VMware vCenter Site Recovery Manager v5.0 – Technical Presentation & Demo

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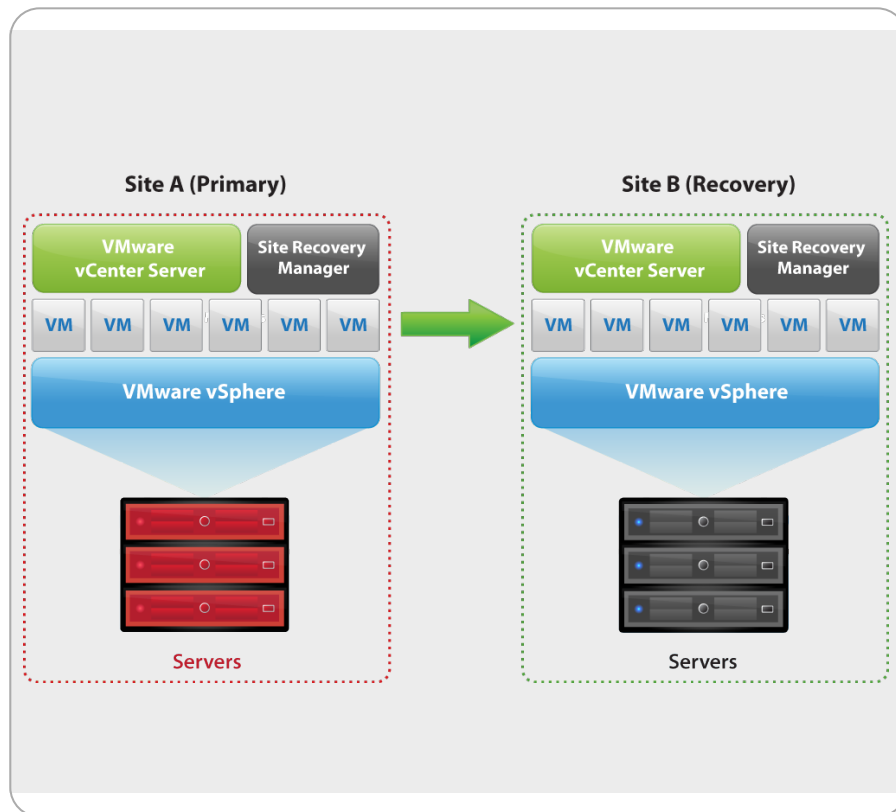
Systems Engineer, VMware

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vCenter Site Recovery Manager Ensures Simple, Reliable DR

Site Recovery Manager Complements vSphere to provide the simplest and most reliable disaster protection and site migration for all applications

Provide cost-efficient replication of applications to failover site

- Built-in vSphere Replication
- Broad support for storage-based replication

Simplify management of recovery and migration plans

- Replace manual runbooks with centralized recovery plans
- From weeks to minutes to set up new plan

Automate failover and migration processes for reliable recovery
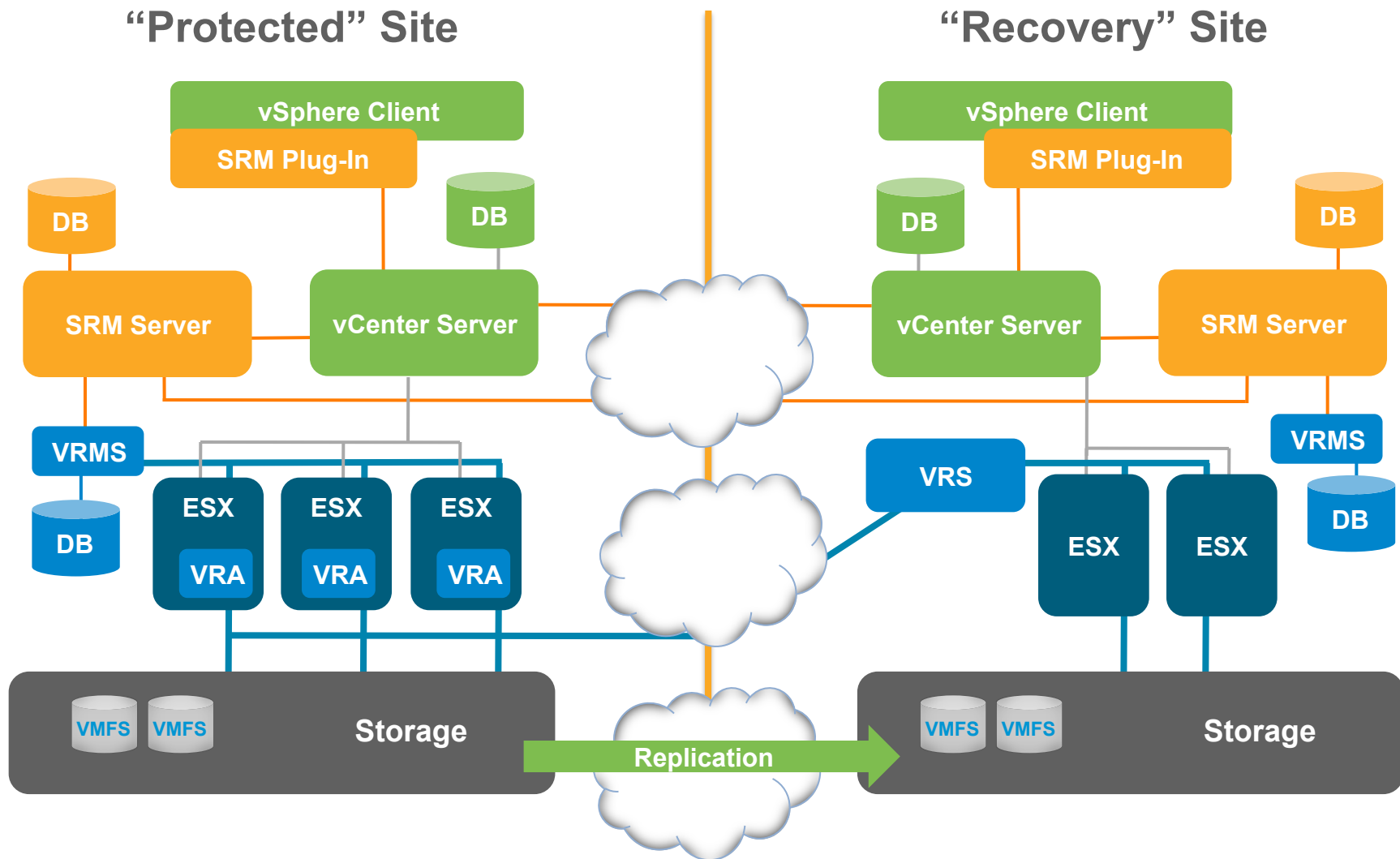
- Enable frequent non-disruptive testing
- Ensure fast, automated failover
- Automate failback processes

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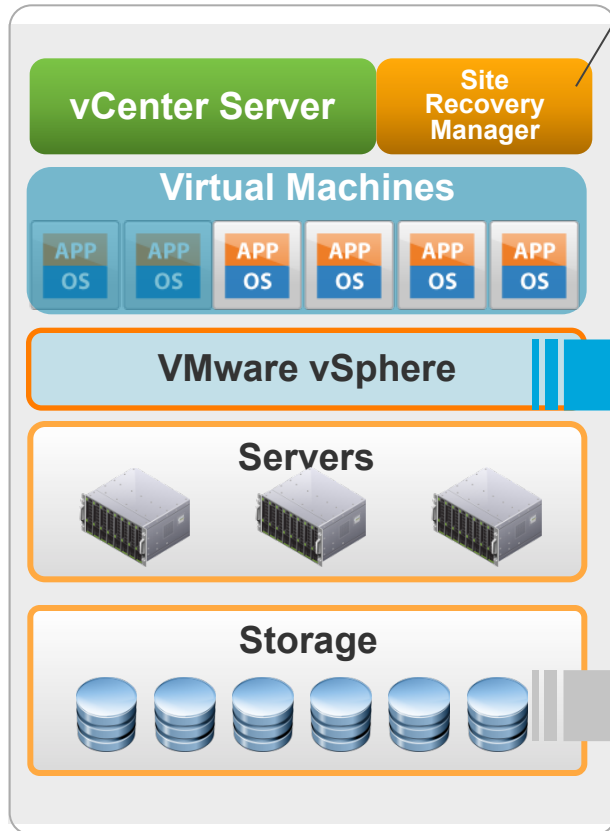## Supported Versions

- vCenter: Version 5.0 only
- ESX:
    - ESX/ESXi 3.5
    - ESX/ESXi 4.0
    - ESX/ESXi 4.1
    - ESXi 5.0 – Mandatory for vSphere Replication
- Unsupported: Storage vMotion, Storage DRS

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SRM Architecture

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Key Components Of SRM 5

Required at both protected and recovery sites

vCenter Server

Site Recovery Manager

Virtual Machines

APP OS | APP OS | APP OS | APP OS | APP OS | APP OS

VMware vSphere

Servers

Storage

Site Recovery Manager

- Manages recovery plans

- Automates failovers and failbacks

- Tightly integrated with vCenter and replication

Choice of replication options

vSphere Replication

- Bundled with SRM

- Replicates virtual machines between vSphere clusters

Storage-Based Replication (3rd party)

- Provided by replication vendor

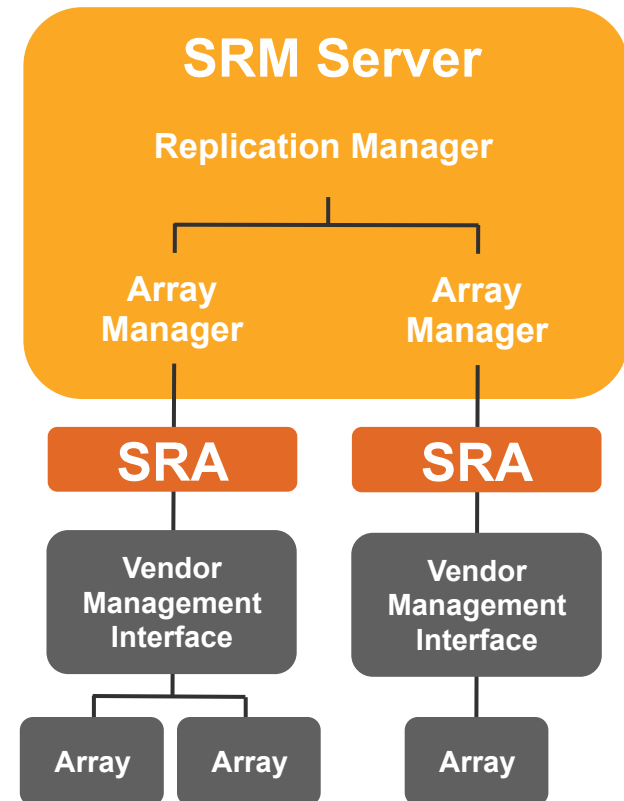- Integrated via replication adapters created, certified and supported by replication vendor

3PAR EMC² FalconStor Software hp invent Hitachi Data Systems Xiotech

DELL EQUALLOGIC FUJITSU LSI IBM NetApp compellent

Components

- **vCenter – must be 5.0 and licensed and running on each site**

- **vSphere – must be 3.5 or later and running on each site**

- **SRM Server – Requires a Windows 64 bit OS.**

- **Storage Replication – must be on our compatibility list, and have the snapshot or clone technology licensed for SRM tests**

- **SRA – Storage Replication Adapter is the connection between VMware and the storage environment**

- **VRMS – vSphere Replication Management Server**

- **VRA – vSphere Replication Agent**

- **VRS – vSphere Replication Server**

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Storage Array Integration

- Storage Replication Adapters (SRAs):
  - Discover arrays
  - Determine which LUNs are replicated
  - Assist in initiating tests, recovery
  - New capabilities in SRAs for version 5.0 include
    - Reprotect
    - Synchronization
    - Planned Migration

- **SRM 5 will require new SRA's**

- **SRM Compatibility Matrix:**
  http://www.vmware.com/pdf/srm_storage_partners.pdf

SRM Server

Replication Manager

Array Manager | **Array Manager**

SRA | **SRA**

Vendor Management Interface | Vendor Management Interface

Array | Array | Array

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vSphere Replication

- **Adding native replication to SRM**

- Virtual machines can be replicated irrespective of underlying storage type

- Enables replication between heterogeneous datastores

- Replication is managed as a property of a virtual machine

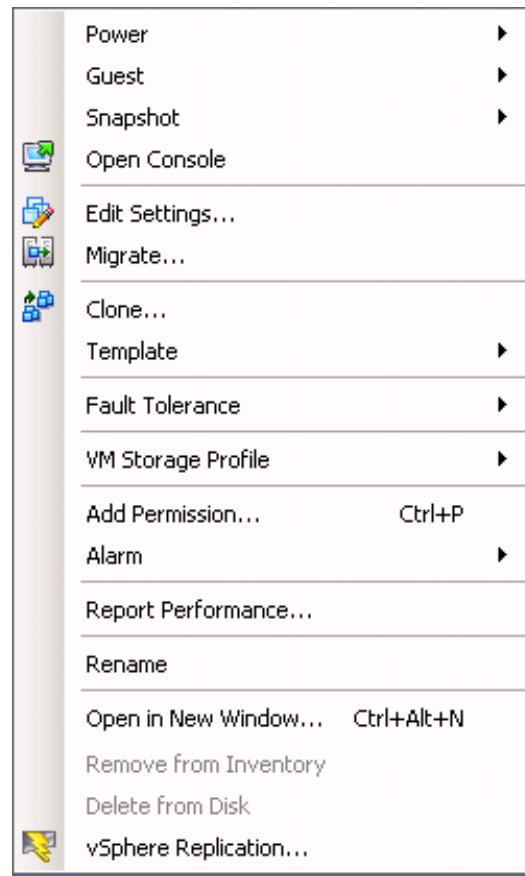- Efficient replication minimizes impact on VM workloads

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vSphere Replication Details

- **Replication options may be set per Virtual Machine**
  - Can opt to replicate all or a subset of the VM's disks
  - You can create the initial copy in any way you want - even via sneaker net!
  - You have the option to place the replicated disks where you want.
  - Disks are replicated in group consistent manner

- **Simplified Replication Management**
  - User selects destination location for target disks
  - User selects Recovery Point Objective (RPO)
  - User can supply initial copy to save on bandwidth

- **Replication Specifics**
  - Changes on the source disks are tracked by ESX
  - Deltas are sent to the remote site
  - Does not use VMware snapshots

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vSphere Replication UI

- **Select VMs to replicate from within the vSphere client by right-click options**

- **Can configure for an individual VM, or multiple VMs simultaneously!**

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Replication UI – VM level

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vSphere Replication Components

- **VR Agent**
  - Component of ESX host and ships with ESX
  - Manages the replication process
    - Schedules replications
    - Transfers data to remote vSphere Replication servers
    - Co-ordinates replication of VM configuration, and group consistency for VM disks
    - Tracks changed blocks
    - Replication traffic routed by VMkernel – not compressed or encrypted.

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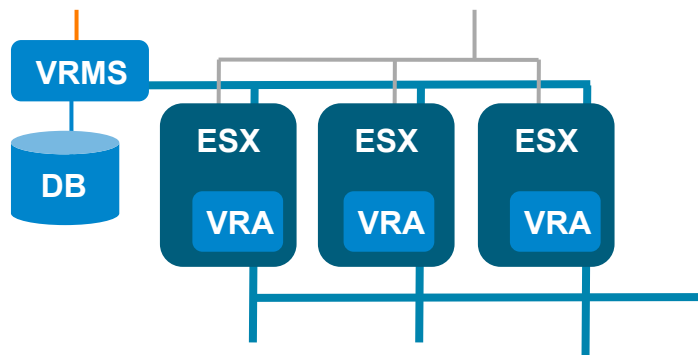
vSphere Replication Components – continued

vSphere Replication Server

- Linux virtual appliance at recovery side

- Deployed, configured, and managed by SRM

- Can scale by instantiating multiple servers

- Receives replication traffic from protection site

- Acts as a proxy, hiding details of the remote site from primary

- Writes incoming replication updates to VMDK files using ESX hosts

- Redo logs are used to preserve consistent updates

- Maintains 1 consistent instance per VM

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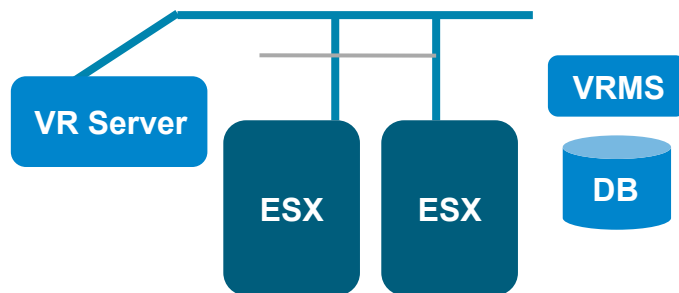
vSphere Replication Components – continued

- **vSphere Replication Management Server (VRMS)**
  - Generic management framework for vSphere Replication
    - Orchestrates the creation of test and fail-over images
    - One VRMS per VC
    - Linux virtual appliance managed via the SRM UI
    - Provides the vSphere Replication support to SRM
    - Maps disks/VMs from primary site to directories / VMDKs at recovery site

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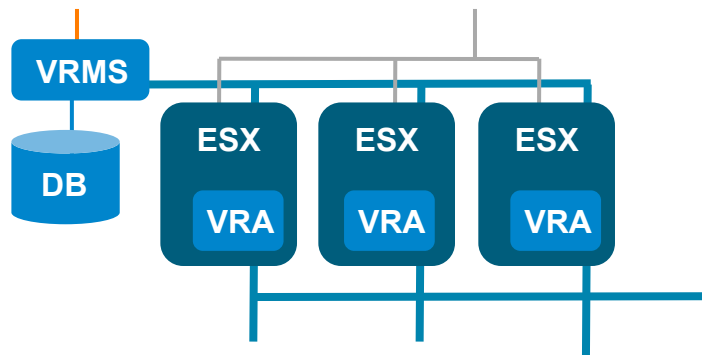
vSphere Replication Traffic

- **Deltas (TCP 44046)**
  - Normal mode of operation sends only changed blocks to the replica site
  - Changed blocks accumulate in a redo log

- **Full Sync (TCP 31031)**
  - Read disks, exchange checksums
  - Used to establish the initial state
  - Also used for recovery from errors or if an unusual state is detected
  - Ensures traffic isolation
  - Ensures data synchronization checks do not impact replication

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vSphere Replication Performance

- A single vSphere Replicaton "replication server" appliance can process up to 1 Gbps of sustained throughput using approximately 95% of 1 vCPU.

- For a VM protected by VR the impact on application performance is minimal, with between 2 – 6% throughput loss.

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Recovery Site Storage

- **vSphere Replication Server writes replica data into a .vmdk**
  - VMDK files may be in any ESX storage
  - VMDK files may be thick / thin / eager / etc.

- **Non-disk data (.nvram, .vmx, etc.) stored in flat files**

- **The "base" disk contains oldest consistent instance**
  - Protected by "redo log" that captures in-flight updates
  - Redo logs are collapsed after instance is complete

- **VR managed disks are not directly visible in vCenter**

- **Test-bubble VMs are created in a sub-directory**
  - Uses additional redo logs to protect the genuine recovery instances
  - Redo logs are cleaned up when test-bubble is reverted

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vSphere Replication 1.0 Limitations

- Focus on virtual disks of powered-on VMs
  - ISOs and floppy images are not replicated
  - Powered-off/suspended VMs not replicated
  - Non-critical files not replicated (e.g. logs, stats, swap, dumps)
- VR works at the virtual device layer
  - Independent of disk format specifics
  - Independent of primary-side snapshots
  - Snapshots work with VR, snapshot is replicated, but VM is recovered with collapsed snapshots
  - Physical RDMs are not supported
- FT, linked clones, VM templates are not supported with VR
- Automated failback of VR-protected VMs will come later that the initial 5.0 release, but will be supported in the future.
- Virtual Hardware 7 or later is required for VMs to be protected by VR.

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Array-based Replication vs vSphere Replication

- **Array-based replication**
  - Configure replication properties per group of physical LUNs
  - Explicitly manage the VM to VMFS to LUN mapping
  - Configuration at each site must match
    - Compatible arrays, same provisioning
    - Same LUNs, same VMFS, same VM to VMFS mappings
  - Configuration of replication is done outside of the vSphere Client
  - Most arrays use schedules to set replication times
  - SRAs to discover replication

- **vSphere Replication**
  - User selects allowable staleness
  - User specifies source and target VMDK
  - Any datastore can hold replication sources or targets
    - Even local datastores
  - Replication is managed at a per VM granularity
  - Strong integration with the platform
  - Can not reprotect

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vSphere Replication

- **vSphere Replication has its own protection groups**

- **VR protection groups can not do an automated failback, but may be manually reprotected and recovered.**

- **They may be mixed in the same Recovery Plan with storage array PGs**

- **A recommendation is to separate recovery plans with VR protection groups from those with Array protected PGs**

- **This is strictly to allow for automated failback with fewer errors**

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vSphere Replication – Installation Recommendations

- **Test SRM using array protected virtual machines first, and ensure that planned migration, test failover, cleanup, and reprotect all work before installing VR.**

- **Install the VRMS appliances on both protected and recovery sides, and connect them**

- **Install the VRS appliance initially only on the recovery side and connect it to the VRMS**

- **Create vSphere Replication protection groups and test failovers independently of SRA protected PGs.**

- **Use the "Getting Started" tab for live links to help install**

- **Be aware that Storage DRS and Storage vMotion are unsupported with SRM. Plan accordingly!**

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Architecture – Storage Impact – Protection Groups

Protected Site

Datastore Group 1
LUN 1 — VMFS A Datastore — **PG 1 - EMail** (VM VM VM)

Datastore Group 2
LUN 2, LUN 3 — VMFS B Datastore — **PG 2 - SQL** (VM VM VM / VM VM VM)

Datastore Group 3
LUN 4 — VMFS C Datastore
LUN 5 — VMFS D Datastore
PG3 - SharePoint (VM) — .vmdk files in separate datastores

Recovery Site

Recovery Plan 1 (Email)

PG 1 - EMail

(VM VM VM)

Recovery Plan 2 (Entire Site)

PG 1 – EMail

PG 2 – SQL

PG3 – SharePoint

(VM VM VM VM VM)

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Storage Impact – Granular DR Testing and Failover

- Group VMs on disk by application, service, business unit, etc. - create a recovery plan for each group.

- Test or fail over only what is necessary
  - i.e. Not "all or nothing"

SRM provides granular testing of disaster recovery plans

Intelligent organization of your storage will enable this!

Recovery Plan 1 (EMail)

Recovery Plan 2 (SQL)

Recovery Plan 3 (Entire Site)

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Use Cases

3 typical

Unplanned Failover

Recover from unexpected site failure

• Full or partial site failure

The most critical but least frequent use-case

• Unexpected site failures do not happen often

• When they do, fast recovery is critical to the business

Preventive Failover

Anticipate potential datacenter outages

• For example: in case of planned hurricane, floods, forced evacuation, etc.

Initiate preventive failover for smooth migration

• Graceful shutdown of VMs at protected site

• Leverage SRM 'planned migration' capability to ensure no data-loss
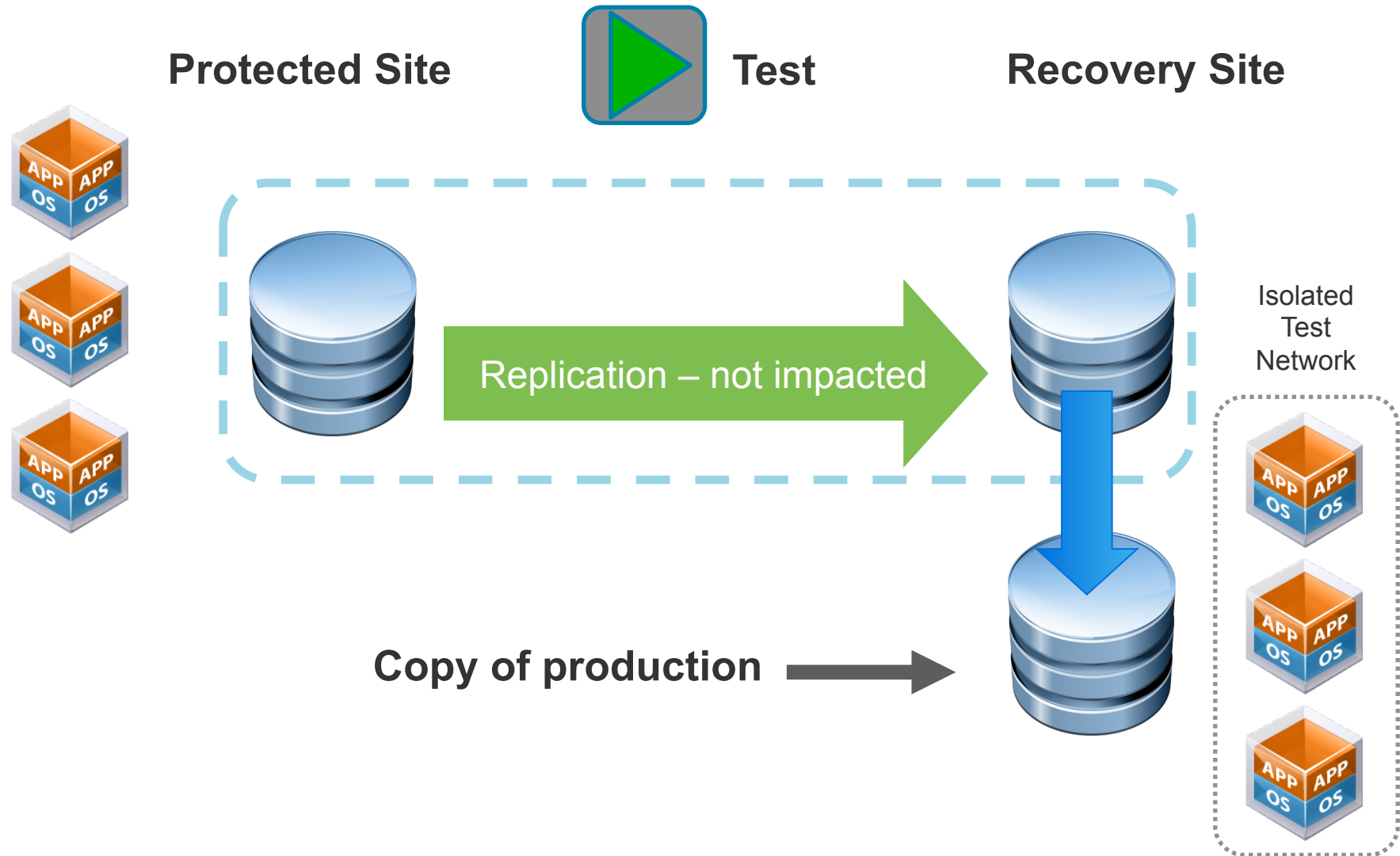
Planned Migration

Most frequent SRM use case

• Planned datacenter maintenance

• Global load balancing
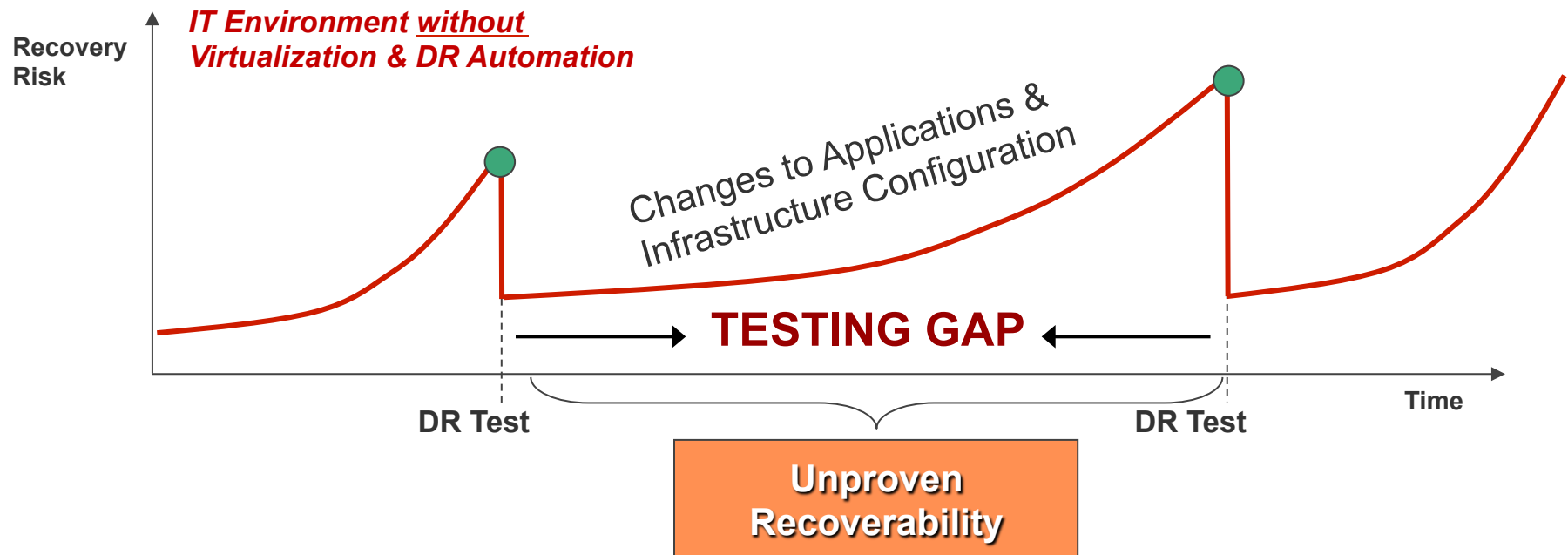
Ensure smooth site migrations

• Test to minimize risk

• Execute partial failovers

• Use SRM planned migration to minimize data-loss

• Automated Failback enables bi-directional migrations

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Additional Use Cases – Upgrade, Patch Testing

Protected Site　▶ **Test**　**Recovery Site**

Replication – not impacted

Isolated
Test
Network

Copy of production　➡

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Risk With Infrequent DR Plan Testing

Recovery Risk (y-axis)

IT Environment without Virtualization & DR Automation

Changes to Applications & Infrastructure Configuration

TESTING GAP

DR Test   DR Test

Time (x-axis)

Unproven Recoverability
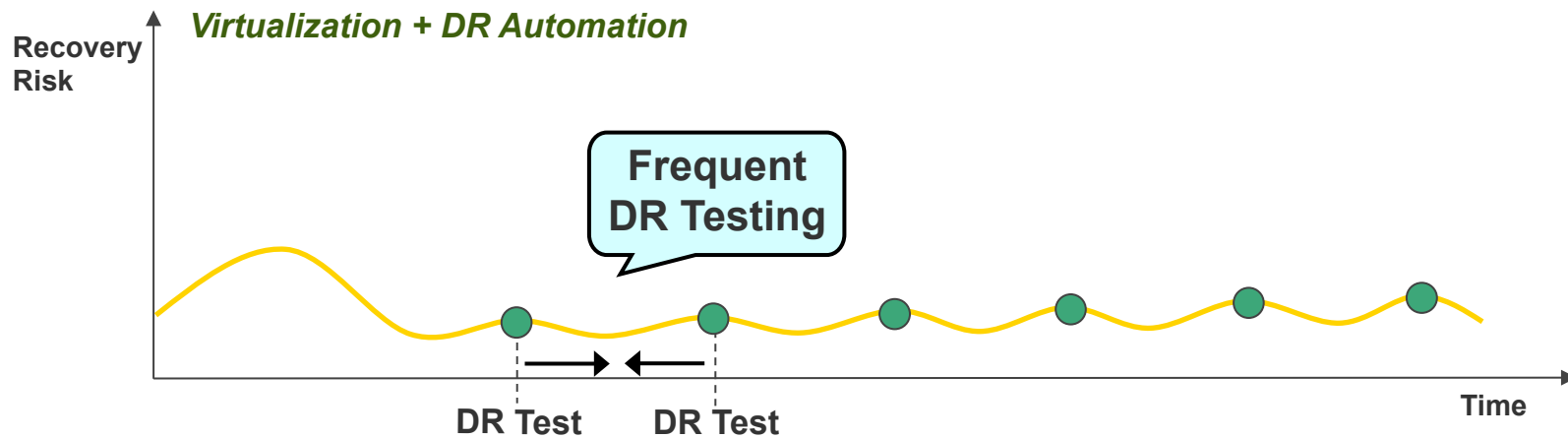
- Parallel and cutover tests provide the best verification, but very resource intensive and time consuming.

- Cutover tests are disruptive, may take days to complete and leaves the business at risk

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Frequent DR Testing Reduces Risk

Virtualization & DR Automation Greatly Reduce Recovery Risk

- Increased confidence that the plan will work
- Recovery can be tested at anytime without impact to production

SRM provides frequent testing of recovery plans

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Advanced – IP Customization

- **The GUI shows IP customization for manual customization of IP addresses**

- **IP Customization information can now be configured for both protected and recovery sites**

- **Command line bulk IP customization includes support for both IPv6 addresses, and dual-site IP information**

- **No more Sysprep, or Customization Specifications required**

- **Performance of IP customization much faster**

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Advanced – IP Customization – UI

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Advanced – IP Customization – command line

- **Important to always pull down, and push up on the same side!**
- **This tool is found in the bin folder**

Dr-ip-customizer --cfg ..\config\vmware-dr.xml -o c:\example.csv --cmd generate --vc vcenter-recovery

Dr-ip-customizer --cfg ..\config\vmware-dr.xml --csv c:\example.csv --cmd apply --vc vcenter-recovery

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Advanced – IP Customization – command line

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
	VM ID	VM Name	vCenter Server	Adapter ID	DNS Doma	Net BIOS	Primary W	Secondary	IP Addres	Subnet M	Gateway(	IPv6 Addr	IPv6 Subn	IPv6 Gate	DNS Serve	DNS Suffix(es)	
	protected-vm-29113	TestWK1	castle.thewhites.ca	1					dhcp								
	protected-vm-29113	TestWK1	castle.thewhites.ca	0													
	protected-vm-29113	TestWK1	hanbury.thewhites.ca	0											192.168.15.8		
	protected-vm-29113	TestWK1	hanbury.thewhites.ca	1					192.168.15	255.255.25	192.168.15.100				192.168.15.12		
	protected-vm-29136	TestSRV1	hanbury.thewhites.ca	0											192.168.15.8		
	protected-vm-29136	TestSRV1	hanbury.thewhites.ca	1					192.168.15	255.255.25	192.168.15.100				192.168.15.12		
	protected-vm-29136	TestSRV1	castle.thewhites.ca	1					dhcp								
	protected-vm-29136	TestSRV1	castle.thewhites.ca	0													
	protected-vm-29155	TestWK2	castle.thewhites.ca	0													
	protected-vm-29155	TestWK2	castle.thewhites.ca	1					dhcp								
	protected-vm-29155	TestWK2	hanbury.thewhites.ca	0											192.168.15.8		
	protected-vm-29155	TestWK2	hanbury.thewhites.ca	1					192.168.15	255.255.25	192.168.15.100				192.168.15.12		
	protected-vm-33535	TestWK3	hanbury.thewhites.ca	0											192.168.15.8		
	protected-vm-33535	TestWK3	hanbury.thewhites.ca	1					192.168.10	255.255.25	192.168.10.100				192.168.15.12		
	protected-vm-33535	TestWK3	castle.thewhites.ca	1					dhcp								
	protected-vm-33535	TestWK3	castle.thewhites.ca	0													

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Useful Links

- **Learn more about vSphere Replication VMworld 2010 SRM Futures – host based replication - http://www.vmworld.com/docs/DOC-4829**

- **Release Notes –**

- **SRM documents –**

- **Admin Guide –**

- **VMware Compatibility Guide –**

- **Storage Partners Compatibility Guide –**

- **Uptime Blog – http://blogs.vmware.com/uptime/**

- **Upgrade blog –**

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Summary

- **New Planned Migration workflow that includes data synchronization and pauses on error**

- **Simplified and automated failback (failover, reprotect, failover)**

- **vSphere Replication is granular – at the VM level!**

- **DR Event will not pause, but will try to include data sync**

- **Will require a new SRA!**

- **Faster IP customization**

- **Significantly improved support for multi – tier applications**

- **In-guest agent support**

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Thank You