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Get Ready for the Challenge of your Life
VIRTUAL DESIGN MASTER
Public Cloud on Red Planet a.k.a Mars
Monday July 13th at 11 AM Eastern Time
Virtual Design Master is an online reality show challenging virtualization professionals to come up with innovative infrastructure designs.

Virtual Design Master
Challenge 2

Prepared for: VirtualDesignMaster.com
Prepared by: Harshvardhan Gupta
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I Want to Build a Public Cloud on Red Planet to for hosting ENV. Infra
Do you take this challenge
You're the one to Save humanity
VDM003
Yes, I was waiting for this
Hold My Hands and i'll transfer my thoughts.
..Public Cloud must be efficient, low cost
now
let's think outside the box, and inside the clouds. To design an environment to meet our needs using any existing public cloud infrastructure to run it on top of.

SYNOPSIS

We've examined how we can rebuild infrastructure from scratch, but now let's think outside the box, and inside the clouds. Before the zombie apocalypse began, many organizations were beginning to leverage public cloud infrastructures for a number of reasons. Some were using it for burst capacity, others for development and test. Some start-ups even used public cloud for everything! Our billionaire philanthropist from Season 1 is a huge fan of public cloud, and was one of the early adopters. HIs task for you now is to design an environment to meet our needs using any existing public cloud infrastructure to run it on top of. Be sure to let him know why you picked this particular public cloud infrastructure, as if he's going to re-create it on Mars, he wants to make sure he's making the best choice. Now for the fun part. We talked about a number of business critical applications in the first challenge. You must deploy one web application (think the time tracking application for the botanists in the greenhouses) and one business critical enterprise application (think life support systems) inside the public cloud infrastructure. As part of your design, you must state what the application requirements you are using are. Remember to think about things like performance, capacity, latency, and high availability. In this case, complexity can be your enemy, but the details can be your friend. Besides your overall design, you will also be judged on the application requirements you develop.

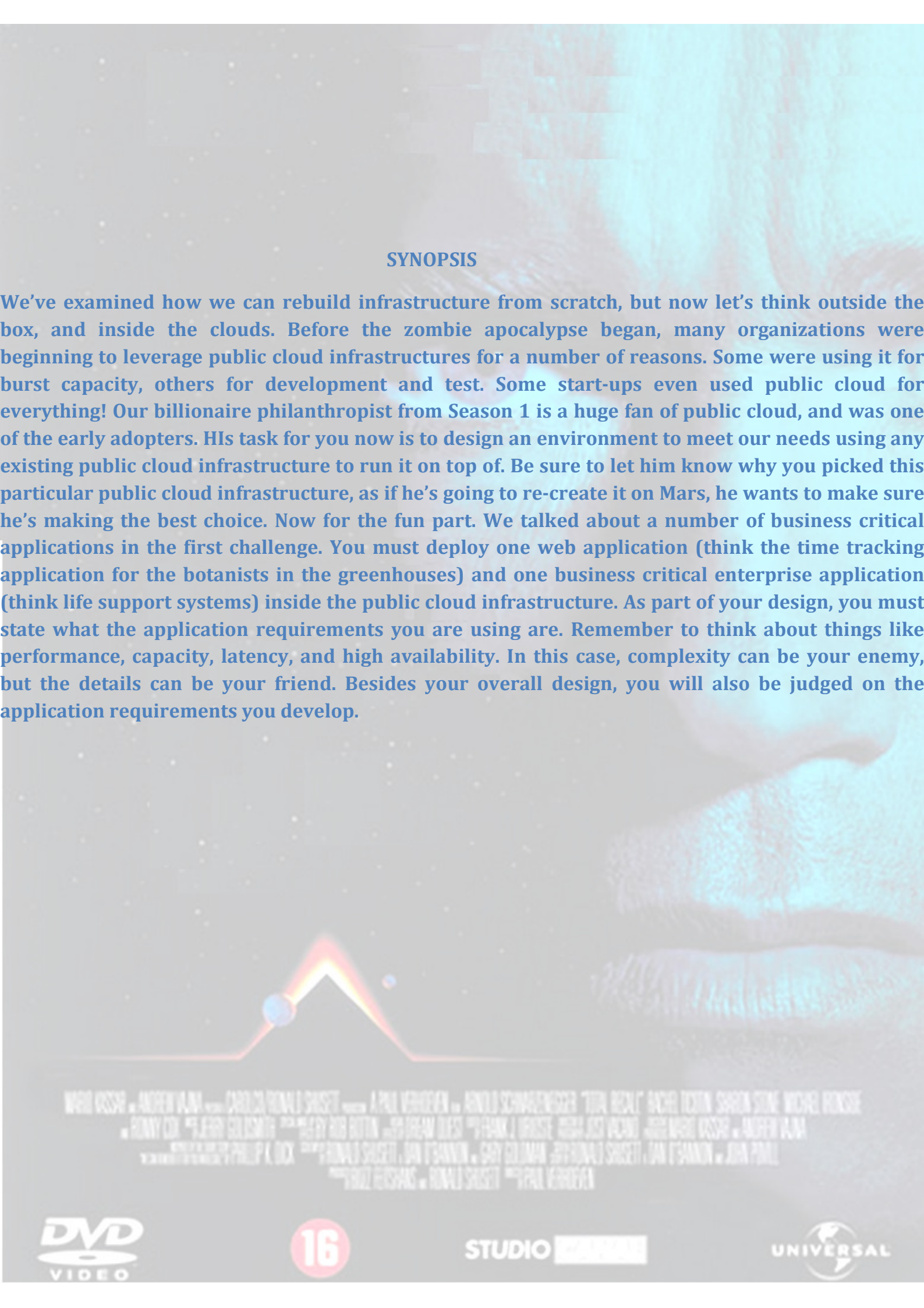


Table of Contents

1. Overview

Millionaire philanthropist sent me back in time on earth before zombie outbreak happen to evaluate public cloud providers and comeback with a plan for replicating same infrastructure here on Mars, definitely with some tweaks.

2. Requirements

The Permanent IT infrastructure strategy for Mars is to move the services and data repositories that are currently delivered out of Temporary datacentre located in Human Pods to Public Cloud.

The IT approach for this Public Cloud facility is to have a replica of best available Public cloud Provider Company operating from Earth before zombie apocalypse.

1. Create a replica of Public Cloud Provider here in Mars

2. Host/Deploy one web application i.e. time tracking application for the botanists in the Greenhouses.

3. And, one business critical enterprise application i.e. life support systems inside the public cloud infrastructure.

4. Applications must be highly available, lower latency and performance are utmost important.

3. Constraints

Major Cloud related Constraints depends upon the choice of public cloud provider chosen for re-built in mars.

One Web Application and One Business critical enterprise application must be deployable on the public cloud provider of your choice.

4. Risks

Major risks are Replacement parts for maintaining large public cloud infrastructure and trained staff for day-to-day operations.

Unavailability of Experienced Data centre architects for designing DC on Mars. So we leverage Open Compute project design specification.

5. Assumptions

There will be two Availability zones on Mars for hosting public cloud infrastructure and both are connected with high capacity intranet/internet link for inter-DC replication.

Sufficient Compute, Networking and Storage h/w is available to build a public cloud infrastructure.

Sufficient cooling and power sources for keeping the facility up and running 24x7x365 (this may vary due measurement of time on mars).

6. Public Cloud infrastructure of choice

We choose VMware vCloud Air as our preferred choice for building public cloud on Mars.

Pros-

1. New born cloud infrastructure with latest compute/networking and storage gear.
2. No use of secret/proprietary stuff, like other cloud providers do (AWS/Azure).
3. VMware eats his own dog food this time, vCloud Air offering runs above same technology i.e. ESXi hypervisor/vCloud Director etc.
4. Two models only i.e. Dedicated and Virtual private.
5. No need to reinvent the wheel, existing VM's can be migrated to public cloud with the use of vCloud connector appliance.
6. No need to re-architect existing applications to make them suitable for public cloud.
7. Automation/orchestration tools built around it vCAC/vRealize and can leverage existing automation techniques being used in temporary Datacenters.
8. Seem less migration from existing infra to public cloud and vice versa.
9. Work load can be balanced between on-premises and cloud infrastructure as 'n' when required.
10. No need to learn new skills, easy to use web interface for day-to-day administration.
11. Petting VM's can be easy, rather than treating them as cattle's (on AWS/Openstack).
12. High Performance Hardware, Sophisticated Resource Management and Careful Management of Capacity are inherent on vCloud Air.
13. vCloud Air 35% Cheaper Than Azure and 83% Cheaper Than AWS.
14. vCloud API for faster integration and development of applications on vCloud Air.
15. vCloud Air disaster recovery for taming rough circumstances on Mars like solarwinds/dust storms etc.

Cons-

1. One of the limitations with vCD, and hence this service, is that you can't define anti-affinity rules (where a master and slave server are guaranteed to be on different physical hosts).

2. Didn't find anything else negative about it.

7. H/W Specs of choice for Public Cloud infrastructure

We choose Open Compute Project as our preferred choice for hardware (Compute/Storage/Networking) on Mars. To keep tap on costly resources like space, cooling and power.

1. Server Technology
   a. Server Design- The high availability (HA) server leverages the Intel Motherboard Hardware Specification v2.0. Instead of accommodating two server motherboard trays with one shared PSU, it accommodates one server motherboard tray with one PSU tray holding two PSUs.

   b. Open Vault (Storage) - The Open Vault is a simple and cost-effective storage solution with a modular I/O topology that's built for the Open Rack. The Open Vault offers high disk densities, holding 30 drives in a 2U chassis, and can operate with almost any host server. Its innovative, expandable design puts serviceability first, with easy drive replacement no matter the mounting height.

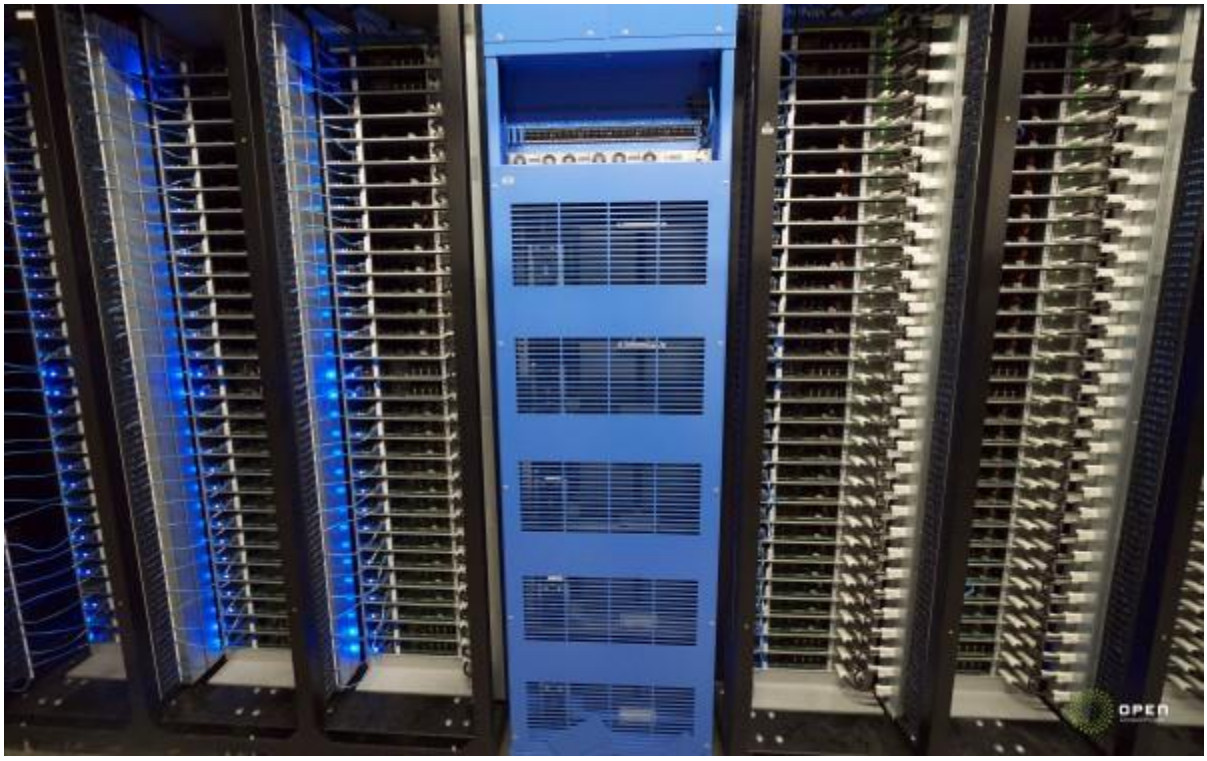
c. Hardware Management (out-band management)

d. Power Supply- The OCP 700W-SH AC/DC power converter, a single voltage 12.5Vdc, closed frame, self-cooled power supply used in high efficiency IT applications. The supply is configurable to a 450W-SH power rating (like the Open Compute Project 450W power supply), as both models use the same PCBs, with just pin-to-pin component replacements.

e. Chassis- The Open Compute Project chassis is designed to accommodate the other components in a server, including the custom motherboard and power supply. Overall it is vanity free, has no sharp corners and is designed for easy servicing. It is completely screw-less, uses quick release components such that the motherboard snaps into place with a series of mounting holes, and the hard drives use snap-in rails to slide into the drive bay.

2. Data Center Technology
   a. Networking- Switch Specifications:
      48x10G SFP+ and 4x40G QSFP+
      1 RJ-45 Out-of-band Management Port (10/100/1000M)
      1 Console port
      1+1 Hot-Swappable PSU
      ONIE Supported Boot Loader

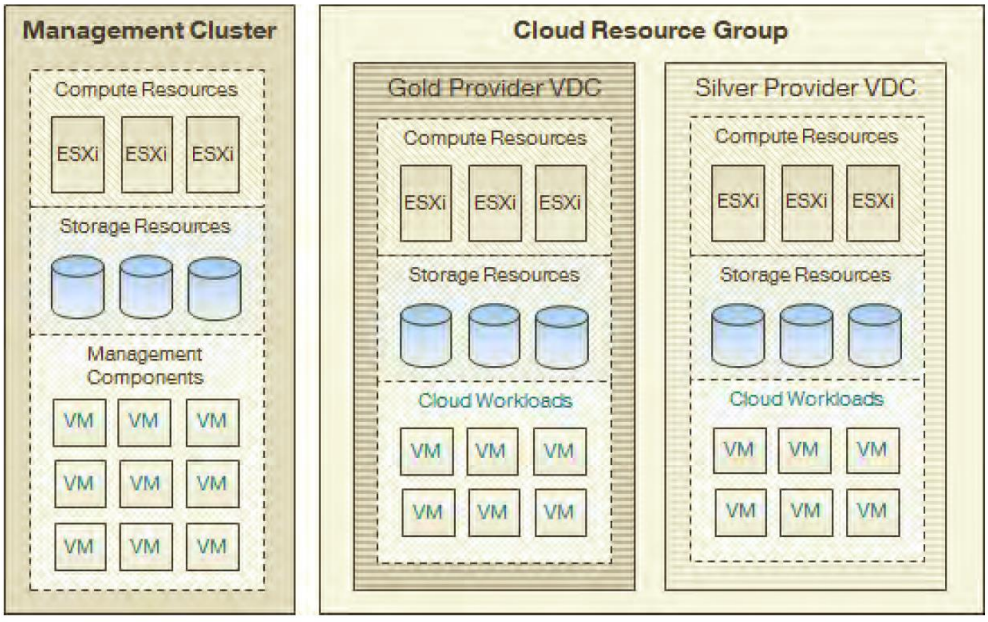
   b. Open Rack
   c. Battery Cabinet - The battery cabinet is a standalone independent cabinet that provides backup power at 48 volt DC nominal to a pair of triplet racks in the event of an AC outage in the data center. The batteries are a sealed 12.5 volt DC nominal, high-rate discharge type with a 10 year lifespan, commonly used in UPS systems, connected in a series of four elements for each group (called a string), for a nominal string voltage of 48VDC. There are five strings in parallel in the cabinet.



d. Data Center Electrical
e. Data Center Mechanical
f. Data Center

8. Logical diagram for Public Cloud

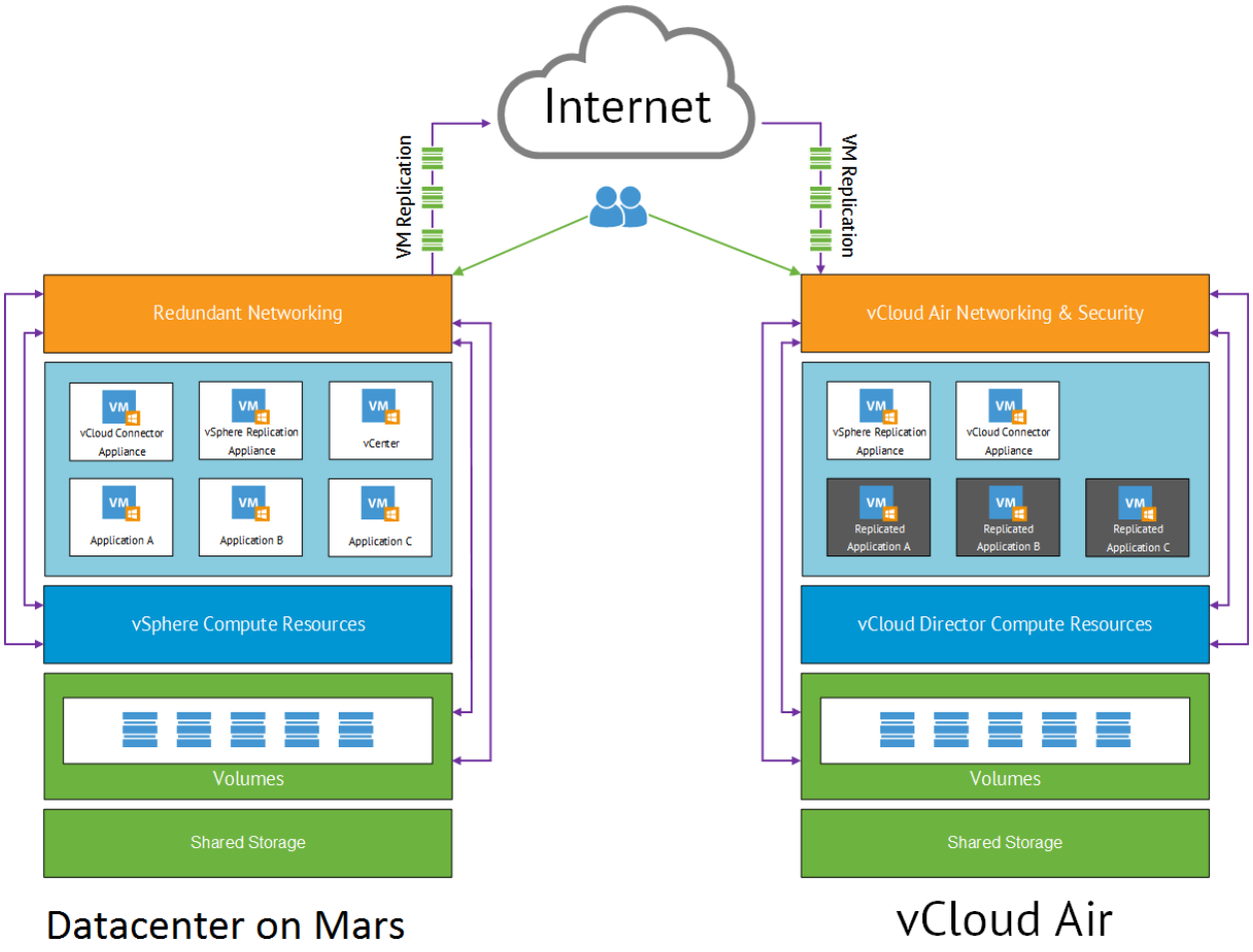
Public cloud will be based on vCloud Air, which relies upon vCloud Director.



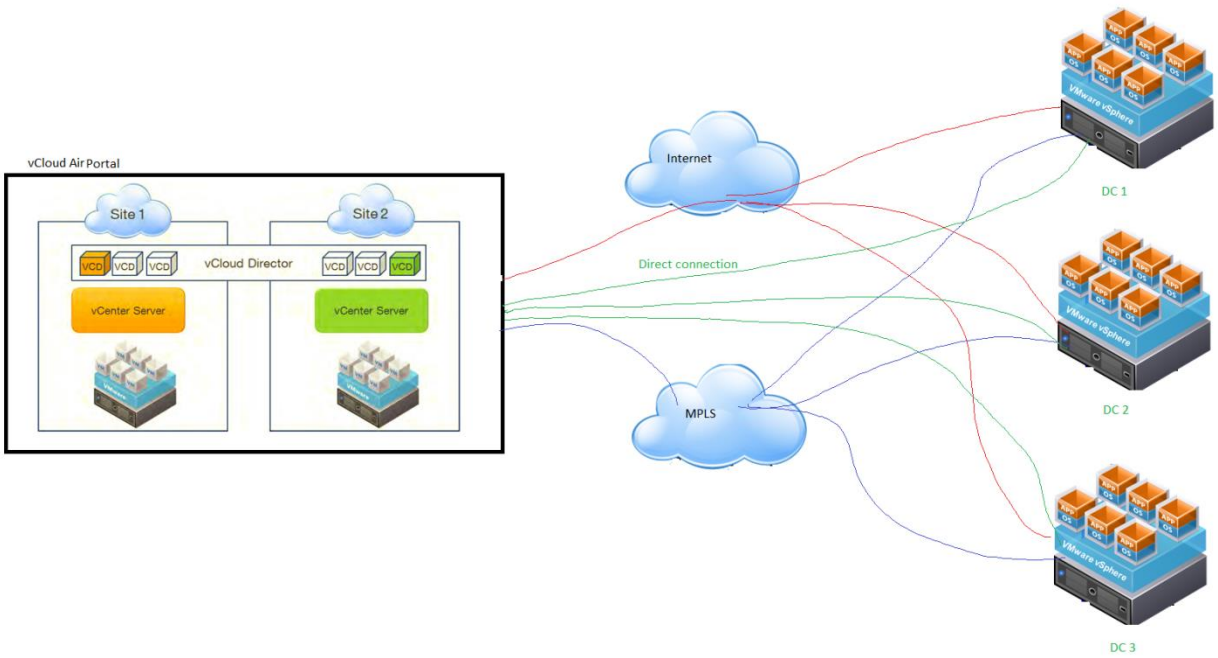
Management Cluster for hosting core components of VMware vSphere, vCloud Director and vRealize. This cluster will also host customized portal for easy consumption of Cloud resources.

Cloud resource groups provide resources for end-user consumption on Mars.

Disaster Recovery consideration-



Multisite consideration-



NOTE:
Each Site/datacenter will be setup with the same configuration to provide simplicity through standardization.

For brevity only one availability zone layout is shown above unless specifically mentioned.

9. Application Architecture

1. **Web Application-Time Tracking for the Botanists in Greenhouses-**
   Botanists are still studying environment and their adverse effect on plantation. They require a time tracking application to monitor the growth of plantations in greenhouses, our only source of green vegetables and vital nutrients required for steady growth of human beings. Time tracking is a very cumbersome job and requires high precision and concentration. Web interface provides a single pane of glass for all aspects of time tracking application and for number crunching huge data public cloud suites best. This application is designed with Disaster recovery in mind, as this vital information will keep botanists to keep progressing on their research work without any hassle.

Availability Requirements-

Web and SQL server components must be highly available.

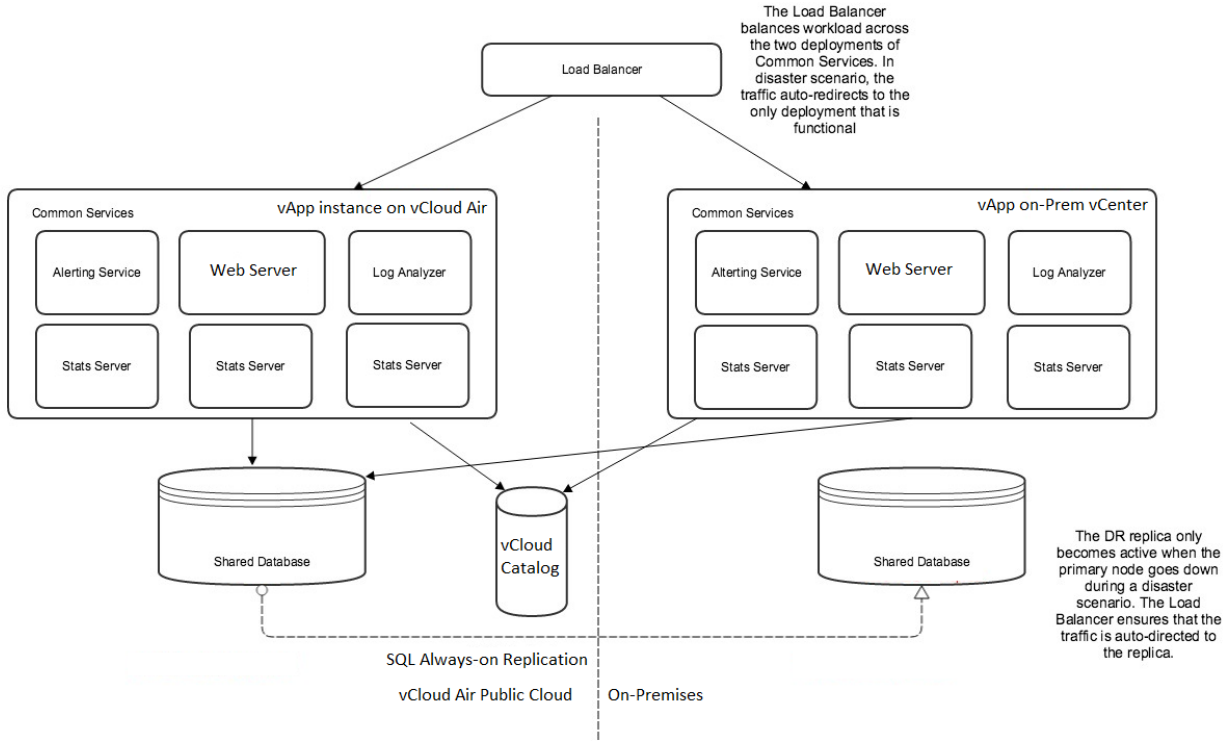
Latency Requirements-

Latency between database servers must be low, i.e. within permissible limit.

Capacity- Each vApp can support one Greenhouse. We are also planning to create a centralized command center for monitoring greenhouses on mars like life support system.

Compute Requirements-

	CPU	RAM	Storage
Web Server	4vCPU	16 GB	150 GB
SQL Server with Always-on	4vCPU	24 GB	500 GB
Stats Server	2vCPU	8 GB	150 GB
Alerting service server	2vCPU	8 GB	150 GB
Log Analyzer	2vCPU	8 GB	150 GB
Load Balancer appliance	4vCPU	16 GB	72 GB



The components that make up Common Services include the following:

- Alerting Service – Software used to integrate our Stats Server and Log Analyzer with Exchange based alerting and messaging system.
- Log Analyzer – Software used to aggregate and to parse logs collected from On-prem agents. The Log Analyzer is integrated with our Alerting Service to provide active monitoring.
- Stats Server – Used to monitor the health of On-prem agents and ensuring that all services are up and running. The Stats Server achieves this by communicating with the Stats/Health Agent

for each On-prem agents to receive status. Stats server also runs some analytics for forecasting data.

- Web Server – A Web Server based on IIS used to manage services for each Greenhouse, including running per-botanists scheduled prescription for plantation. This also uses powershell scripts for automation.
- vCloud Catalog – Catalog stores vApp for faster deployment of application/components

2. **Business (Life) critical enterprise application-Life support systems-**
   Life support system is one of the most critical applications on Mars; this application takes care of Oxygen supply, cooling, energy consumption, safety and security. This application comprises of shared SQL Always-on Database, a web interface, CCTV Footage storage/archival and some clients to gather information from different sensors spread across human pods. The Life support command center system must be highly available and fault tolerant, as human lives are on stake here.

Availability Requirements-

Web and SQL server components must be highly available Except On-Premises collectors. On-Premises collectors will be using shared database; if any collector fails or any mechanical failure happen email alert will be triggered. CCTV collector will synchronize with deduplication appliance hosted on cloud and does video footage compression, which later kept on VTL for archival.

Latency Requirements-

Latency between database servers must be low, i.e. within permissible limit.

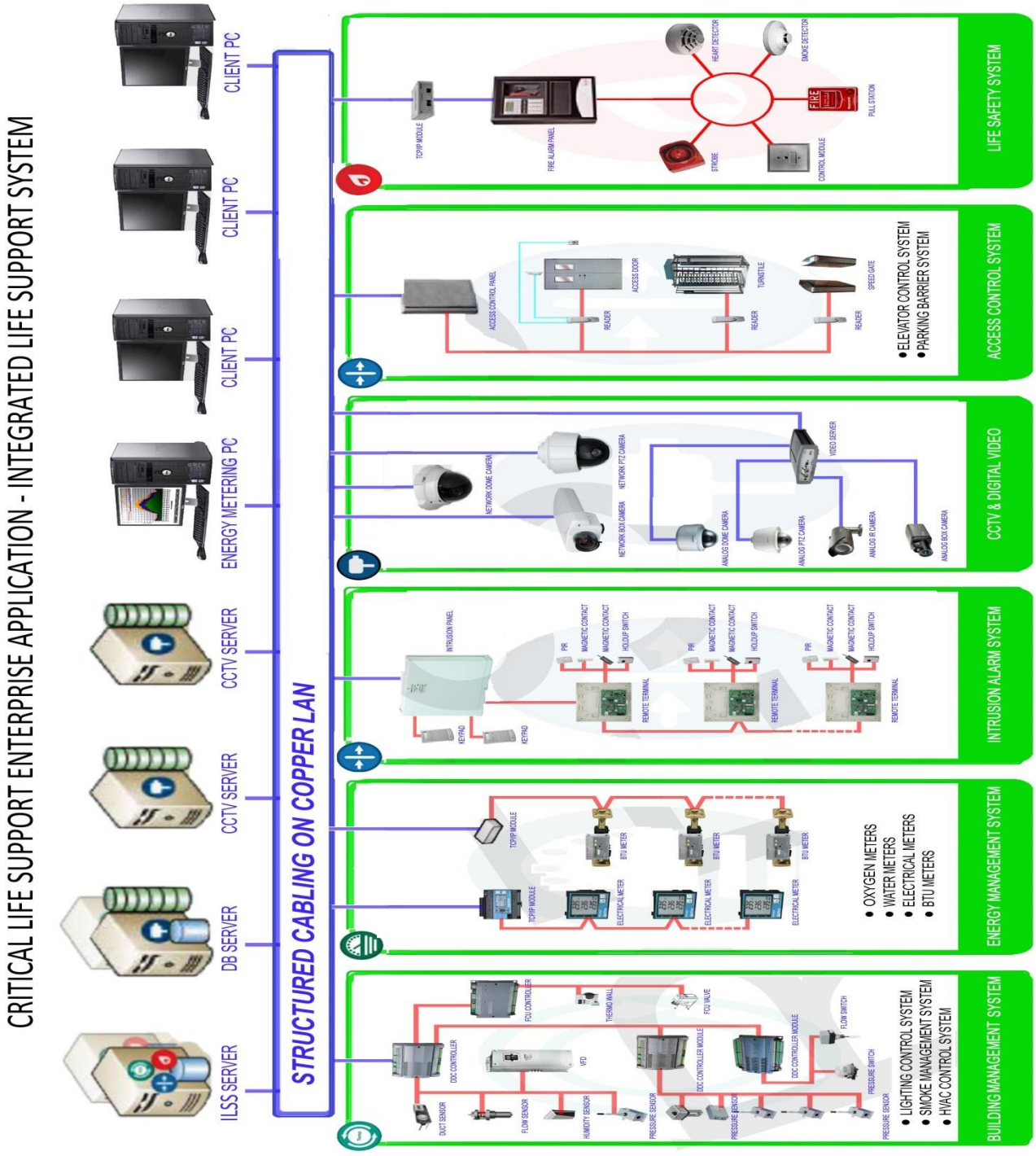
Capacity-

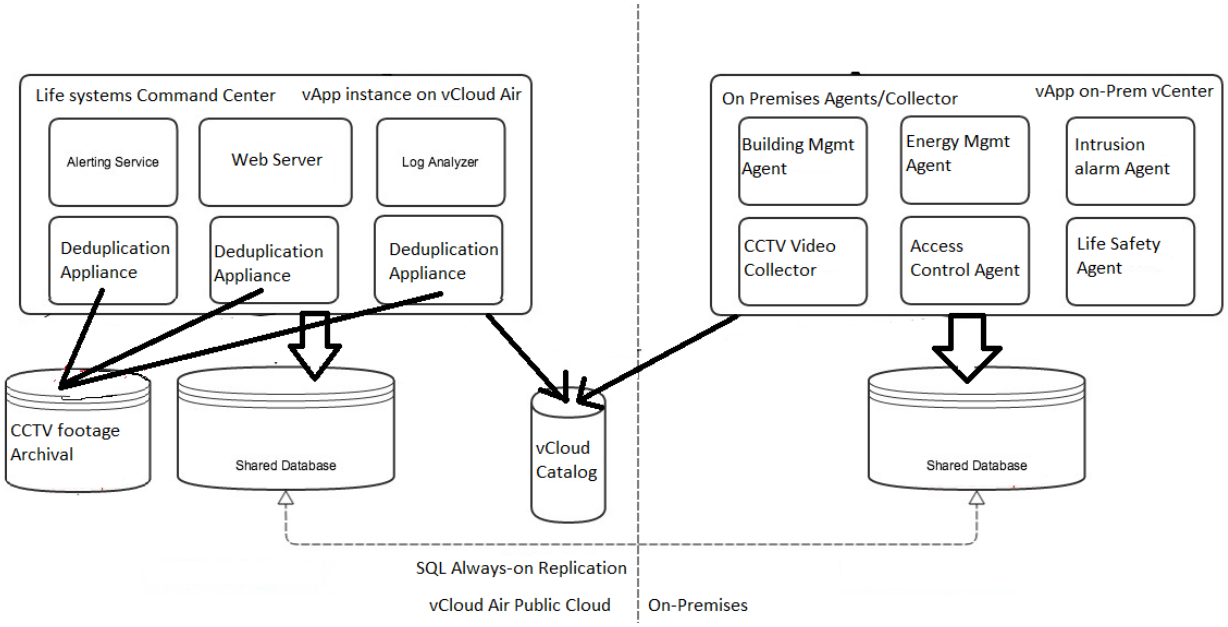
vApp used as a centralized command center, for monitoring human pods on mars. Collectors/Agent can capture data from three sensors only, more sensors require more agents/collectors installation to distribute load.

Compute Requirements-

	CPU	RAM	Storage
Web Server	4vCPU	16 GB	150 GB
SQL Server with Always-on	4vCPU	24 GB	500 GB
Alerting service server	2vCPU	8 GB	150 GB
Log Analyzer	2vCPU	8 GB	150 GB
Building Mgmt Agent	4vCPU	16 GB	72 GB
Energy Mgmt Agent	2vCPU	4 GB	72 GB
Intrusion alarm Agent	2vCPU	4 GB	72 GB
CCTV Video Collector	2vCPU	4 GB	72 GB
Access Control Agent	2vCPU	4 GB	72 GB

Life Safety Agent	2vCPU	4 GB	72 GB
Deduplication Appliance	8 vCPU	32 GB	300 GB





The components that make up Common Services include the following:

- Alerting Service – Software used to integrate our Stats Server and Log Analyzer with Exchange based alerting and messaging system.
- Log Analyzer – Software used to aggregate and to parse logs collected from On-prem agents. The Log Analyzer is integrated with our Alerting Service to provide active monitoring.
- Deduplication Appliance – These appliance provide deduplication facility for CCTV footage captured through collectors and will be stored on VTL.
- Web Server – A Web Server based on IIS used to manage services for each Greenhouse, including running per-botanists scheduled prescription for plantation. This also uses powershell scripts for automation.
- vCloud Catalog – this stores vApp for faster deployment of application/components
- CCTV Footage Archival- VTL for footage archival older than 90 days with optimal deduplication
- Building Mgmt Agent- Interfaces with Lighting control system and smoke management system.
- Energy Mgmt Agent- Interfaces with Oxygen, water, energy, electrical and BTU Meters
- Intrusion alarm Agent- Interfaces with Remote sensors for Magnetic trip alarm devices
- CCTV Video Collector- Captures Audio/Video from CCTV.
- Access Control Agent- Keeps track of Access within Human Pods controlled environment and chaos avoidance
- Life Safety Agent- Interfaces with heat/smoke detector and triggers fire suppression systems.

10. References

1. blogs.vmware.com
2. hypervizor.com
3. Honeywell automation
4. Wikipedia