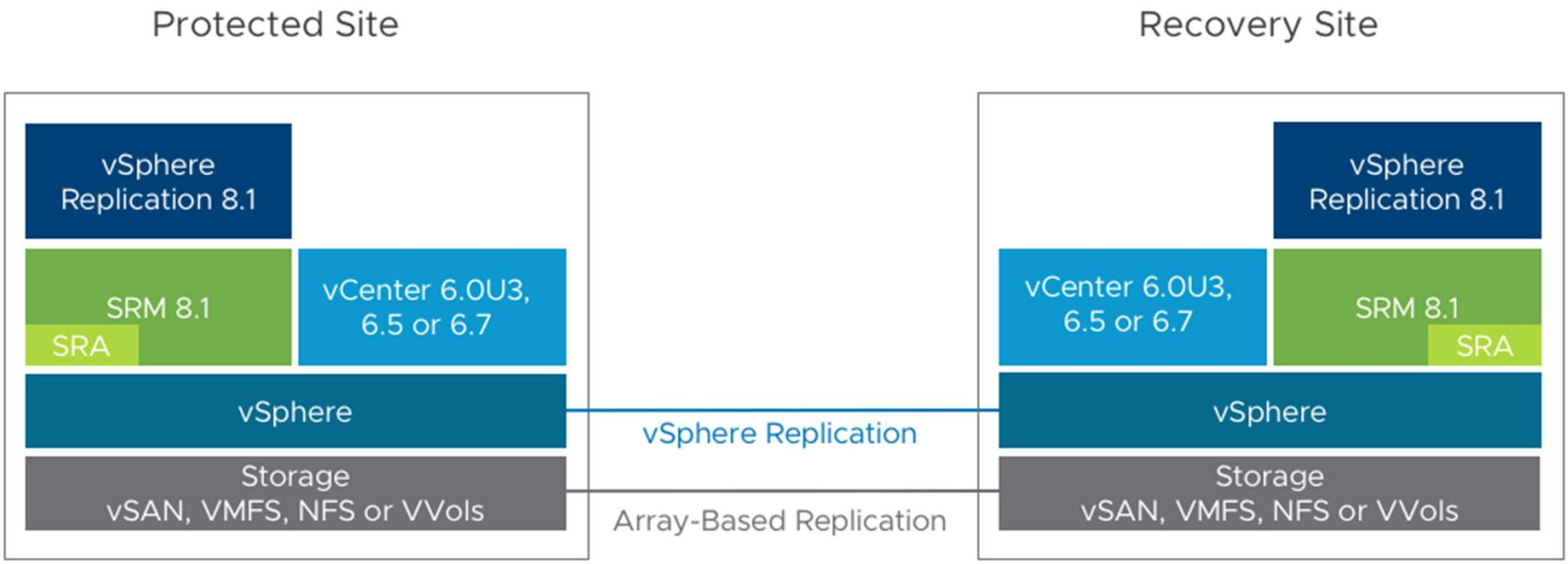
Here is our vocabulary lesson for the day

- **Recovery time objective (RTO):** Targeted amount of time a business process should be restored after a disaster or disruption in order to avoid unacceptable consequences associated with a break in business continuity.
- **Recovery point objective (RPO):** Maximum age of files recovered from backup storage for normal operations to resume if a system goes offline as a result of a hardware, program, or communications failure.
- **Consistency group**: One or more LUNs or volumes that are replicated at the same time. When recovering items in a consistency group, all items are restored to the same point in time.
- **Datastore group**: One or more datastores that are treated as a unit in Site Recovery Manager. A common example is a consistency group in an array replication solution.
- **Protected site**: Site that contains protected virtual machines.
- **Recovery site:** Site where protected virtual machines are recovered in the event of a failover.

NOTE: It is possible for the same site to serve as a protected site and recovery site when replication is occurring in both directions and Site Recovery Manager is protecting virtual machines at both sites.

SRM Solution Components

Management, data movers, and orchestration



vSphere Replication vs Storage Replication

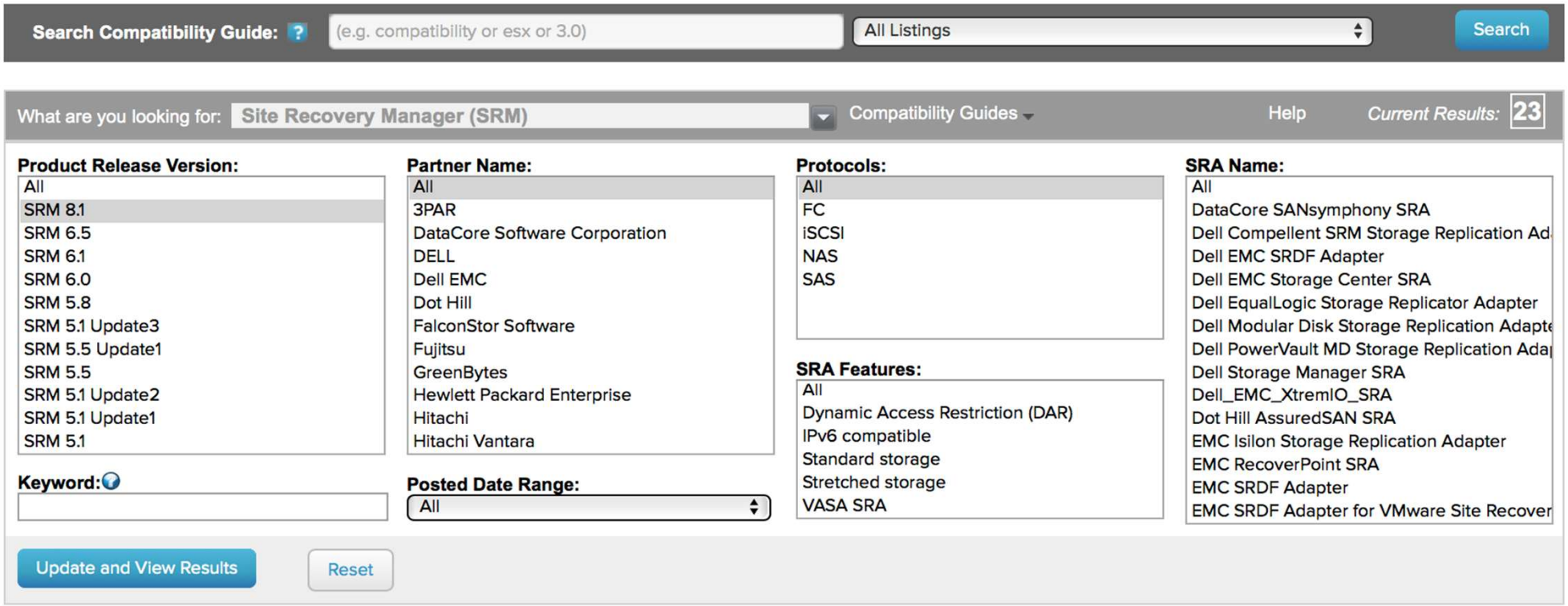
https://blogs.vmware.com/vsphere/2015/04/srm-abrvsvr.html

Feature	Array-Based Replication	vSphere Replication
Minimum RPO	0 mins (vendor dependent)	15 mins. (5 mins with VSAN)
Maximum Protected VMs	5,000 VMs	2,000 VMs
Vendor / Array / Storage types	FC, iSCSI or NFS	Supports any storage covered by the vSphere HCL
Cost / Licence	Replication and snapshot licensing is required	Included in vSphere Essentials Plus 5.1 and higher
Application consistency	Depends on vendor, may require guest based agents	Supports VSS & Linux file system application consistency
Powered off VMs, Templates, Linked clones, ISO's	Able to replicate	Can only replicate powered on VMs.
RDM support	Physical and Virtual mode RDMs can be replicated	Only Virtual mode RDMs can be replicated
Multiple Points in Time (MPIT)	MPIT is supported by some storage vendors	Supports up to 24 recovery points

SRM / Storage Compatibility

http://www.vmware.com/resources/compatibility/search.php?deviceCategory=sra

VMware Compatibility Guide



SRM with Storage-based Replication

SRM integrates with vendor specific SRA to manage replication

Array Pair	Array Manager Pair	Last Array Manager Ping
✓ 50:06:01:60:BE:E0:47:ED ↔ 50:06:01:60:BE:E0:4A:04	VNX 5500 Sofia ↔ VNX 5500 B	✓ Success, 4/16/2018, 5:40:06 AM PDT

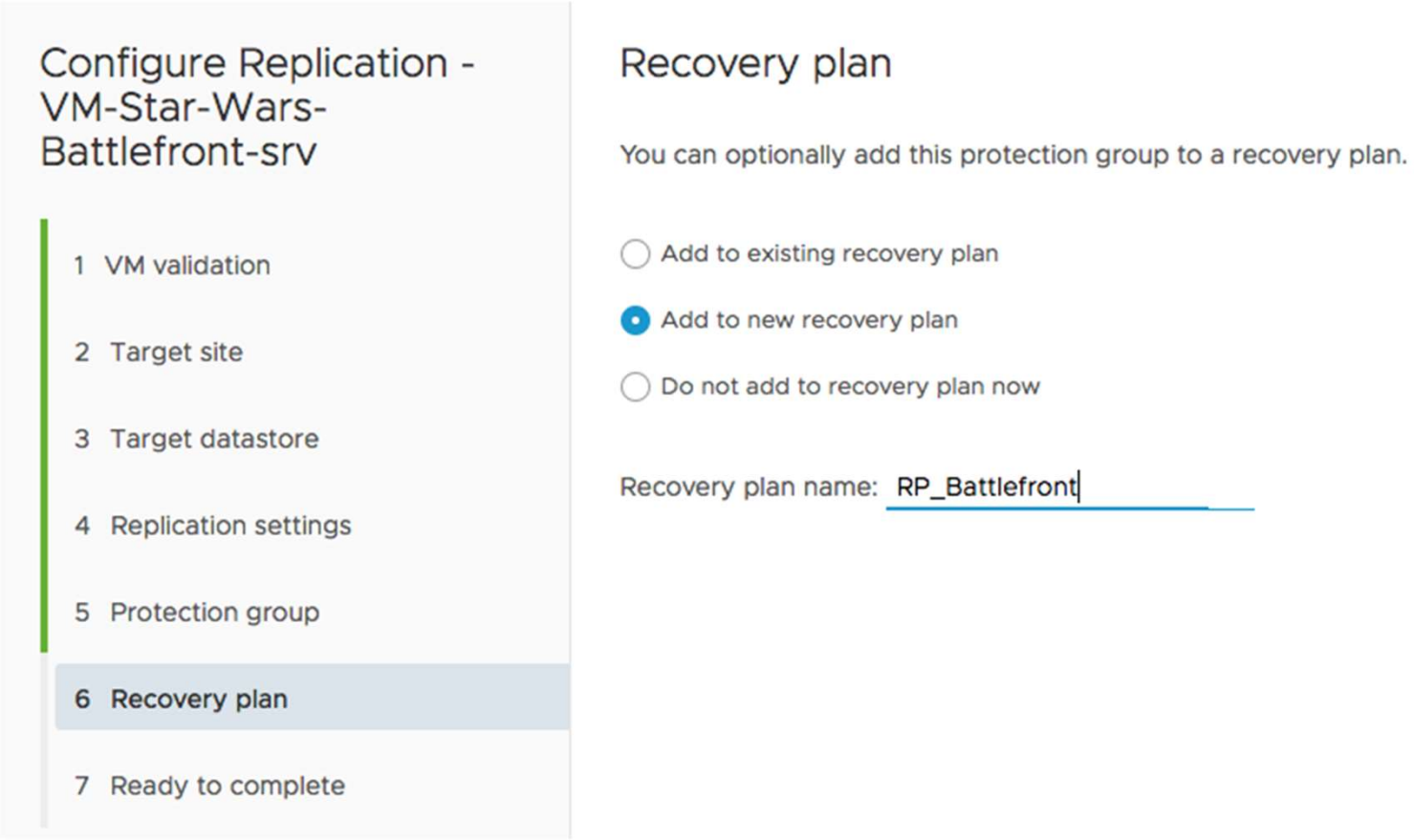
Storage replication adapter:	EMC VNX SRA	VNX 5500 Sofia		VNX 5500 B	
Stretched storage:	Not supported	SRA version:	5.0.2	SRA version:	5.0.2
		Address:	10.26.231.149	Address:	10.26.231.151

DISCOVER DEVICES

Device (VC Boston)	Datastore	Status	Device (VC Las Vegas)	Protection Group
AM-10GB-RP-LUN-1		→ Forward	AM-10GB-RP-LUN-1	
AM-10GB-RP-LUN-2		→ Forward	AM-10GB-RP-LUN-2	
AM-3GB-RP-LUN-6		→ Forward	AM-3GB-RP-LUN-6	
AM-5GB-RP-LUN-3		→ Forward	AM-5GB-RP-LUN-3	

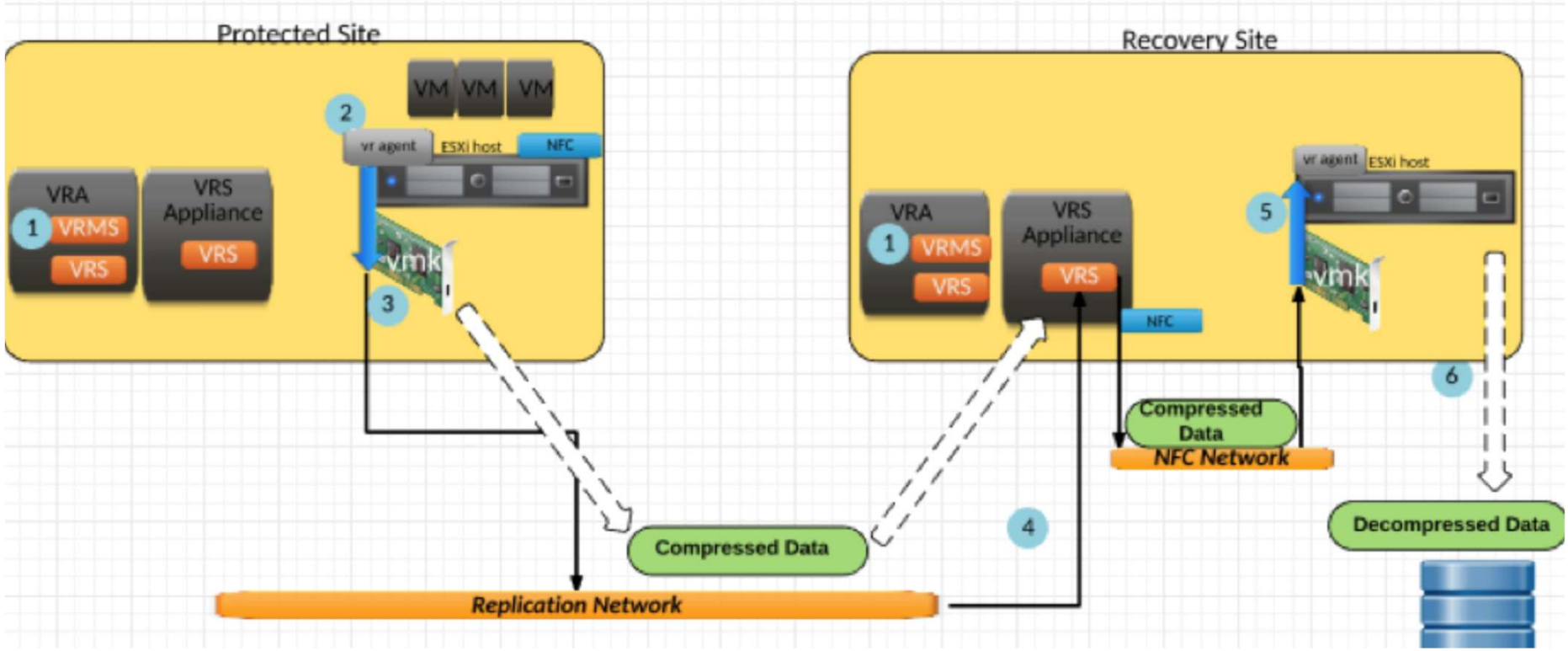
SRM with vSphere Replication

Software based virtual disk replication that integrated easily with SRM



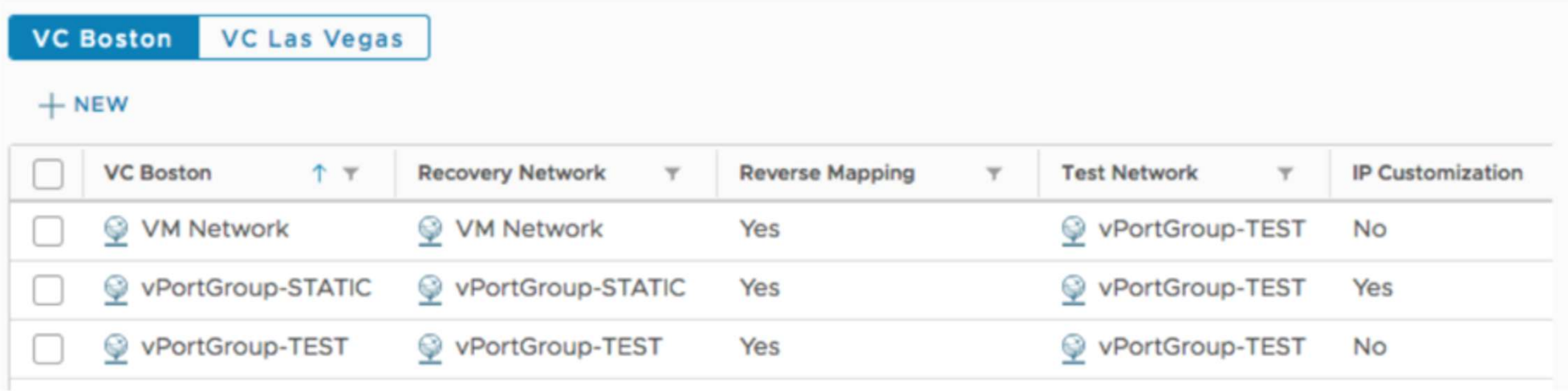
vSphere Replication Data Flow

Hypervisor based replication



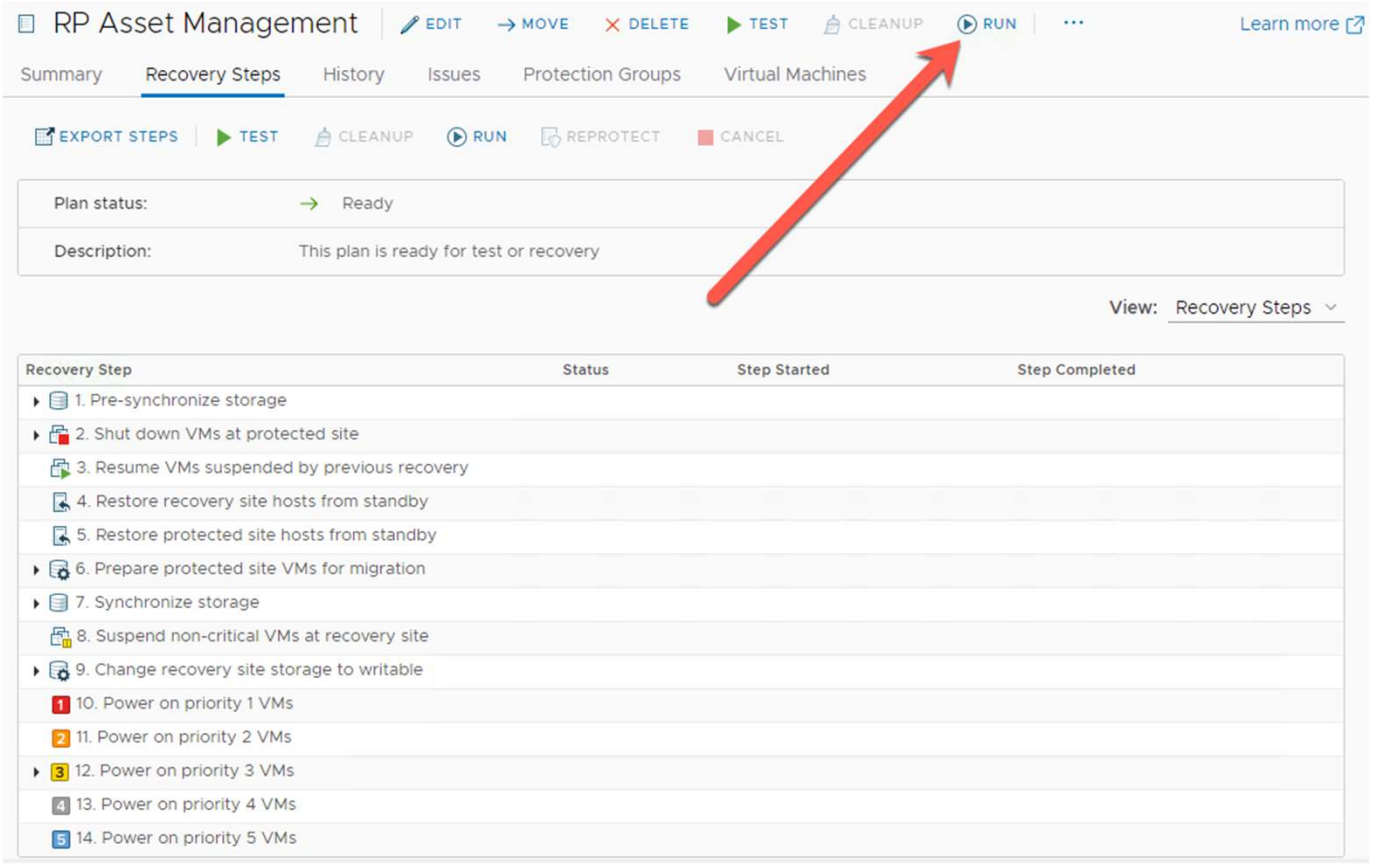
Network and Inventory Mapping

Map source networks, compute resources, VM folders between sites



Recovery Plan Orchestration

Predefine your recovery plans in SRM



SRM Licensing

Work with your VMware license provider to understand your unique options

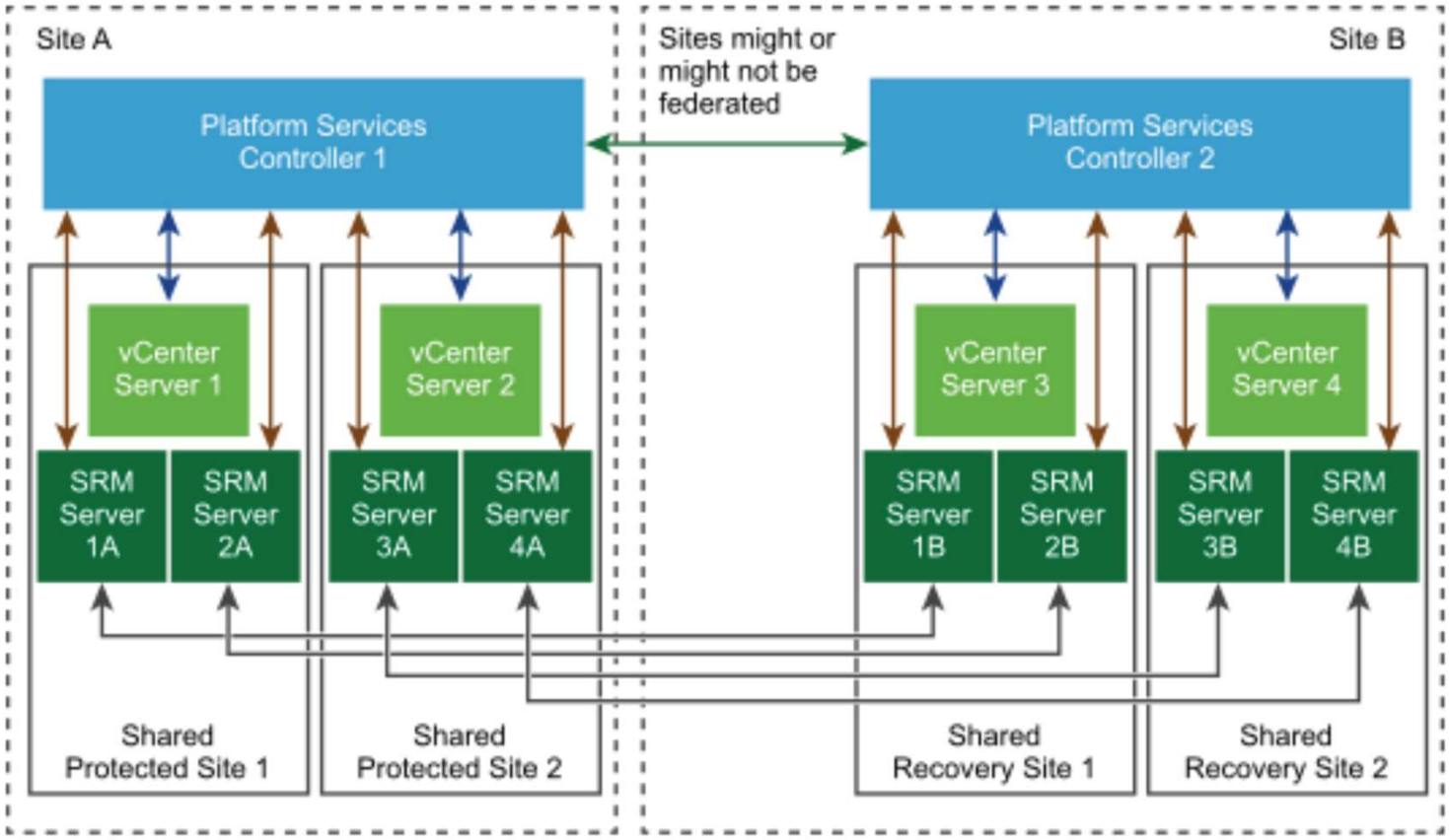
- Licensed per VM in packs of 25 VMs.
  - SRM Standard – up to 75 VMs per site (3 packs).
  - SRM Enterprise unlimited number of VMs (unlimited number of packs)

- SRM Enterprise exclusive features:
  - VMware NSX integration
  - Orchestrated cross-vCenter vMotion
  - Stretched storage support
  - Storage policy-based management

NOTE: some SRM bundling options may exist that allow per processor instead of per VM

Multi vCenter Server Deployment

Multi-vCenter Server instances per site



Example: Key Requirements

DR Test Success Criteria

How do we verify that the DR Solution works well?

- VMs start successfully
- VMs have network connectivity
- Application functionality test

Disruptive vs Non-disruptive Testing

- Non-disruptive testing plus application functionality = complex DR Test Network
- For disruptive testing, will data changes be persisted or discarded?
- For non-disruptive tests, ensure replication still occurs and DR is still available.

Example: Requirements included Test Plan with application specific steps and expected results.

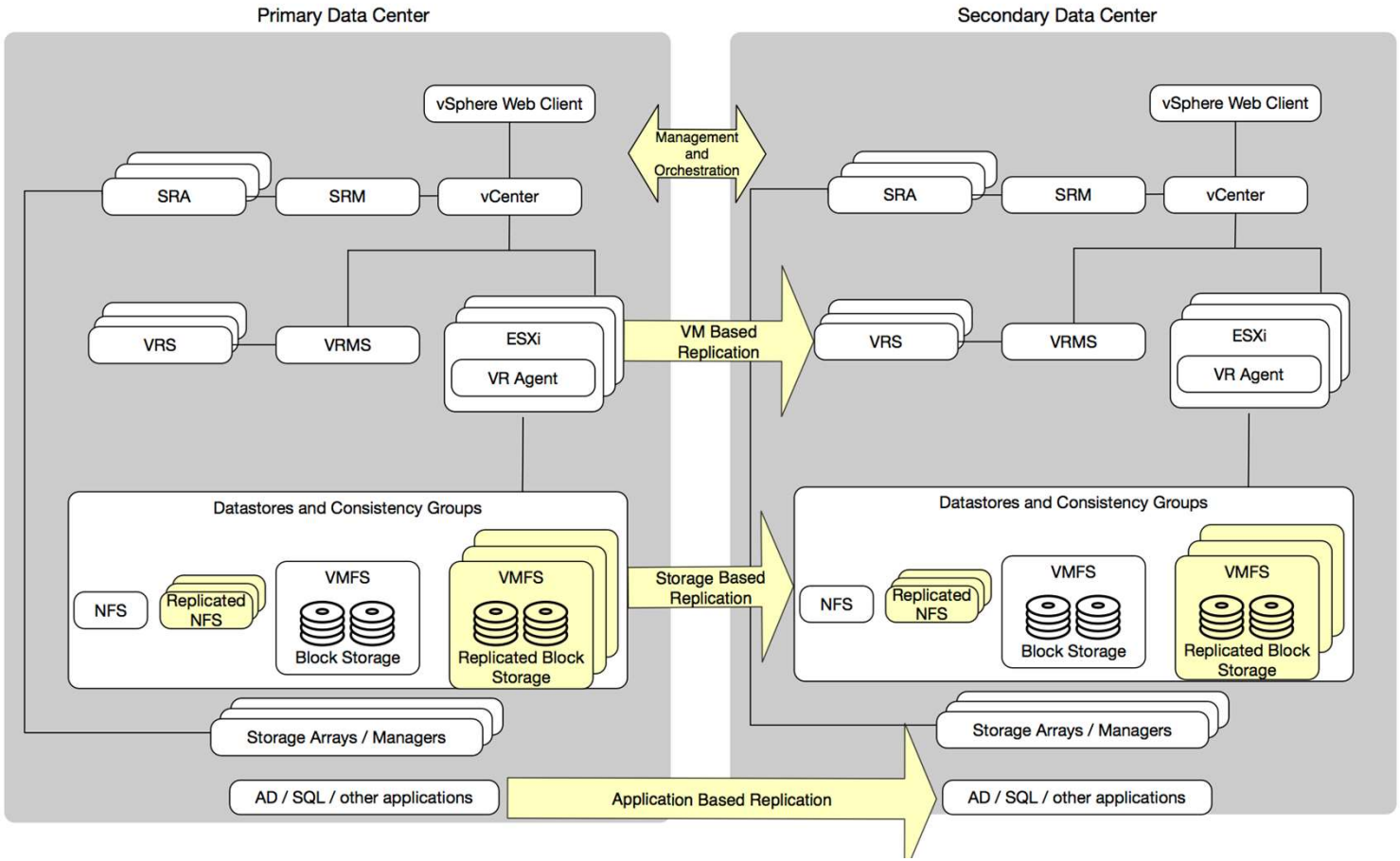
Example: High Level Design

Mapping your Unique Requirements to potential solution components

Requirement	Solution Component
Ease of Management	Standard Replication: vSphere Replication
SLA Tiers: RPO < 15 minutes, RPO =4 hours, RPO = 24 hours	Storage based replication, vSphere Replication RPO setting
Application Consistency	vSphere Replication VSS Quiescing Support, Storage based consistency groups
RDMs in Physical Compatibility Mode	Storage based replication
Recover from Virus / Hack Disaster	Multiple Point in Time Recovery
DR tests plans with application functionality	NSX based networks, virtual desktops, required services (AD, DNS)
Proactive alerting based on RPO	vSphere Replication RPO violated alarms
Backup and recovery of the DR solution	Backup Exec – daily full and differential backups

Example: High Level Design

High-level design: SRM with vSphere Replication, NFS, and block storage



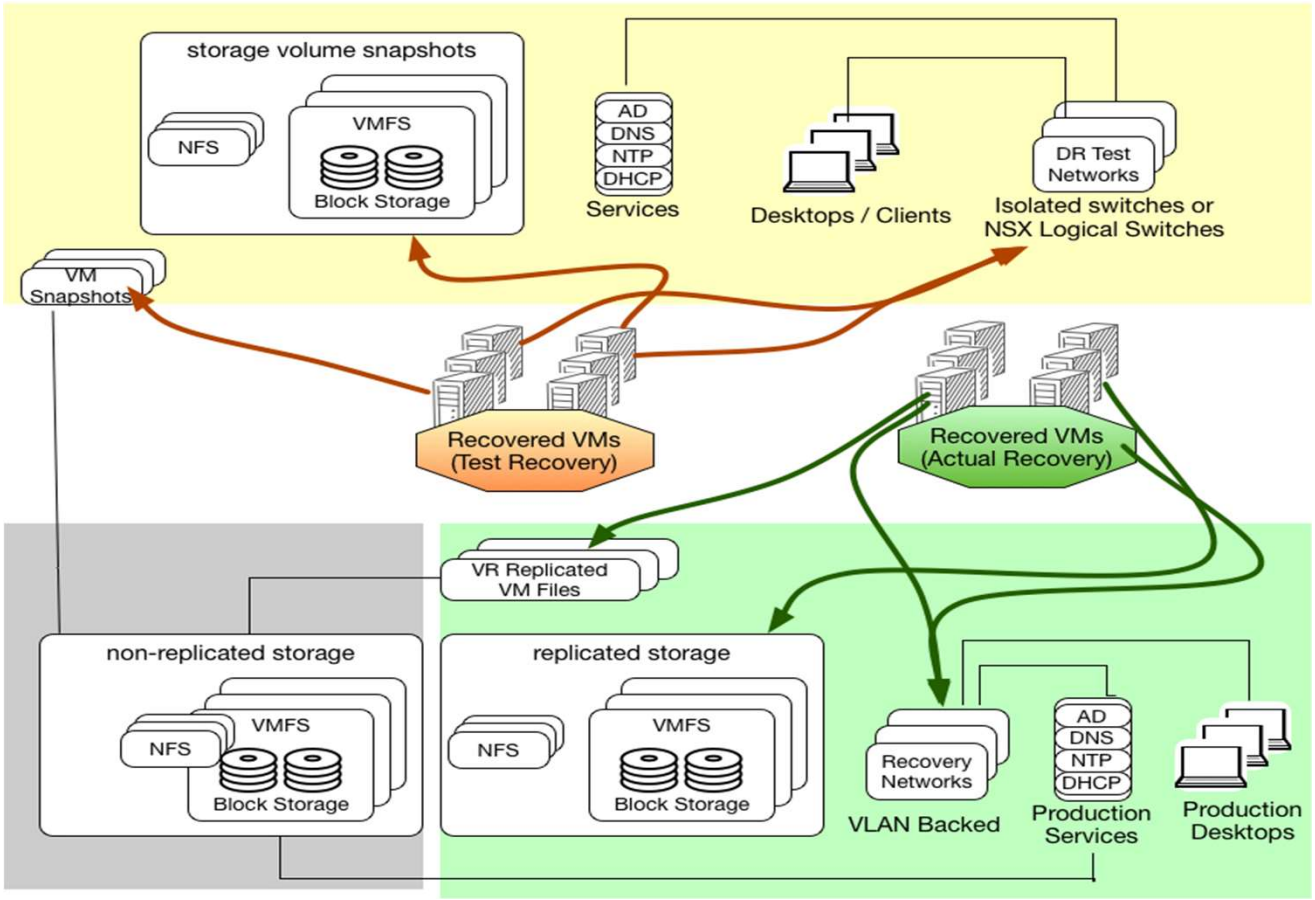
Example: Application / VM Details

VM worksheet identifying application, priority, target IP, dependencies, etc.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
vCenter Site Recovery Manager Virtual Machines																	
Machine ID	Group	Server Host nam	Priority (1,2,3,	Application or Function	RTO	RPO	Source IP address	Target IP Address	Source VLAN	Target VLAN	Source Port Group	Target Port Grou	Target Test Port Group	Source Datastore Name	Destination Datastore Name	LUN ID	Recovery VI
001	App-01	Win-A	1	PoC	24 h	4 h	192.168.10.10	172.16.10.10	101	201	POC	POC	auto	Datastore_01	Datasore_01	1	SRM_NFS
002	App-01	Win-B	1	PoC	24 h	4 h	192.168.10.11	172.16.10.11	101	201	POC	POC	auto	Datastore_01	Datasore_01	1	SRM_NFS
003	App-02	Win-C	2	Web-App-A	48	8	192.168.10.12	172.16.10.12	102	202	App-A	App-A	auto	Datastore_02	Datasore_02	2	SRM_NFS
004																	

Example: Recovery Site Logical Design

Provide network infrastructure and services for non-disruptive DR testing



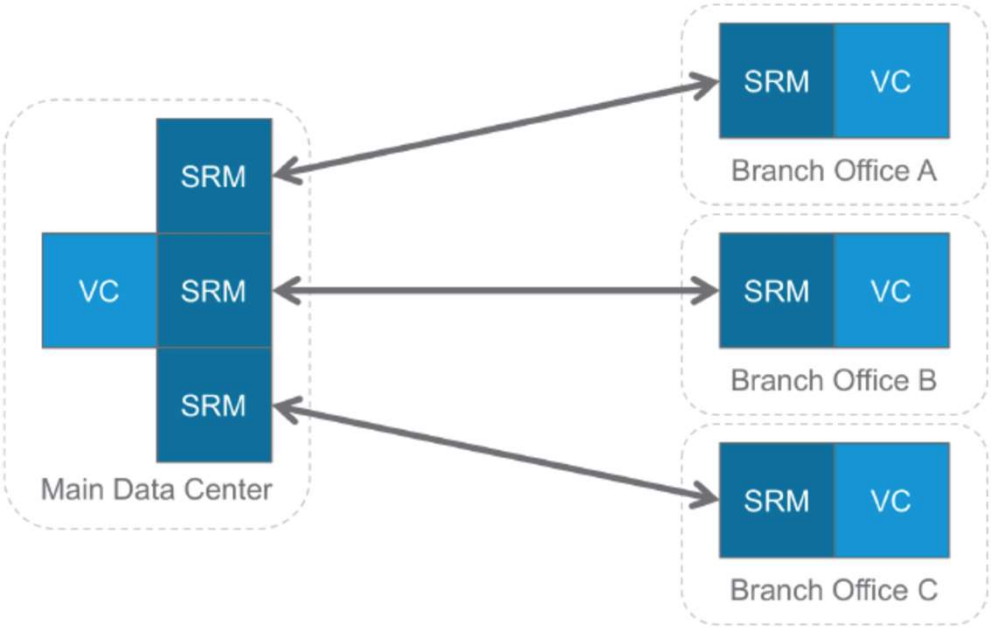
Example: Monitoring / Alerting

We configured email notifications on these specific vCenter Server alarms

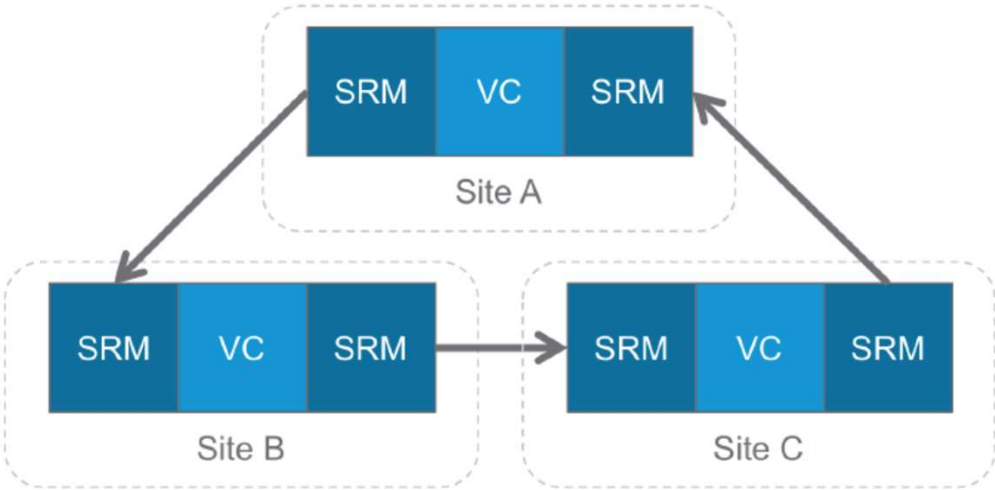
Alarm	Description
No connection to VR Server	No connection to VR server
Remote Site Down	Remote Site Recovery Manager site is down
Remote VRM site connected	The VRM server established connection to the remote site
Remote VRM site disconnected	The VRM server lost connection to the remote site
RPO restored	Virtual machine vSphere replication RPO has been restored
RPO violated	Virtual machine vSphere replication RPO has been violated
Unknown Status	Site recovery server status is not available
VR Server disconnected	VRM lost connection to a VR server
VR Server reconnected	VRM restored connection to a VR server

Example: Multi-site Deployment

Shared Recovery or Protected Site



Site A to B to C



Lessons Learned

A few lessons I learned the hard way

- Follow the storage vendor documentation.
- Storage based replication requires
  - VMs to be carefully grouped into LUNs / Consistency Groups
  - All grouped VMs must be recovered and tested together
  - Adding a VM to a consistency group may requires SRM work
- Clearly identify the success criteria for DR testing
- Identify multi-site recovery scenarios and requirements
- Always run recovery plans in test mode prior to running in planned migration or actual recovery mode

Call to Action

Lots of ways to get started

- Learn more: HOL-1905-01-SDC: https://labs.hol.vmware.com
- Review Product Details: https://www.vmware.com/products/site-recovery-manager.html
- Proof of Concept Testing: https://storagehub.vmware.com/t/site-recovery-manager-3/srm-evaluation-guide/
- VMware Professional Services: https://www.vmware.com/professional-services.html
- VMware Education: SRM Fundamental Couse: https://mylearn.vmware.com/descriptions/EDU_DATASHEET_SRMICM_V6_1.pdf
- Reach out to me: @johnnyadavis