

# Virtual Design Master

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## *Challenge 3- Disaster Recovery*

After spending lot of time and energy working on Mars, we can't forget our Moon base, which is a perfect choice for Disaster Recovery Site. Come up with a Disaster Recovery plan for our key applications on Mars.

Submitted by-Harshvardhan Gupta

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# **1. Executive Summary**

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## **1.1 Project Synopsis**

Billionaire Philanthropist wants to build a public cloud on Moon base and utilise it for Disaster Recovery Scenario.

Our vCloud Air Replica on Mars was very successful and doing well in supporting critical business applications, so we've submitted the proposal to create vCloud Air on moon base as well. vCloud Air on Moon Base will target only disaster recovery subscription.

## **1.2 Intended Viewers**

This document is specifically written for technical people responsible for building Public cloud on moon base. Document provides guidelines to build a public cloud on Moon base.

## **1.3 Project Vision**

Deliver Public cloud infrastructure on Moon base for disaster recovery purpose. This cloud's sole purpose is to provide disaster recovery solution to applications running on Mars.

### **1.3.1 Project Requirements**

R001-Protect Microsoft Exchange Environment.

R002-Protect Web Application servers with locally running instance of IIS/MSSQL

R003-Protect Maria DB Cluster

R004-Protect File Servers hosting very important data for in-pod entertainment of human's

R005-Protect Virtual Machines running CoreOS to support Docker Container

R006-Protect Legacy Windows NT 4 running IBM DB2 database.

R007-Must be a fully supported solution.

### **1.3.2 Project Constraints**

C001-Utilize Existing IT Infrastructure on Moon Base to replicate public cloud.

C002-State-of-the-Art advanced Laser Communications link available between Mars and Moon base.

C003-Provides consistent less than 10 ms Round Trip Time no matter what time of day it is.

C004-No alternate link available between Mars and Moon base.

C005-Desgin/architect solution within 5-days of accepting challenge.

C006-Disaster recovery solution must support all OS from Win NT to Core OS.

### **1.3.3 Project Assumptions**

A001-Infratructure that needs to be protected from disaster is still running on-premises above vSphere.

A002-MS Exchange 2013 architecture designed with multiple DAG's.

A003-Active Directory Infrastructure is highly available and disaster proof.

A004-Basic Infrastructure like (NTP, DHCP, DNS, IP Ranges, and VPN etc.) is available on Moon Base.

A005-CoreOS based Docker containers are used by developers for development purposes and doesn't cater any Business critical application.

A006-LegacyWindows NT running IBM DB2 doesn't utilise windows legacy clustering technology and runs in a workgroup environment.

A007- File servers are at 10% utilization only.

A008-Soyuz module for sending external storage to Moon Base for offline seeding of Data.

## 2. Public Cloud of choice for Disaster Recovery Scenario

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Disaster recovery is the ability to recover data in case the production system is damaged, destroyed or becomes unavailable for an undeterminable period of time. A comprehensive disaster recovery solution that can restore data quickly and completely is required to meet low RPO and RTO thresholds. Whenever such disaster recovery question comes into mind vCloud Air DRaaS has all the answer. It provides simple and secure asynchronous replication and failover from on-premises vSphere using vSphere remote replication technology. It also provides warm standby capacity, self-service protection, failover and fallback workflows per VM. Supports wide range of RPO's from as low as 15 min. to as long as 24 hours. Initial offline data seeding facility available for transferring large data ex- file server.

Features	Description
<b>VM-centric policy-based storage and replication</b>	Replicate in flexible topologies – e.g. from traditional external storage to Virtual SAN storage – using vSphere Replication, VMware's proprietary hypervisor-based replication technology – no more need for matching storage at source and target
<b>Centralized recovery plans</b>	Create and manage recovery plans directly from the next-generation user interface of the vSphere Web Client
<b>Self-service, policy-based provisioning</b>	Tenant-driven provisioning of pre-defined DR policies via blueprints in vRealize Automation
<b>Automated disaster recovery failover</b>	Initiate recovery plan execution from the vCloud Air Web Client with a single click of a button
<b>Planned migration and disaster avoidance</b>	Graceful shut down of protected virtual machines at the original site and Replication synchronization of protected virtual machines prior to migration to avoid data loss
<b>Automated fallback</b>	Re-protect virtual machines by reversing replication to the original site
<b>Non-disruptive testing</b>	Recover virtual machines into an isolated network to avoid any impact on production applications

<b>No Apps Left Behind, DR automation for all virtualized applications</b>	Application-agnostic DR solution engineered to protect any virtual machine
<b>Flexible, cost-effective Replication</b>	vCloud Air 35% Cheaper Than Azure and 83% Cheaper Than AWS

Based on above data and comparative with other Cloud DR provider, our choice was clear and will deploy a replica of vCloud Air Disaster Recovery public cloud platform named as “Galactica DR”.

We will provide below subscription service-

**Term Lengths:**  
1m, 3m, 12m, 24m, 36m subscriptions

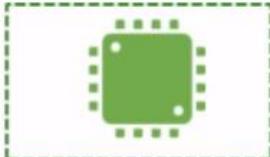


**Disaster Recovery**  
Logically Isolated  
Business Continuity  
Solution

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**Base Resources:**

- 20GB vRAM
- 10GHz vCPU




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**Starts at:**

- 1 TB




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- 10 Mbps allocated
- 50 Mbps burstable
- 2 Public IPs



### 3. Galactica DR Design Decision and Summary

The old infra designed by Daemon in Season 2 left behind when moved to Mars, was configured with VMware Management Cluster, Compute Cluster and DR Cluster. We reclaimed Hardware from DR Cluster and distributed blades equally and built another Compute Cluster. Now we can deploy vCloud Cell servers for redundancy and load balancing.

#### 3.1 Physical Design- Galactica DR

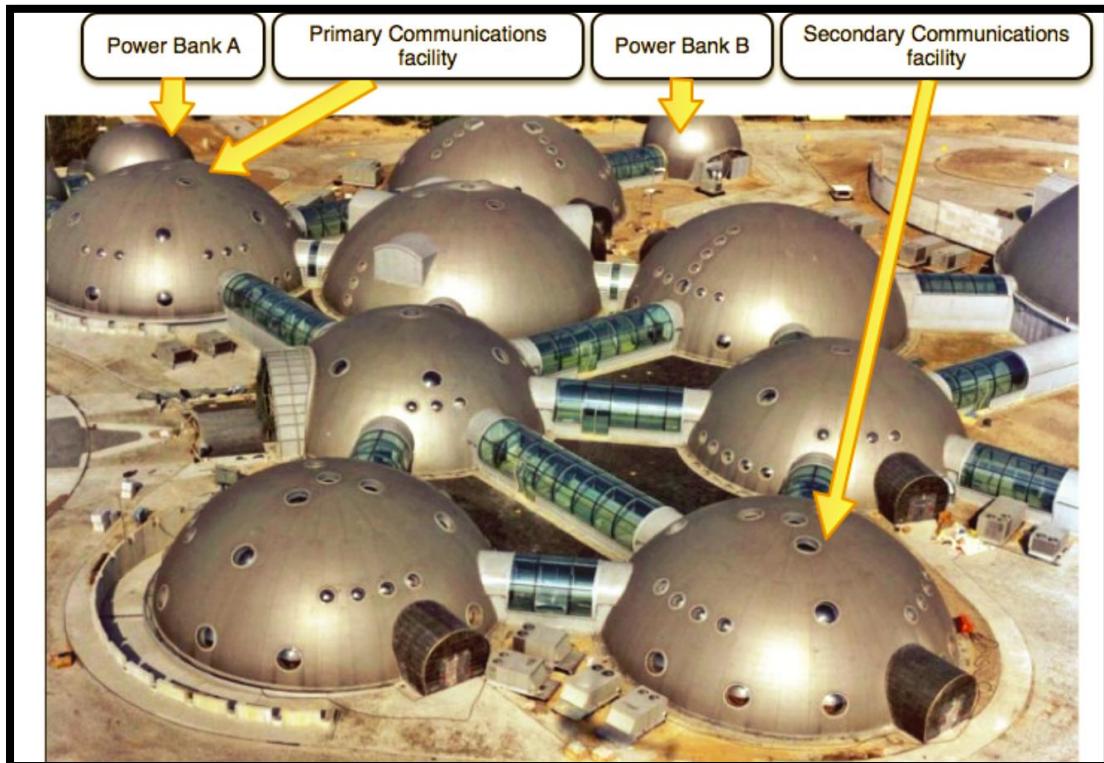
We will create only one instance of Galactica DR because of limited H/W and nominal demand, if demand increases in future will deploy more public clouds like this on dark side of Moon base.

### 3.1.1 Cooling Sources

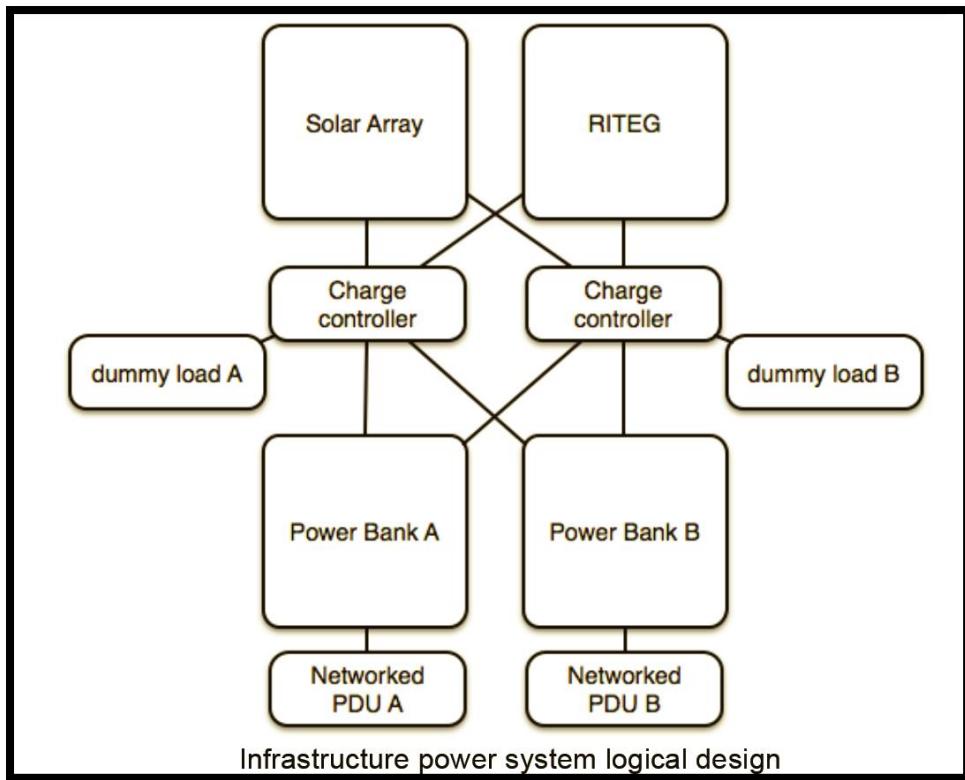
Beneath Moon's surface, temperature is lot cooler than compared to ground, will create air duct underneath Moon's surface and pass Air from duct and circulate this cooled Air inside Datacenter. This system is economical, renewable and maintenance free.

### 3.1.2 Power Sources

The power systems will be on A/B power banks and Alternate source of power will be Radioisotope thermoelectric generator (RITEG) as described by Daemon in Season 2.

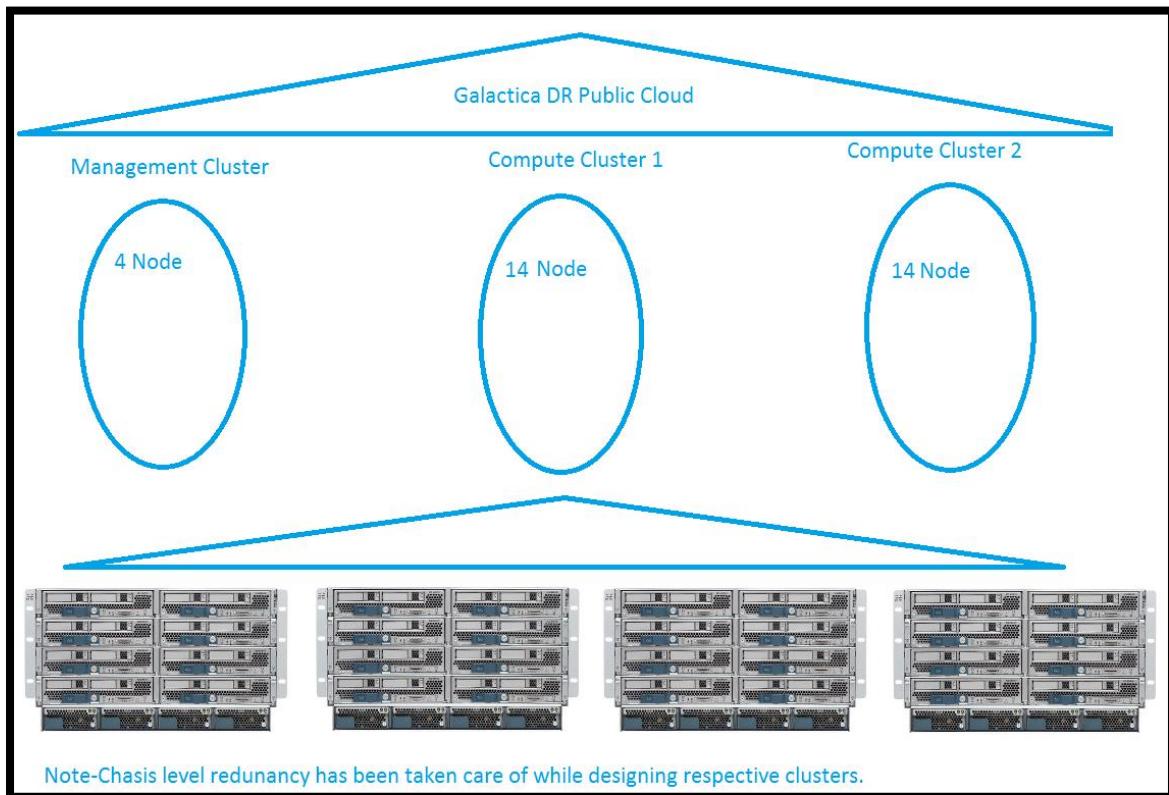


Logical Design for Power infrastructure system



### 3.1.3 Compute Gear

Existing Setup utilizes UCS B series chassis with 8 blades each, RAM upgrades were made for accommodating future workloads. Total capacity of 32 blades, they will be divided in two categories -  
 1. Management Cluster and 2. Compute cluster for Galactica DR.

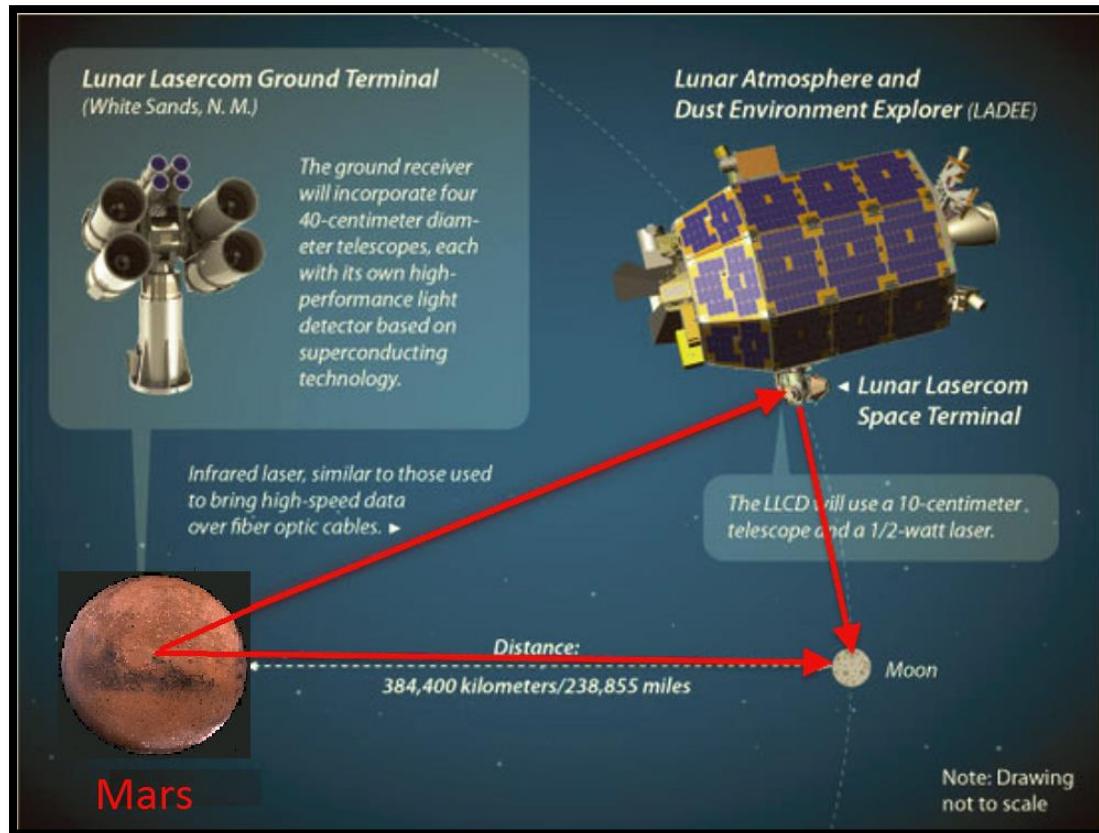


Cluster Name	Total Compute	Total RAM
Mgmt Cluster	4 hosts x 4 cores x 1.8 Ghz=28.8 Ghz	16x4=64 GB
Compute 1	14 hosts 4 cores x 2.6 Ghz=145.6 Ghz	64x14=896 GB
Compute 2	14 hosts 4 cores x 2.6 Ghz=145.6 Ghz	64x14=896 GB
Grand Total	320 Ghz	1.8 TB

### 3.1.4 Networking Gear

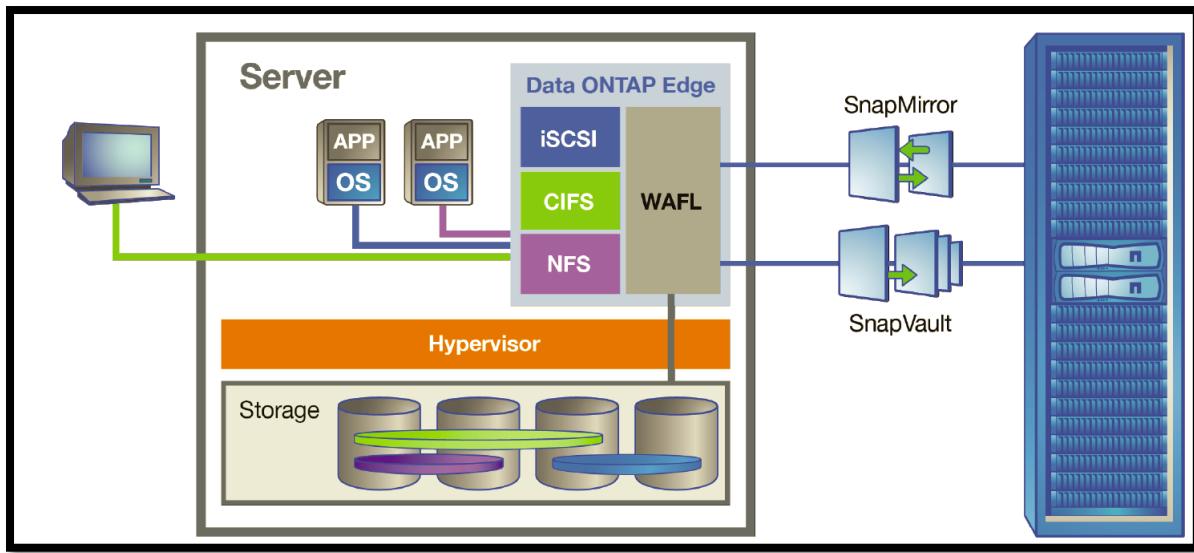
Within Galactica DR public cloud Cisco 5548 series switches will be used as in Mars to keep network standard, our only Network engineer guy insisted upon this.

Direct Connect link- between Mars and Moon base State-of-the-art Laser communication-



### 3.1.5 Shared Storage

NetApp FAS8020, which still has some shelf life left will be used as a primary shared storage and set to replicate using OnTap Edge VM's. The OnTap Edge VM's will make use of local storage on each blade.



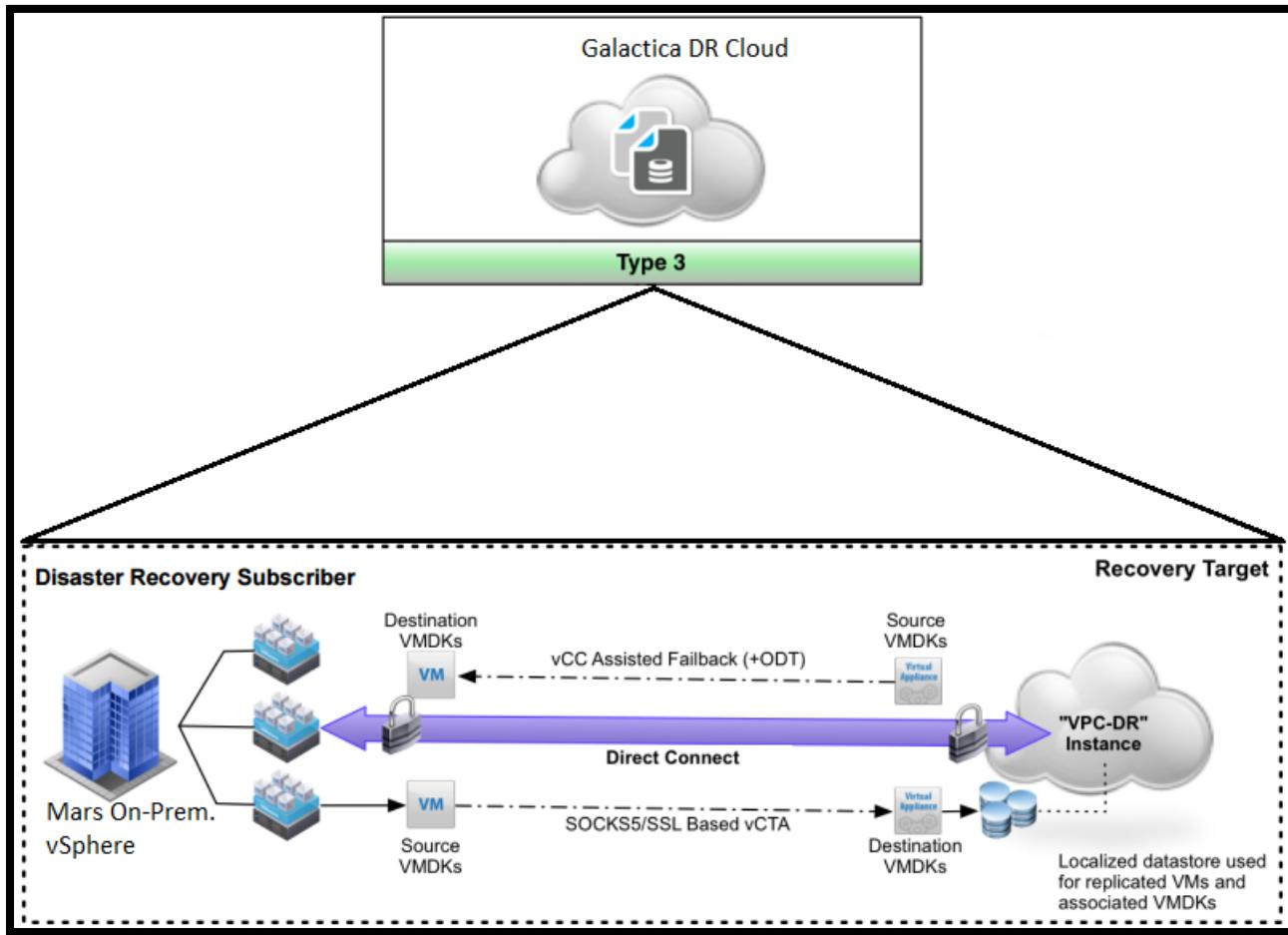
### 3.2 Galactica DR Subscription model

Single Subscription model, demand is very low as of now and based on future demands from Aliens other affordable subscriptions will be offered.

Service/Description	Resources	Optional Add-Ons
<b>Disaster Recovery:</b> Business continuity protection for your on-premises clouds.	<ul style="list-style-type: none"> <li>• 10GHz vCPU standby capacity</li> <li>• 20GB vRAM</li> <li>• 1TB of persistent storage</li> <li>• 2 Public IPs</li> <li>• Unlimited Failover Tests</li> <li>• 10Mbps allocated throughput</li> </ul>	<ul style="list-style-type: none"> <li>• Compute Subscription</li> <li>• Compute One-time</li> <li>• Persistent Storage</li> <li>• Public IPs</li> <li>• Direct Connect</li> <li>• Offline Data Transfer</li> </ul>
<b>Features</b> (all services include the following features)		
<ul style="list-style-type: none"> <li>✓ Firewall</li> <li>✓ VPNs</li> </ul>	<ul style="list-style-type: none"> <li>✓ Load Balancer</li> <li>✓ Disk I/O</li> </ul>	<ul style="list-style-type: none"> <li>✓ Redundancy + HA</li> <li>✓ DHCP + NAT</li> </ul>

Based on requirement optional add-ons can be added at any time.

### 3.1.6 HLD of Galactica DR



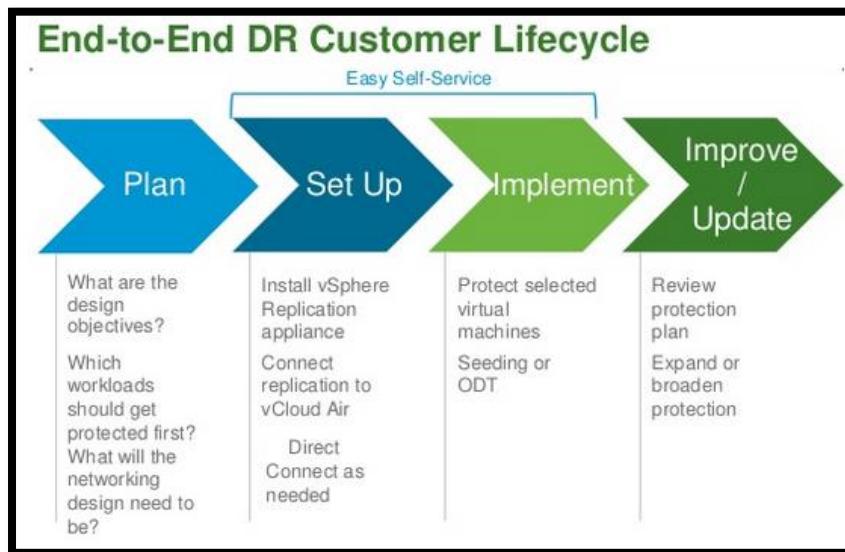
## 4. End-to-End DR Lifecycle

Components that need to be protected on Mars are listed below- 45 VM's with various configurations and roles installed.

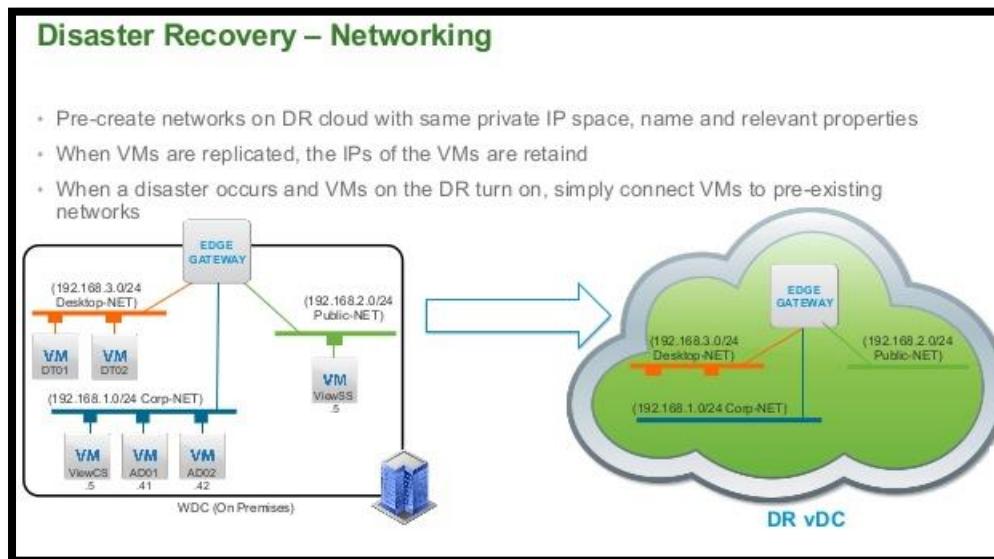
Qty	VM Role	vCPU	vRAM	Storage
2	Microsoft Exchange Front-end Server	4	12 GB	150 GB
3	Microsoft Exchange Mailbox Server	4	12 GB	300 GB
15	IIS/MSSQL Based Web App	2	8 GB	150 GB
3	MariaDB Cluster	1	4 GB	300 GB
5	File Server	2	12 GB	15 TB ( 10 % utilize)
15	CoreOS to support Docker	4	12 GB	72 GB
2	Legacy Win NT 4 with IBM DB2	1	4 GB	36 GB

Note-Uncheck 'synchronization guest time with host' to avoid NTP related issues.

Galactica DR Lifecycle includes four phases-

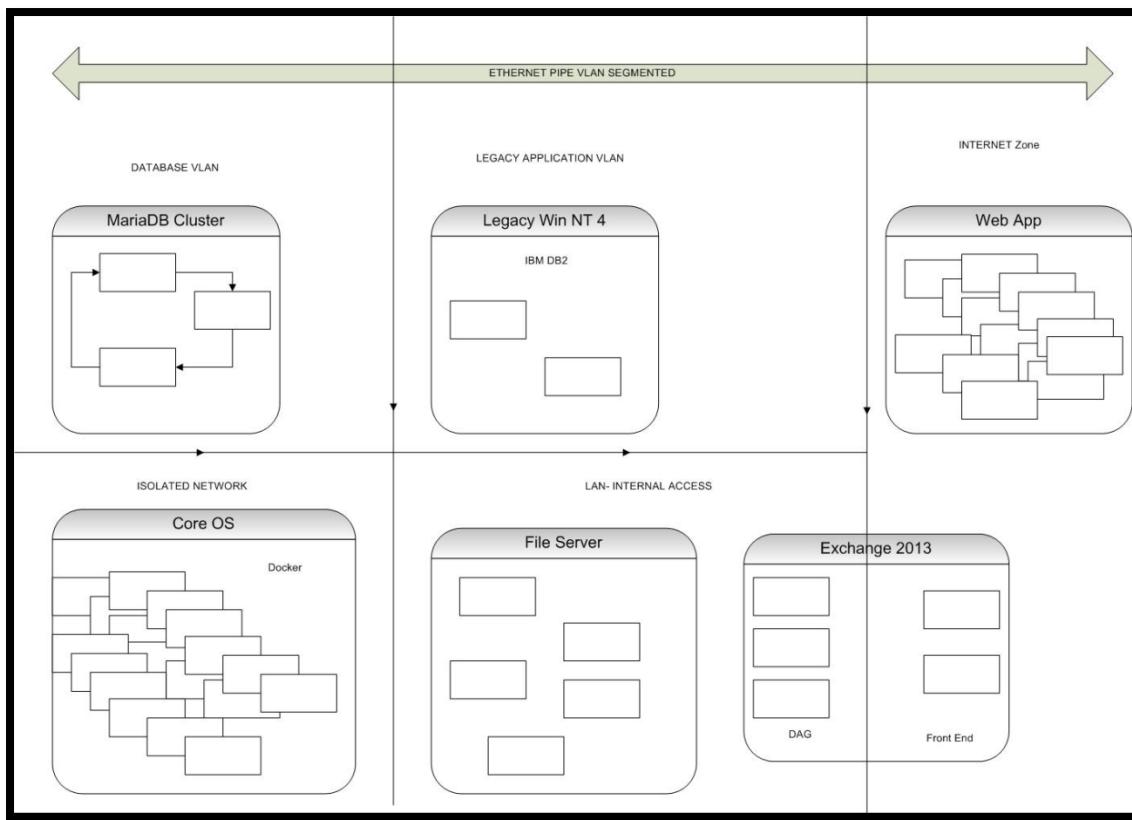


#### 4.1.1 Networking Design for VM's on Mars



Virtual servers are segregated with VLANs and falls under their individual VLAN's on Premises.

VLAN	VM's	IP Subnet
<b>DATABASE VLAN</b>	MariaDB Cluster	10.10.11.X/24
<b>LEGACY APP VLAN</b>	Win NT 4 with IBM DB4	10.10.12.X/24
<b>INTERNET VLAN</b>	Web App and Exchange Front End	10.10.13.X/24
<b>ISOLATED VLAN</b>	Core OS with Docker	10.10.14.X/24
<b>INTERNAL VLAN</b>	File Share and Exchange DAG	10.10.15.X/24

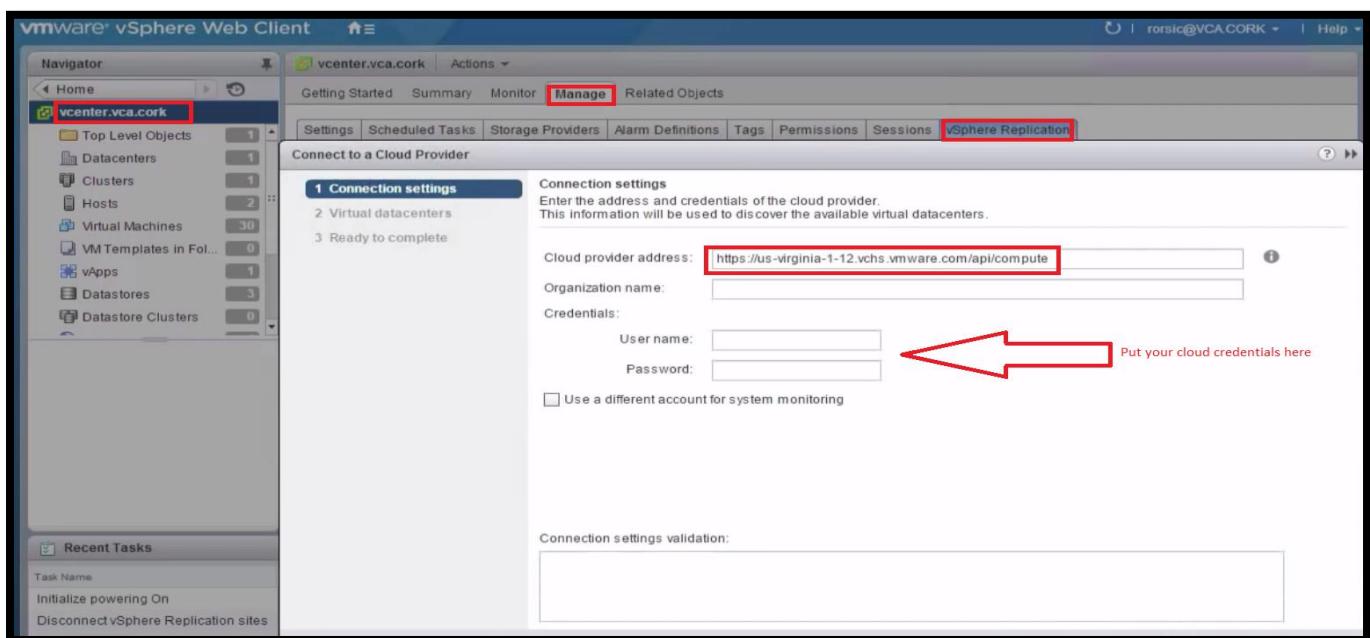


#### 4.1.2 vSphere Replication Appliance and plugin

Interested party must use vSphere replication 5.8, for replicating the Virtual machines to Galactica DR. It enables you to configure replication of VM to either Galactica DR or some other DR location using same interface. VSphere replication is distributed as an OVF format and available on Mars File Share under utilities folder. Deploying OVF is not part of this document. Please refer VMware's offline product documentation repository located on File share under Documentation share.

#### 4.1.3 Connect Replication to Galactica DR

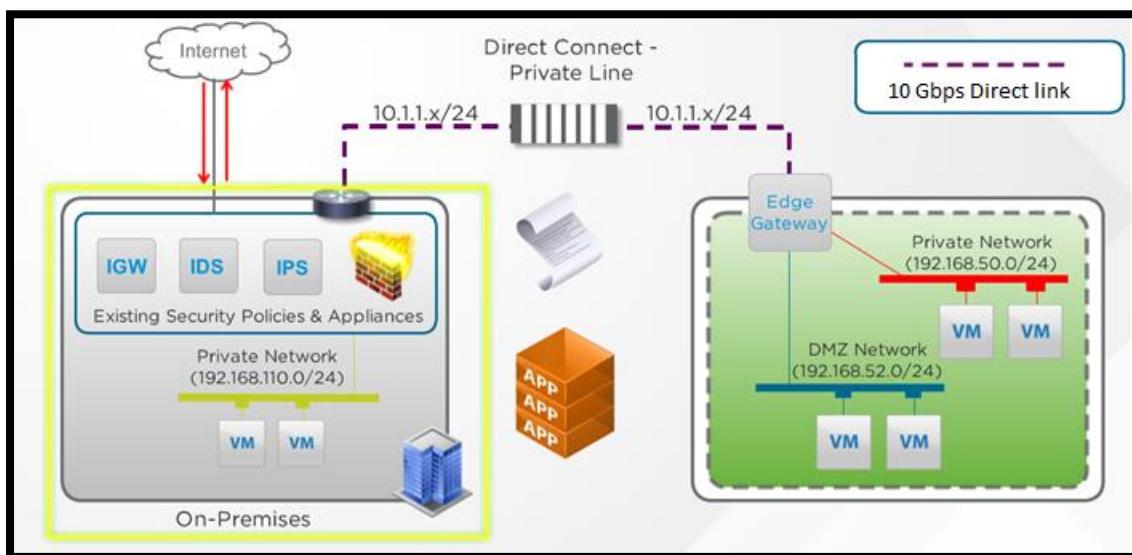
Once installed, make configuration changes to connect with Galactica DR, as instructed below.



Select Virtual Datacenter and click finish.

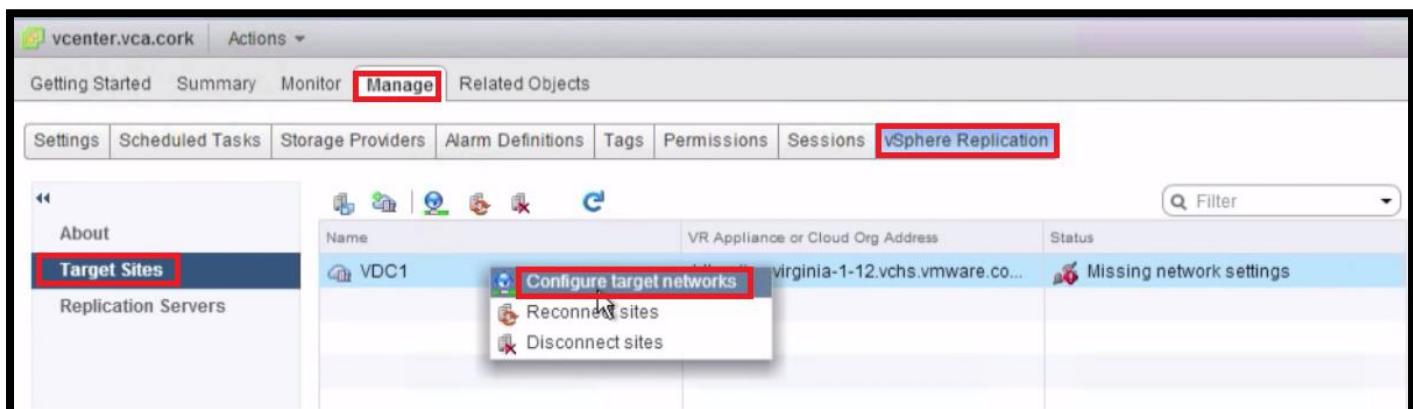
#### 4.1.4 Direct Connect method for connecting to Galactica DR

As per constraint, we've only Laser communications link between Mars and Moon Base, it's considered as Direct Connect method for DR replication and accessing DR protected VM. At any point of day this link will provide 10 Gbps speed with 10 ms RTT. As and when technology matures or more communication satellites will be launched link bandwidth will be increased by 2x.

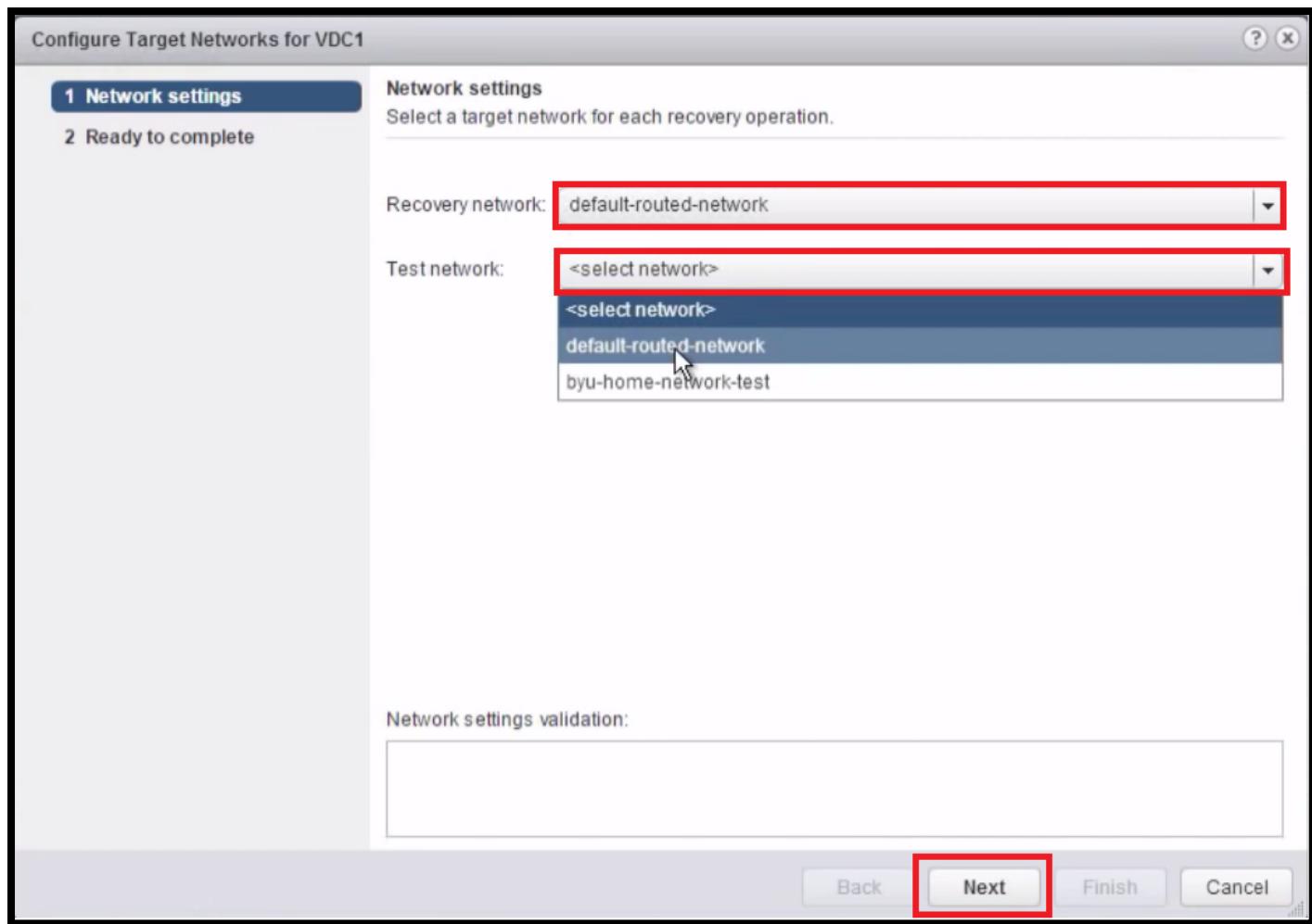


Note-above graphic is solely used for describing Direct Connect – private line.

Configure Target Networks in vSphere Web Client under vSphere Replication, as described below

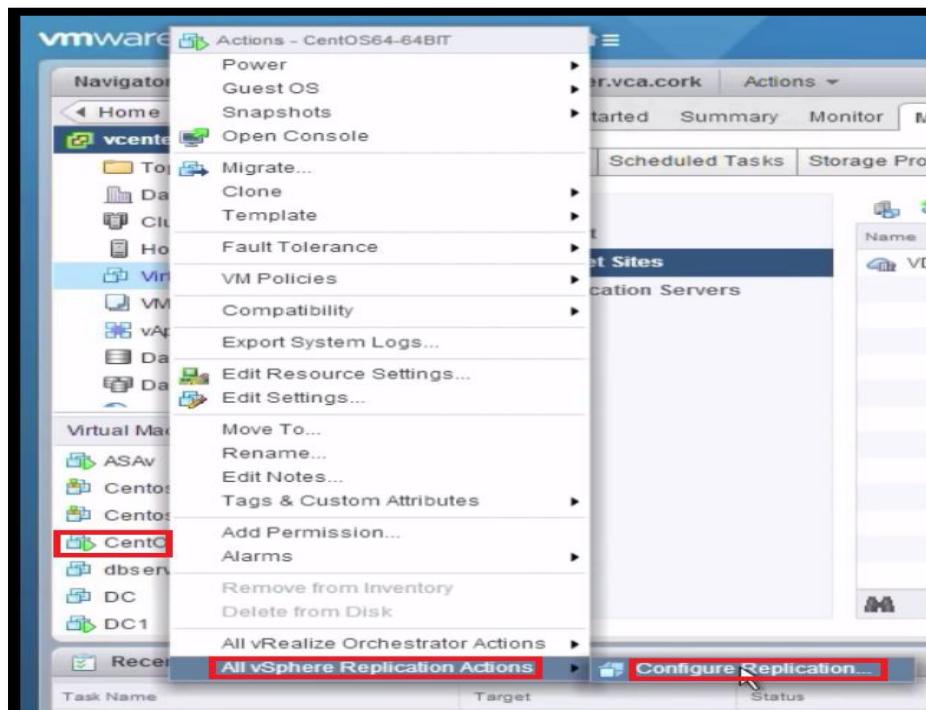


Select Direct connect – private line connection under Recover network/test network dropdown and click next. Once validation succeeds click finish to save settings

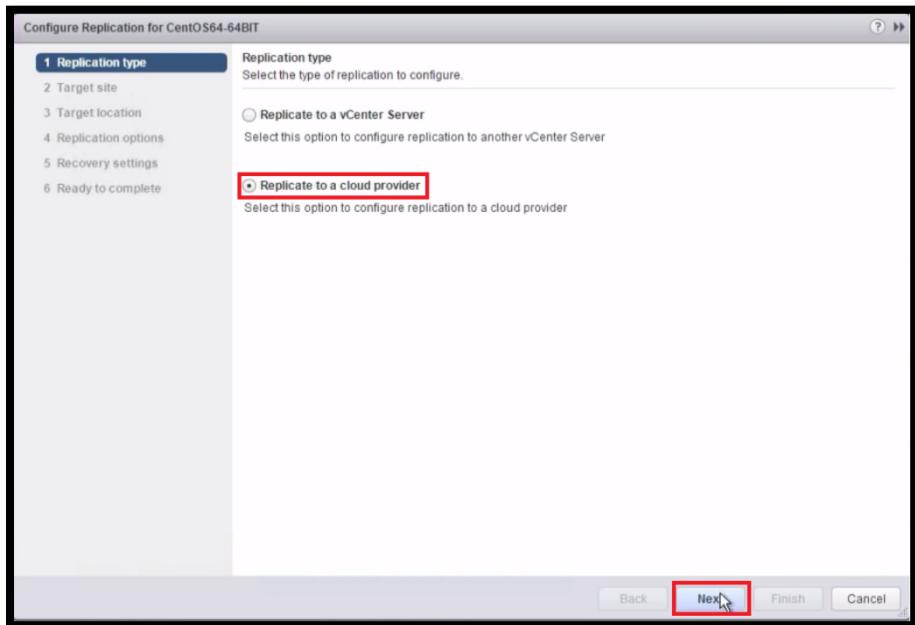


#### 4.1.5 Protect virtual machines

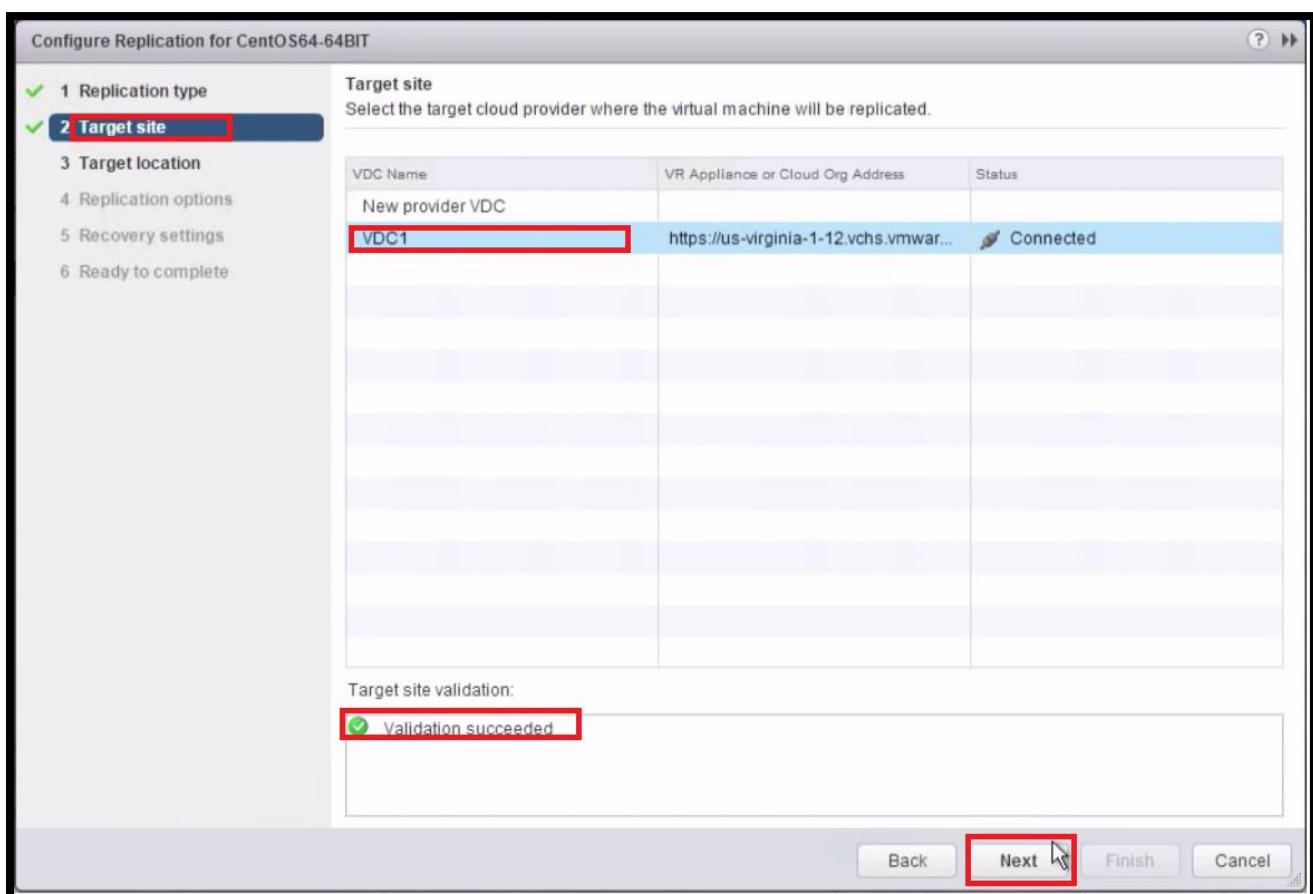
Select Virtual Machine from Left Pane and right click to access menu, scroll down to “all vSphere Replication Actions” and select “Configure Replication”.



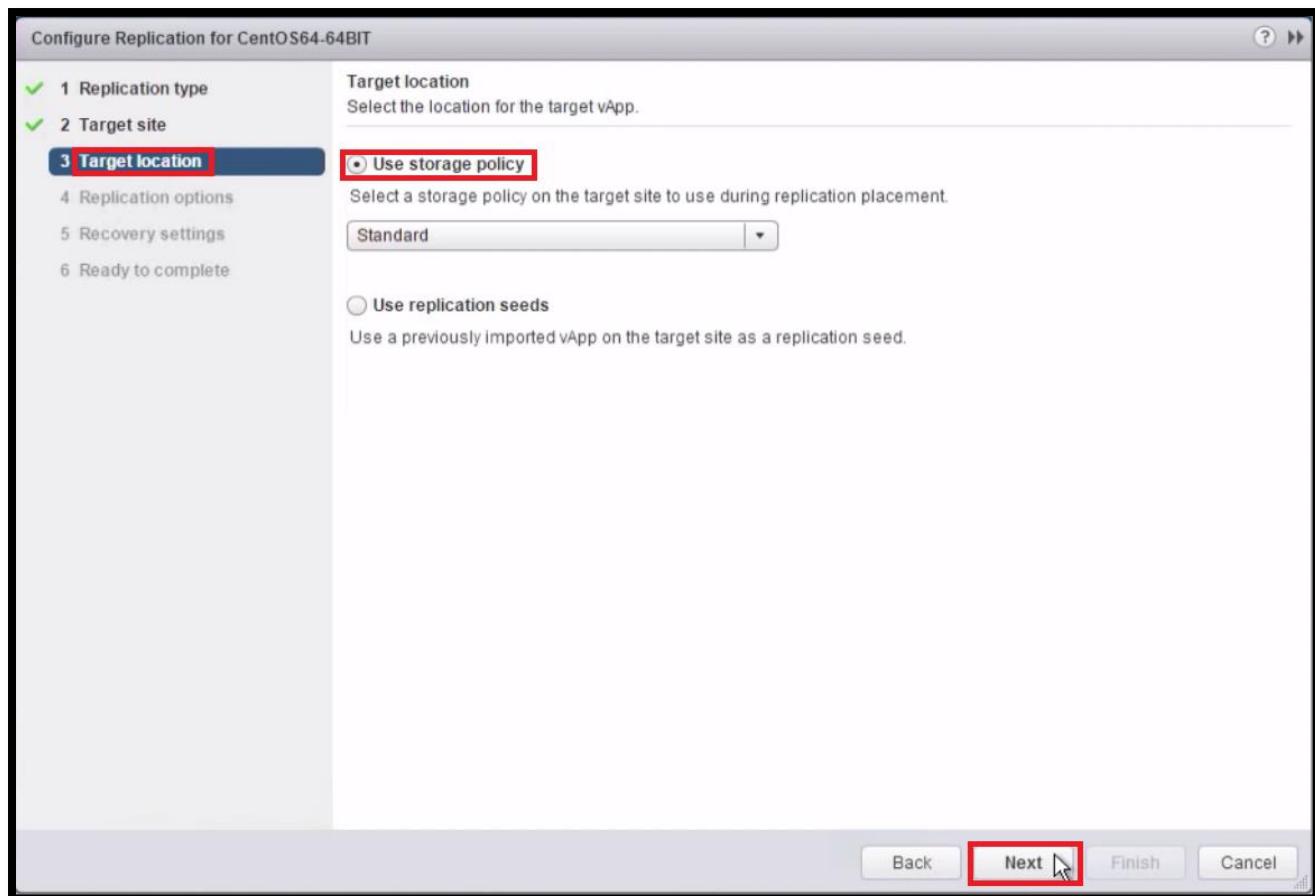
A Wizard will launched, select “Replicate to Cloud provider” and click next



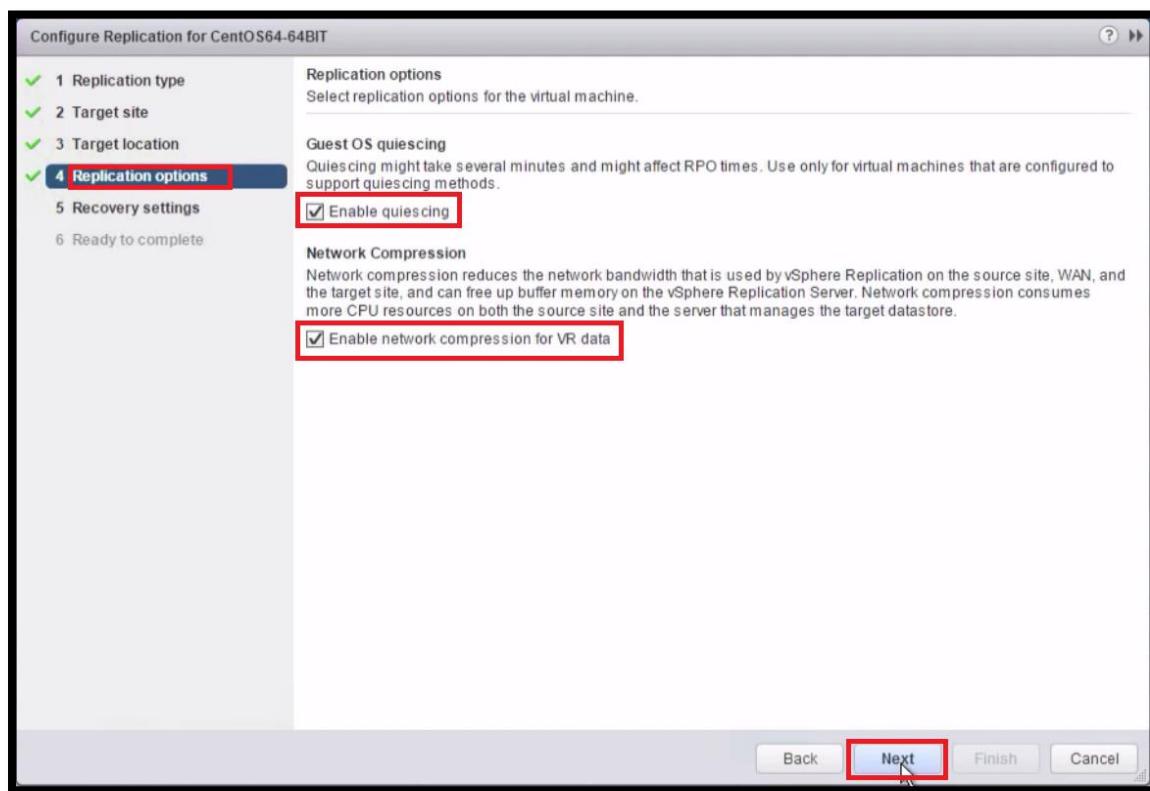
After clicking next, select pre-configured Target Site and Validate.



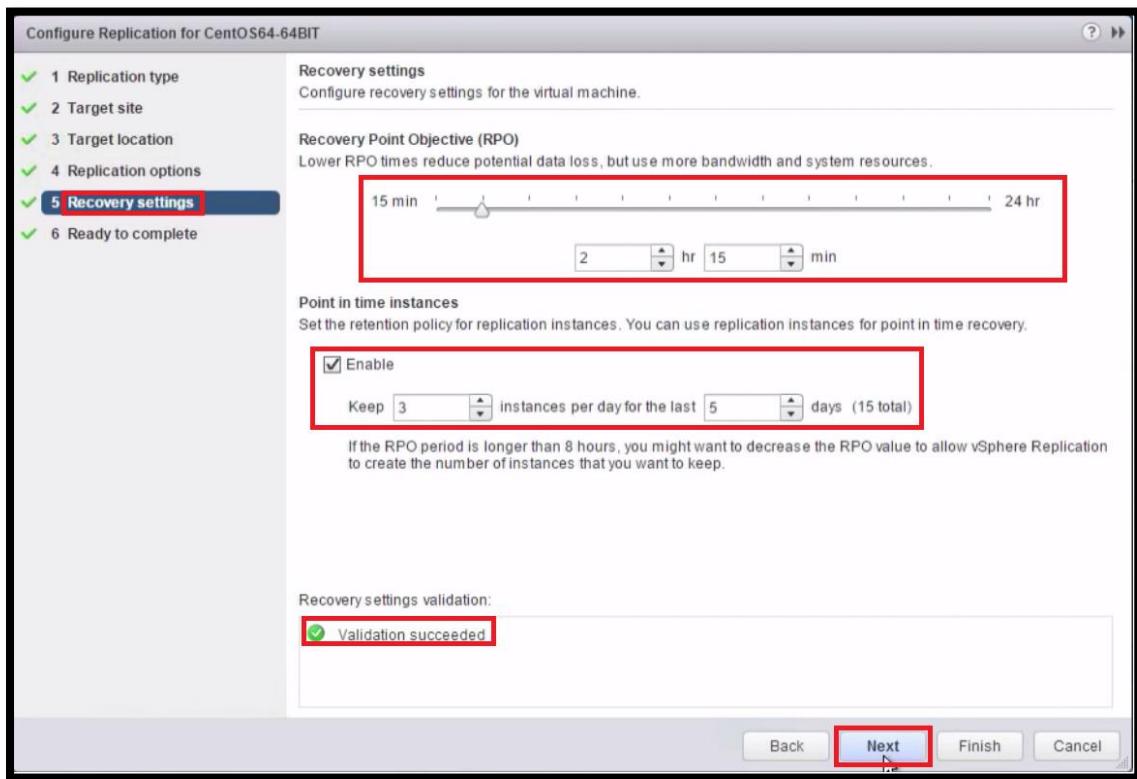
Moving to next stage, select Target Location and click next



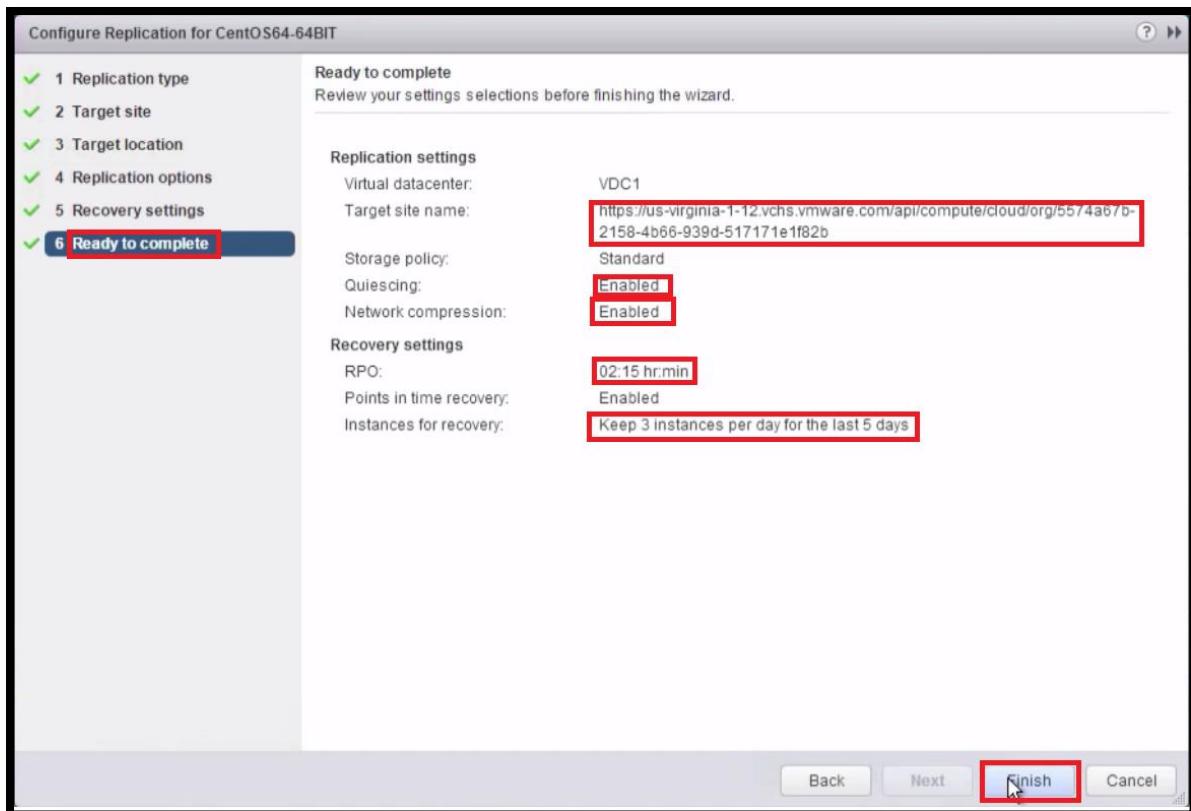
Moving to next step, select replication options, tick check box to enable Network compression and click next. Built-in Network compression is plus to keep away competitors.



Moving to next step, select Recovery setting. You can use slider or drop down to select RPO, whichever suits you best. In addition to this you can also enable up to 24 Point in time instances for protected Virtual Machine (Giving Neck-to-Neck competition to competitors).



Final step is to review summary and hit Finish.



Once submitted, you can check progress of Replication under Monitor Tab.

The screenshot shows the VMware vSphere Web Client interface. In the left sidebar, under 'Virtual Machines', several VMs are listed, including 'ASAv', 'Centos-64 (0fa05c1f-c915...)', 'Centos-64 (...)', 'CentOS64-64BIT', 'dbserver', 'DC', and 'PC1'. The 'vSphere Replication' tab is selected in the top navigation bar. Below it, the 'Outgoing Replications' section shows a table with one item: 'CentOS64-64BIT' with a status of 'Initial Full Sync' to 'VDC1'. The 'Replication Details' panel provides more information about the replication process.

Rinse and repeat for every Virtual machine to be protected using vSphere replication.

You can also configure reverse replication from Galactica DR Cloud to on-premises vSphere environment and can follow similar wizard to finish reverse replication. Once you click finish and initiate full sync you will get a popup message of “successful reverse replication” on vCloud web client

The screenshot shows the VMware vCloud Air web client interface. The 'Incoming Replications' tab is selected. The table displays two entries: 'vmtm\_drtes...' and 'vmtm-DRT...', both of which are in an 'OK' state. A success message box is visible at the bottom right of the screen, stating 'The Disaster Recovery reverse replication configuration completed.'

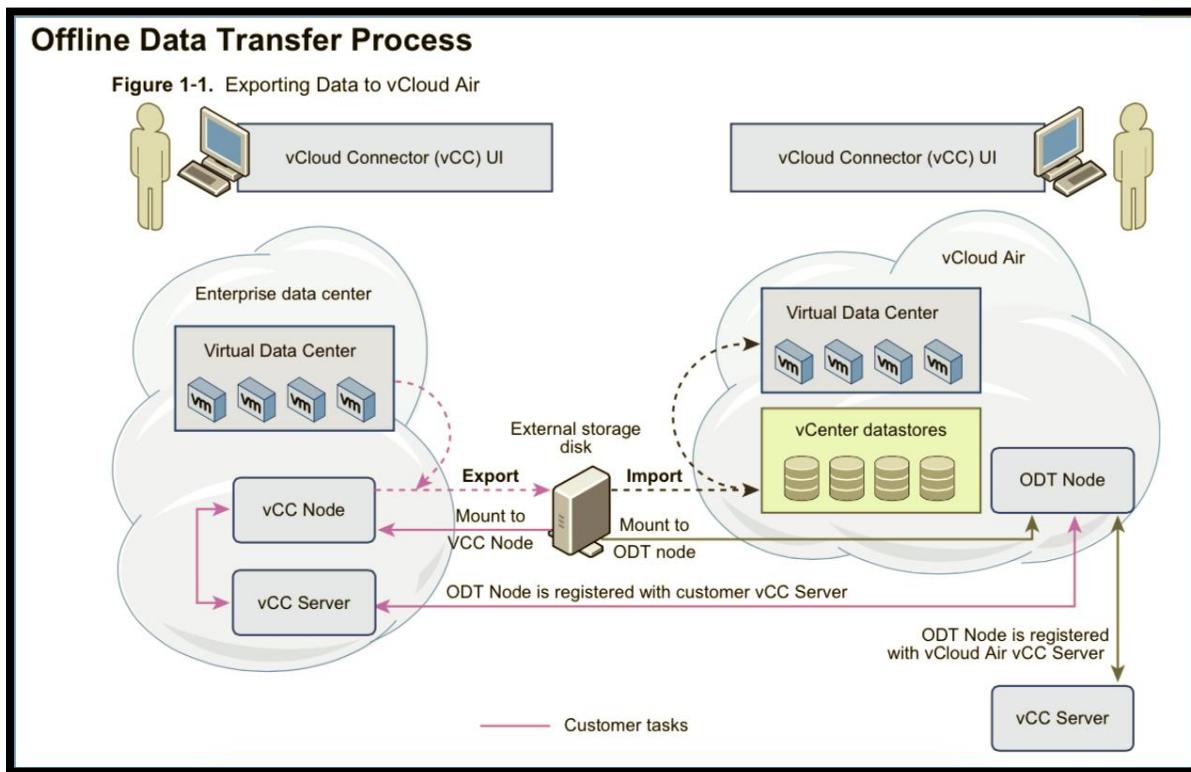
#### 4.1.6 Offline seeding method

We also support initial Offline seeding of Data for VM's with large storage requirements this whole process is secure and encrypts data before writing to External Storage Device. Soyuz Spacecraft can be used for shipping External Storage Device with Data for seeding process. The process is described below-



Customer has to mount the External Storage Disk vCloud connector (vCC) node and export the data that needs to be seeded to DR site and ship it us. Once we receive hard drive in our datacentre, we will mount it

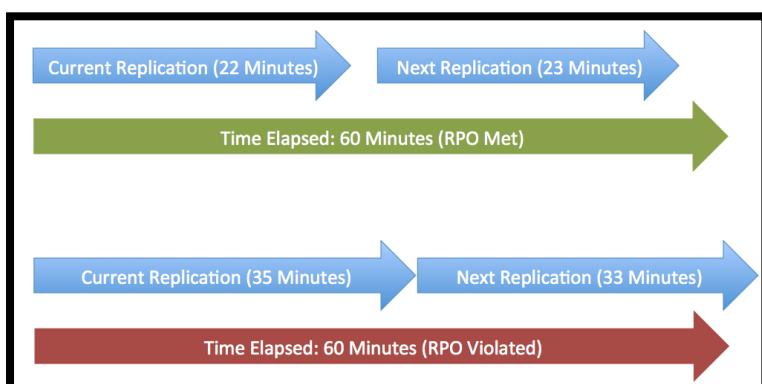
to already registered Offline Data Transfer (ODT) node and inform customer. Customer initiates Import of data to Datastores. ODT are suitable for seeding File Servers data and saves a lot on bandwidth costs.



#### 4.1.7 Review Protection plan – RPO

Once all VM are protected, start reviewing the Last Sync Duration and tweak RPO settings, Lower RPO can lead to choking Direct connect link and may trigger alerts.

To avoid RPO violation, VR attempts to complete a replication cycle in less than half of the configured RPO. Estimated transfer time is calculated averaging the previous 15 delta replications and adding 20% to that average transfer time, as a buffer. To help illustrate this, examples are shown in the diagram below. For both examples, the RPO is configured at 60 minutes. In this example, the current replication takes 22 minutes to complete. Once the current replication is completed, the data at the target will look the same as the data at the source when replication started 22 minutes earlier. As the next replication begins, the restore point of the target continues to age. The next replication takes 23 minutes to complete. When the next replication cycle is finished, the target has newer data and now looks the same as the source did 23 minutes ago. Data replication starts again and the cycle continues. To resolve the RPO violation, more bandwidth should be provided to VR (which should shorten replication time) or the RPO policy should be increased.



Virtual Machine	Status	Target	VR server	Test Status
vmtm-domaintest	Initial Full ...	VDC1	unknown	None
vmtm-DRTEST02	OK	VDC1	unknown	None

**Replication Details**

- Status: OK
- Virtual machine: vmtm-DRTEST02
- Target site: VDC1
- Last instance sync point: 4/2/2015 6:47 AM
- Last sync duration: 39 seconds
- Last sync size: 7.34 MB
- RPO: 15 minutes

#### 4.1.8 Expand/broaden Protection

Add more virtual machines or complete services for protection. Services which are inherently not designed with disaster recovery in mind can also be protected without changing the underlying architecture or code. Galactica's DR solution is based on vCloud Air Disaster RaaS which provides Application Agnostic Disaster recovery solution engineered to protect Virtual Machines.

If you're running two decade old Legacy application or a new-born container application Galactica DR solution supports it all under one umbrella. Galactica DR based on vCloud Air supports most of the OS's available and developers are thriving hard to bring support for newest operating systems as well.

## 5. Initiate Recovery in DR Cloud

Initiate a DR or manual failover is a breeze on Galactica DR. Open Cloud portal on a supported browser like chrome, Mozilla firefox or Internet explorer. Depending on your subscription you will see tabs on your successful logon. Please click on “Disaster Recovery to the Cloud” and you’ll be presented with a nice GUI similar to Site Recovery Manager.

**Disaster Recovery to the Cloud**

Protect and Recover virtual machines using Disaster Recovery

**Virtual Private Cloud OnDemand**

Create virtual machines, and easily scale up or down as your needs change.

**My Subscriptions**

View subscriptions including dedicated clouds, virtual private clouds and disaster recovery clouds.

You can see all protected VM's with their current status under “Virtual Machines” tab.

VMware vCloud® Air™

Home > Disaster Recovery > VDC1 > Virtual Machines

**Virtual Private Cloud OnDemand** in US Virginia 112

Virtual Data Centers + Resource Usage **Virtual Machines** Replication Status Gateways Networks

All

VDC1

New Virtual Machine Test Cleanup Recovery Actions Only Show Disaster Recovery Replicas: Search

Status	Name	Recovery Status	Recovery TL	Owner	CPU	Memory	OS	vApp	Source vCen...
<input type="checkbox"/>	vmtm_D...	Replication in Progress	-	system	1vCPU	1.0 GB	Microsoft Wi...	vmtm_DRTE...	vca01.lab.vch...
<input type="checkbox"/>	vmtm-do...	Replication in Progress	-	system	1vCPU	1.0 GB	Microsoft Wi...	vmtm-domai...	vca01.lab.vch...
<input type="checkbox"/>	vmtm-DR...	Replication in Progress	-	system	1vCPU	1.0 GB	Microsoft Wi...	vmtm-DRTE...	vca01.lab.vch...
<input checked="" type="checkbox"/>	vmtm-DR...	Reverse Replication in Prog...	-	system	1vCPU	1.0 GB	Microsoft Wi...	vmtm-DRTE...	-
<input checked="" type="checkbox"/>	vmtm_dr...	Reverse Replication in Prog...	-	vcapmm@g...	1vCPU	1.0 GB	Red Hat Ent...	vmtm_drt...	-

You can also check progress of replication status under “Replication Status” tab.

VMware vCloud® Air™

Home > Disaster Recovery > VDC1 > Replication Status

**Virtual Private Cloud OnDemand** in US Virginia 112

Virtual Data Centers + Resource Usage Virtual Machines **Replication Status** Gateways Networks

All

VDC1

Remove replication Cloud provider address: https://us-virginia-1-12.vcr Organization Name: 756de263-5621-462f-9c9 Search X

Name	Replication Status	Last Completed	Duration	Size	RPO
vmtm_DRTEST04	Initial Full Sync	--	--	--	15 minutes
vmtm-domaintest	Initial Full Sync	--	--	--	15 minutes
<input checked="" type="checkbox"/> vmtm-DRTEST02	Success	Thu Apr 02 2015 07:45:48 GMT-0700 (Pacific Daylight Time)	00:00:41	4.9 MB	15 minutes
vmtm-DRTEST01	Success	--	--	--	15 minutes
vmtm_drttest05	Success	--	--	--	15 minutes

You can initiate recovery of VM's from “Virtual Machines” Tab, once you click recovery button a popup will appear.

VMware vCloud® Air™

Home > Disaster Recovery > All > Virtual Machines

**Virtual Private Cloud OnDemand** in US Virgin 112

Virtual Data Centers + Resource Usage Virtual Machines Replication Status Gateways Networks

All

VDC1

New Virtual Machine Test Cleanup Recovery Actions Only Show Disaster Recovery Replicas: Search

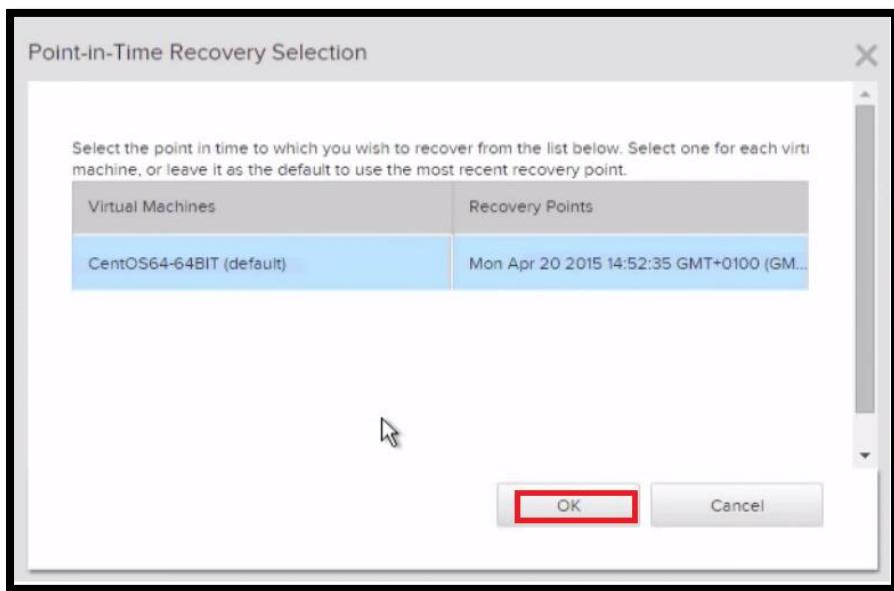
Status	Name	Recovery	Memory	OS
<input type="checkbox"/>	T6-Win-Scale-02	-	2 MB	Microsoft Windo...
<input checked="" type="checkbox"/>	CentOS64-64BIT	Replic...	0 GB	CentOS 4/5/6/7
<input type="checkbox"/>	T6-Win-Scale-01	-	0 GB	Microsoft Windo...
<input type="checkbox"/>	SmallTools	Replic...	6 MB	Debian GNU/Lin...
<input type="checkbox"/>	T6-Win-Scale-05	-	2 MB	Microsoft Windo...
<input type="checkbox"/>	Ubuntu1404	Recover...	0 GB	Ubuntu Linux (32-bit)
<input type="checkbox"/>	DSL-1	Replic...	6 MB	Other 2.6.x Linu...
<input checked="" type="checkbox"/>	T6-Win-Scale-03	-	system	1vCPU 512 MB Microsoft Windo...

Recovery

You are requesting that CentOS64-64BIT be recovered.  
Are you sure you want to recover the virtual machine?

Yes No

Click yes to proceed and you'll be presented by a pop-up asking for Point-in-time recovery selection.



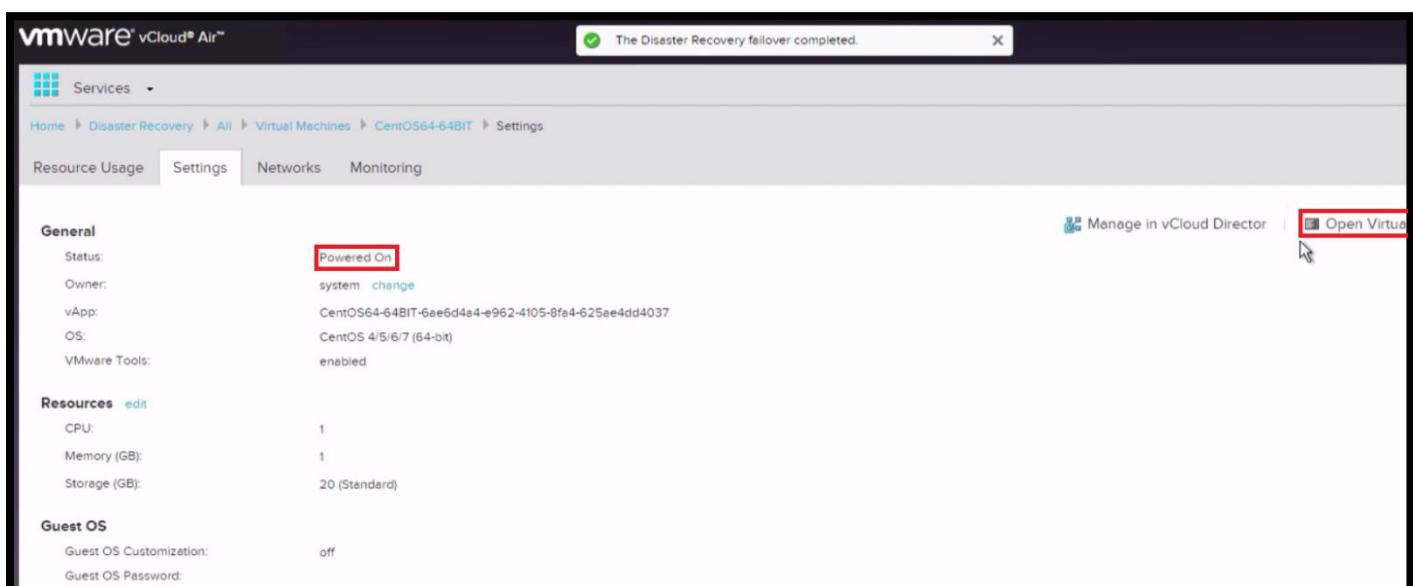
A Confirmation pop-up will be displayed, stating DR Failover process initiated.



Once Process finishes, status of Protected Virtual Machine changes to "Recovered".



Power-on Recovered Virtual Machine and click on its name to open "Settings" page



Once Protected VM is recovered on DR cloud, same status will be reflected on vSphere Web client. Click on Oval icon before full sync icon to initiate reverse replication of VM if required.

The screenshot shows the VMware vSphere Web Client interface. The top navigation bar includes 'Getting Started', 'Summary', 'Monitor' (which is highlighted with a red box), 'Manage', and 'Related Objects'. Below this, a sub-navigation bar has tabs for 'Issues', 'Log Browser', 'Service Health', 'Tasks', 'Events', 'System Logs', and 'vSphere Replication' (also highlighted with a red box). On the left, a 'Navigator' pane shows 'Top Level Objects' like Datacenters, Clusters, Hosts, and Virtual Machines (which is also highlighted with a red box). The main content area displays 'Outgoing Replications' and 'Incoming Replications' sections. Under 'Incoming Replications', there is one entry for 'CentOS64-64BIT' with a status of 'Recovered' (highlighted with a red box). A 'Filter' dropdown is visible on the right.

Summary screen will appear with information of reverse replication.

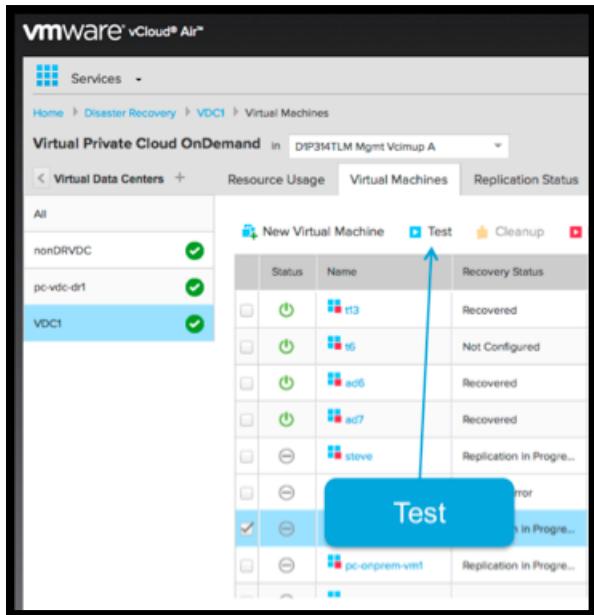
This screenshot shows a configuration dialog for a VM named 'CentOS64-64BIT'. The title bar says 'VM "CentOS64-64BIT" - Reverse Replication'. At the top, there is a warning message: '⚠ The existing VM on target site will become inaccessible when replication is reversed.' (highlighted with a red box). The dialog is divided into sections: 'General' (highlighted with a red box) and 'VM 'CentOS64-64BIT''. The 'General' section contains fields for 'Source site' (highlighted with a red box) and 'Target site'. The 'VM 'CentOS64-64BIT'' section contains fields for 'Source VM', 'VM Storage Policy', 'Target location', 'Quiescing', 'Network compression', 'RPO', and 'Points in time recovery'. At the bottom right are 'OK' and 'Cancel' buttons (highlighted with a red box).

Progress of reverse replication can be monitored under “Incoming replication” section

This screenshot shows the 'vSphere Replication' tab in the 'Monitor' section of the vSphere Web Client. The 'Incoming Replications' section is highlighted with a red box. It lists a single entry for 'CentOS64-64BIT' with a status of 'Initial Full Sync' (highlighted with a red box). The 'Source' is listed as 'VDC1'. A 'VR server' column shows 'VR-appliance' and a 'Test Status' column shows 'None'. A 'Filter' dropdown is at the top right. In the bottom right corner, a 'Data Transfer Details' window is open, showing 'Checksum compared: 1.08 GB of 20.00 GB' and 'Transferred: 40.00 KB of 40.00 KB'. The 'Status' field in the main table is also highlighted with a red box.

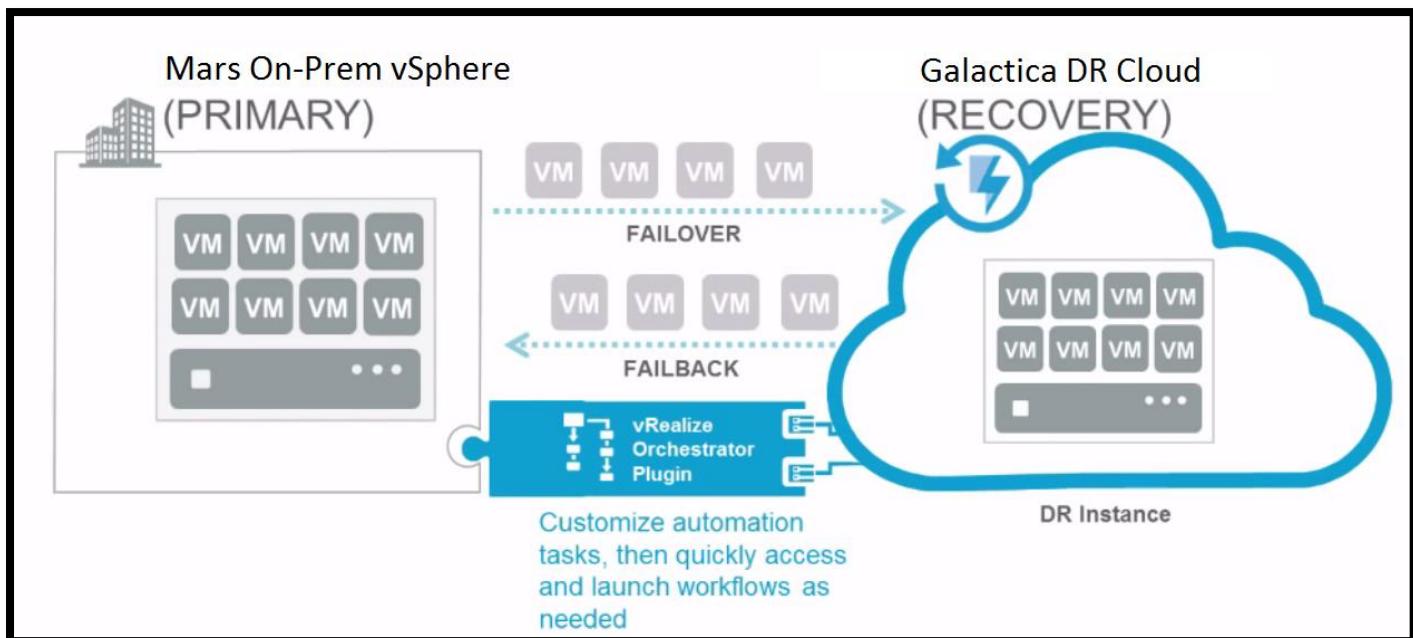
## 6. Initiate DR Test

Galactica DR includes 7-day run-time per DR Test and 30 days of recovered VM run-time. Initiating a DR test is almost similar to recovery. GUI operation is almost similar to initiating a Recovery Process.



## 7. Automate DR with vRealize Orchestrator

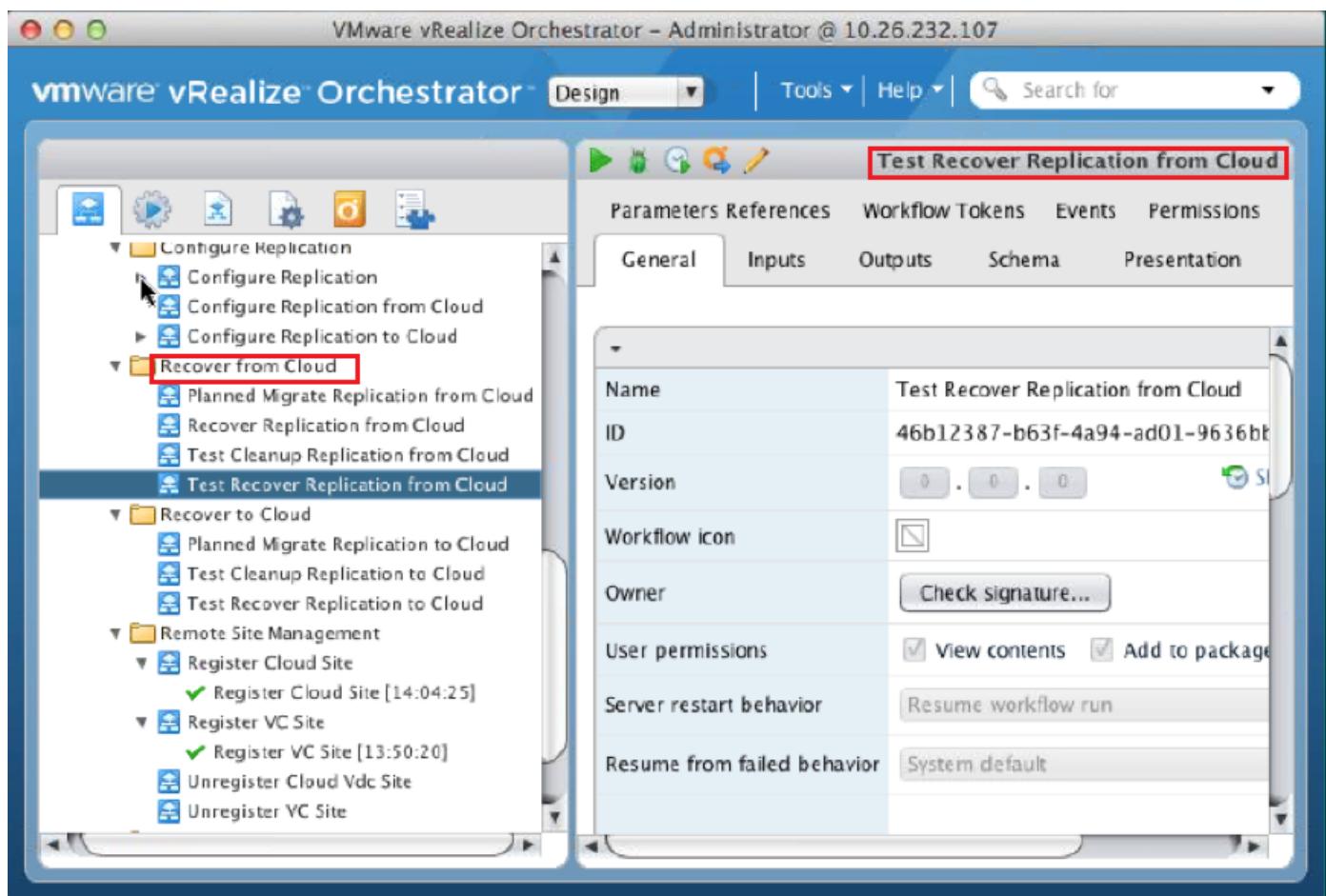
Galactica DR supports vRealize Orchestrator to automate failover and failback operations for one-click functionality. You can customize automation tasks and then quickly access and execute workflows as when required. Workflows for disaster recovery are created and being tested regularly (half yearly), in case of a disaster you just need to run the workflow from vRealize orchestrator web interface.



With just a few clicks you can create workflows to perform a number of tasks, including:

- Configure replication to the cloud
- Configure replication from the cloud
- Register cloud site
- Initiate planned migration to cloud
- Test recover to cloud
- Test clean up

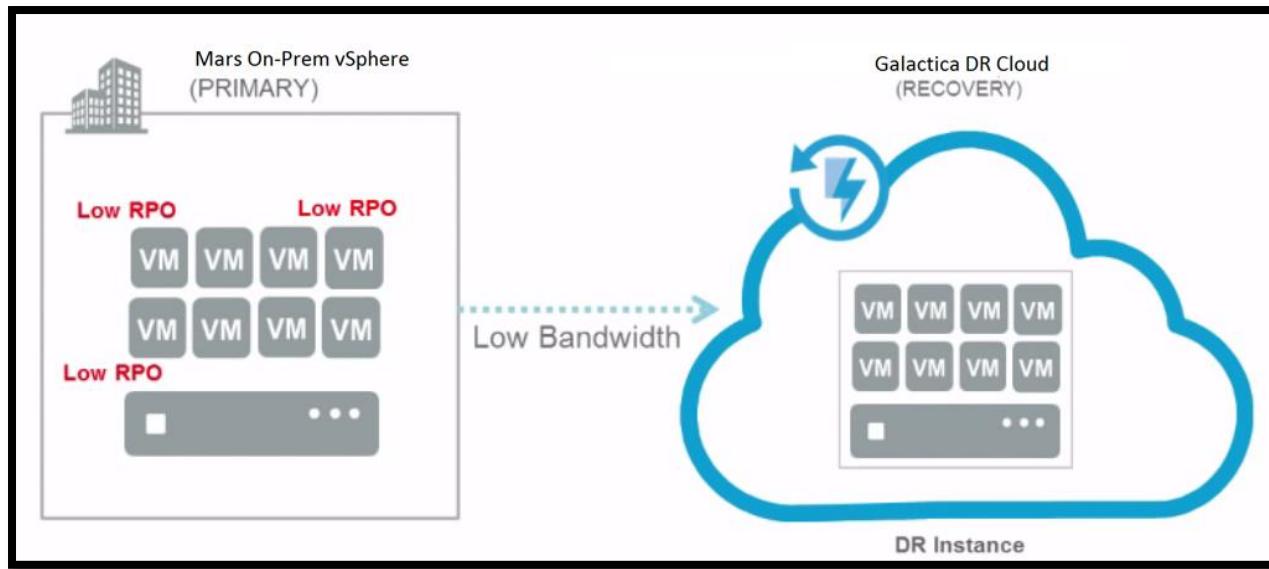
vRealize Orchestrator allows you to build a fully automated end-to-end disaster recovery solution in the cloud. vRealize Orchestrator is a very powerful, free product supplied with vCenter. You can deploy vRealize Orchestrator from Utility share on file server. It comes as an OVF appliance and can be deployed in the cloud. Leverage the full capabilities without needing a vCenter running on-premises.



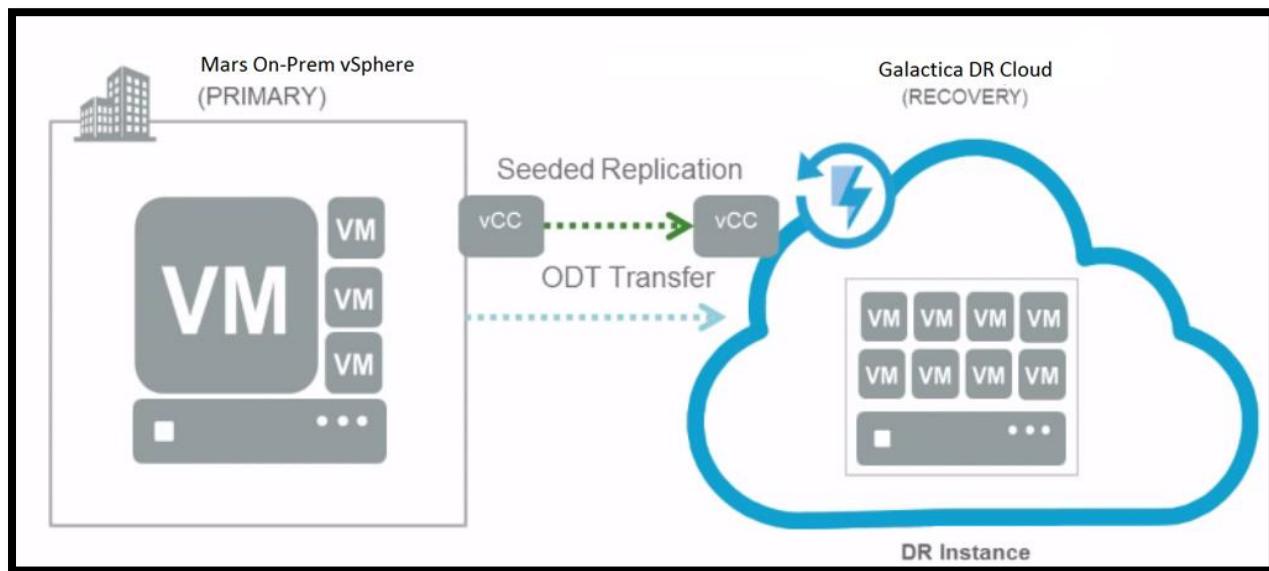
## 8. Challenges

When designing Disaster recovery solution for Mars on-premises VSphere, there are some challenges want to highlight like-

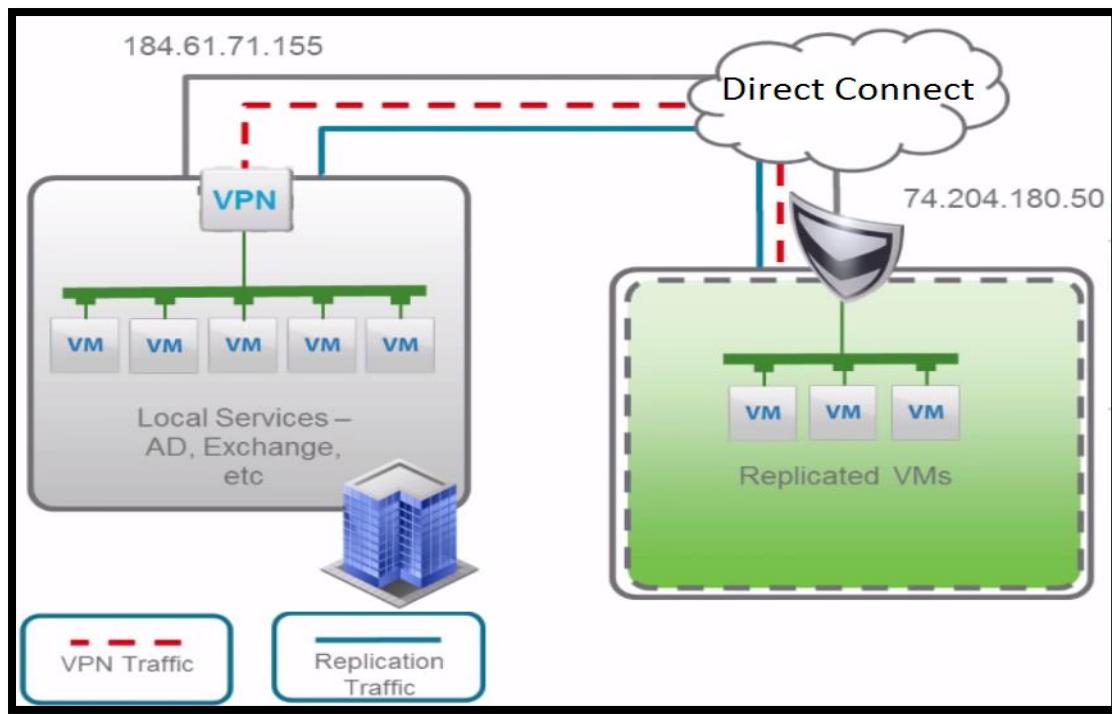
**Bandwidth**-If Some-one sets up lower RPO for multiple VM's then there is a possibility of replication being failed and errors of RPO violation. To resolve the RPO violation, more bandwidth should be provided to VR (which should shorten replication time) or the RPO policy should be increased.



**Virtual Machine Size-** File server VM's has extremely large storage of 15 TB each, and bandwidth is not that great. The time it will take for vsphere replication to create the first full sync, replication could be too long that vsphere replication couldn't catch-up. Vsphere replication will always try to catch-up the complete sync but won't finish within time. So Offline seeding of data is a turnkey solution from Galactica DR.



**Network Setup-** Need to think about network setup like how to setup Networking in DR environment for replicating your own on-premises environment like VPN or Direct Connect or it could be something completely different e.g. Advanced Laser communication .



**Application Type-**Applications like Mail servers are not the best to be protected using Host based replication technology because it doesn't understand or care about what workload is running inside it. Applications like Active Directory or Ms Exchange comes with built-in replication like AD's site-to-site replication. So create architecture to replicate to a hot site which runs continually.

#### Site 1 (Off prem Cloud)

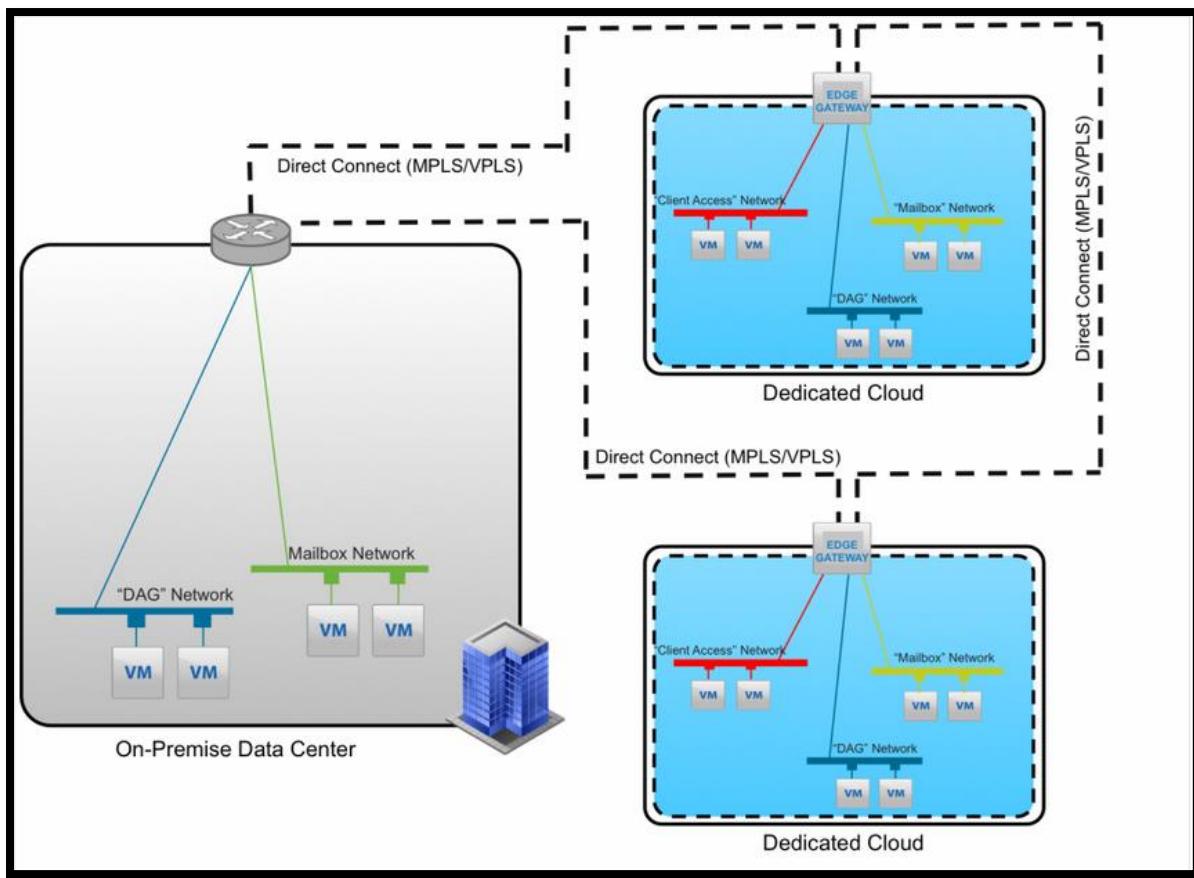
- Provision multiple Client Access Servers
- Provision multiple DAG servers
- Provision multiple Mailbox Servers

#### Site 2 (Off prem Cloud)

- Provision multiple Client Access Servers
- Provision multiple DAG servers
- Provision multiple Mailbox Servers

#### Site 3 (On prem Datacenter)

- Provision multiple DAG servers
- Provision multiple Mailbox Servers



## 9. RPO/RTO for Protected VM's

RPO/RTO is selected based on the VM's impact on the Mars human colony.

Qty	VM Role	vCPU	vRAM	Storage	VM's Impact on Mars human Colony	RPO	RTO
2	Microsoft Exchange Front-end Server	4	12 GB	150 GB	High	15 Min	30 Min
3	Microsoft Exchange Mailbox Server	4	12 GB	300 GB	High	15 Min	30 Min
15	IIS/MSSQL Based Web App	2	8 GB	150 GB	Medium	60 Min	2 Hour
5	File Server	2	12 GB	15 TB ( 10 % utilize)	Medium	2 Hour	4 Hour
3	MariaDB Cluster	1	4 GB	300 GB	Low	4 Hour	8 Hour
2	Legacy Win NT 4 with IBM DB2	1	4 GB	36 GB	Low	4 Hour	6 Hour
15	CoreOS to support Docker	4	12 GB	72 GB	Negligible	8 Hour	10 Hour

RPO RTO decision maker	
High	<pre> graph LR     A[Microsoft Exchange Front End Server] --&gt; B[Microsoft Exchange Mailbox Server]     style A fill:#fff,stroke:#000,stroke-width:1px     style B fill:#fff,stroke:#000,stroke-width:1px     </pre> <p>Mailing system is preferred medium of communication</p>
Medium	<pre> graph LR     A[IIS/MSSQL Based Web App]     B[File Server]     </pre> <p>These are used for SPA and storing entertainment content</p>
Low	<pre> graph LR     A[MariaDB Cluster Node] --&gt; B[MariaDB Cluster Node]     B --&gt; C[MariaDB Cluster Node]     </pre> <p>These stores legacy DB's for gathering Identity and health care data, DB's kept as read-only</p> <p>Legacy Win NT 4 with IBM DB2</p>
Negligible	<pre> graph LR     A[CoreOS to support Docker]     </pre> <p>Developers use Docker container for development</p>

## 10. References

1. Daemon Behr's season 2 challenge 2 submission document
2. Blog.vmware.com
3. Hol.vmware.com
4. Vmfocus.com
5. Slideshare.com

## 11. Definitions

vSphere Replication Appliance- A special version of vSphere Replication is used to copy virtual machines between location, and make that copy available for restoration using the vSphere Web Client.

vCloud Connector- vCloud Connector provides a single user interface for viewing private and public clouds and transferring content between them

Test Recovery- vCloud Air Disaster Recovery service provides the ability to perform test recoveries for 7-day run time.

Failover- When you recover a virtual machine from your source site to vCloud Air, the production state of the virtual machine represents a point in time before the outage. Data accumulated after the last replication to vCloud Air and before the recovery is not available.

Fallback- Fallback of virtual machines that have been recovered in vCloud Air is performed using vCloud Connector.