

Virtual Design Master

Challenge 1

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EXECUTIVE SUMMARY

Objective

The objective of this design is to support first of its kind human colonies in Mars until a more permanent infrastructure will be built. Also build a messaging and collaboration infrastructure on top of it for developing a warning system to give a more human touch to residents in Mars.

Goals

Solution should be reliable, fits into smaller space and requires less cooling as these things comes at a premium in Mars. Downtime should be negligible, as human lives are involved.

Solution

With the above goals in mind, the solution has been designed around the following key elements:

All supporting key elements must be highly available within same enclosure to keep space utilization to bare minimum.

- The physical and application infrastructure must be redundant with no single point of failure as pods can sustain up to 20 min. with available oxygen.
- The application/messaging/collaboration framework must be able to warn living beings when mechanical components are failing or have failed.

The physical infrastructure has been kept simple, and relies heavily on hyper converged Infrastructure (HCI) systems. It is easy to rack, stack, and patch this design. The Nutanix virtual computing platform was chosen as the scalable compute and storage systems, this solution requires 90% lesser space compared to conventional server/storage infrastructure. NX-6000 has been chosen for this task as it targets apps with heavy storage requirements with 3x more storage capacity.

The virtualization infrastructure will be based on the VMWare vSphere, and will include a highly available management cluster. The virtual servers supporting the Environmental Support/Green House Control and messaging application will reside on a separate cluster of nodes managed by VMware vSphere. We also kept future growth in our mind while designing infra for deployment of any unknown business critical application.

PHYSICAL DESIGN

Overview

There will be three Data center in Mars, all are connected with 40 GBE leaf and spine network.

The infrastructure and application design for these Human Colonies have been configured in a highly available manner. It is the goal of this design to eliminate any potential single points of failure, such that it is able to support the mission critical life sustaining workloads.

The physical design of the infrastructure has been kept very low profile, so that resources can be best utilized and kept operating with lower running cost.

Infrastructure

As noted earlier, the physical infrastructure follow KISS philosophy, and relies heavily on HCI due to its easy implementation.

The physical node will reside in two separate racks (Half-height 21U) in each DC, supplied by two redundant power sources. The configuration of both racks will closely resemble one another, and will be used to provide physical separation of the key components in support of a highly available architecture.

The racks will be interconnected via the 10 GBE switch (leaf and spine fashion), and each rack will contain the required network equipment to provide Intranet.

The Cisco Nexus 5548UP was chosen as the top-of-rack switch, which provides ample bandwidth and ports for the infrastructure, along with future expansion.

The Nutanix NX-6000 virtual computing platform was chosen as the scalable compute and storage systems. Each of these systems contains four nodes, one of which will be used for the management framework, and the balance to be used for the application framework. The base configuration will utilize one NX-6000 in each rack, with plenty of room for future growth.

Risks

There is an inherent risk, if one DC was destroyed due to natural calamity (Heavy wind/storms), the mission critical application would be shifted by manual intervention, even if the mechanical components was still available.

Assumptions

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It is assumed that the human beings living in colonies situated in Mars, can handle or operate a web based application i.e. Prism central UI for day-to-day task. In addition, there is enough physical space, power and cooling capacity available to scale the physical equipment if required although they come at a premium. DC's will be situated in close vicinity and have a subway underneath connecting colonies with each other.

Figure 1 - Physical Rack Layout

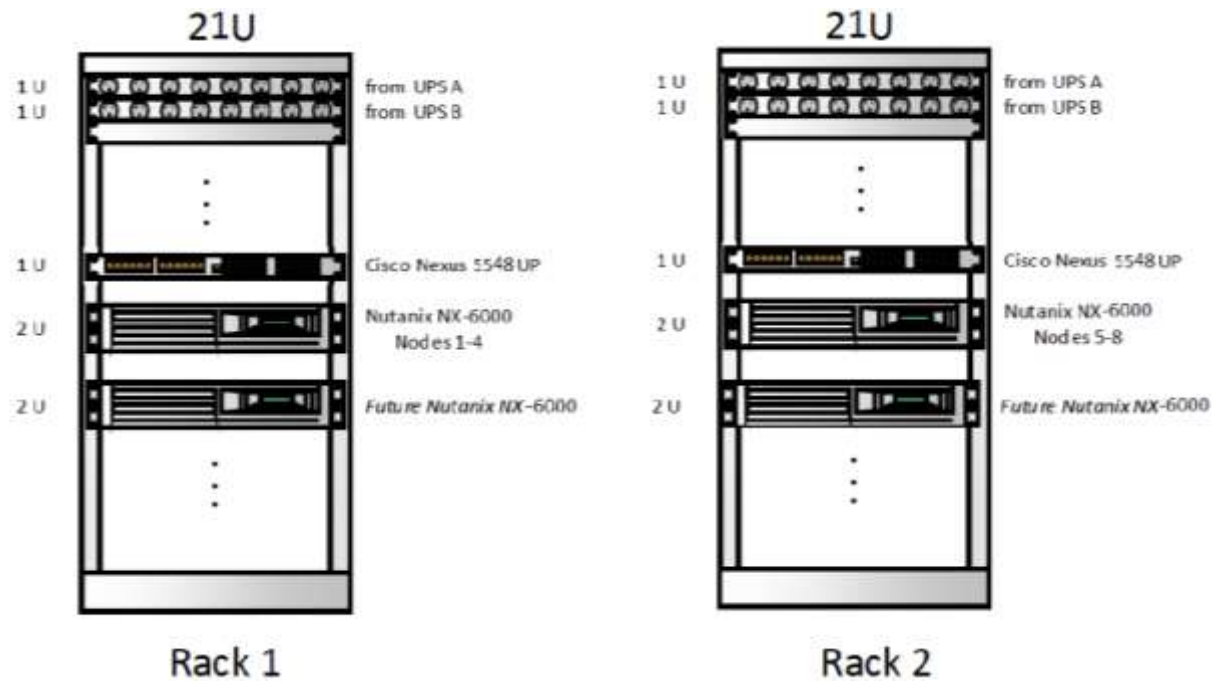
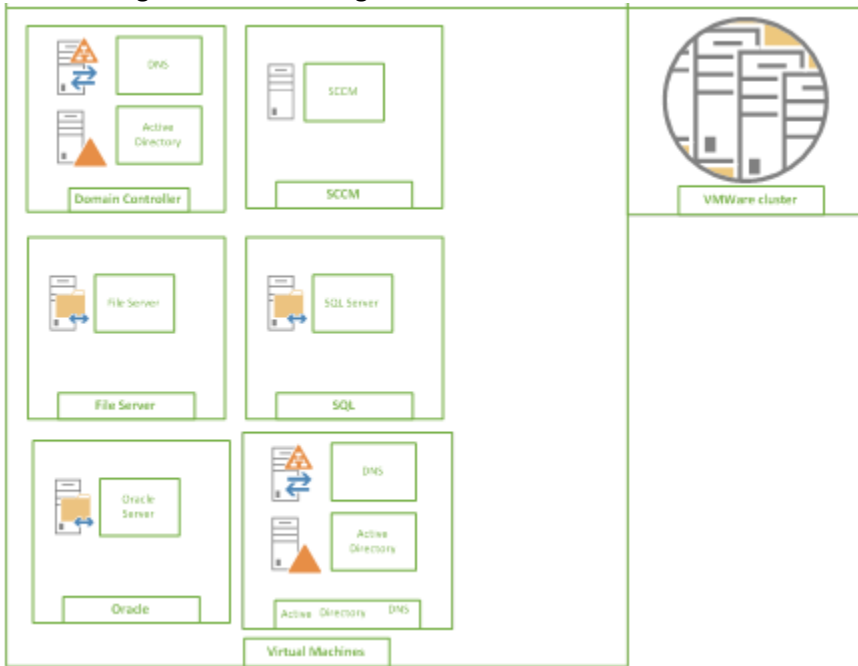


Figure 2 - High-Level Overview of Virtualization

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LOGICAL DESIGN

Overview

The principle for this design is based on High Availability and Web Scale. The purpose of this is to protect the critical components (i.e. environmental application workload and data) at the human colonies, and ensure that the infrastructure can scale out quickly and efficiently without fuzz, thanks to Nutanix inherent state-of-the-art technology.

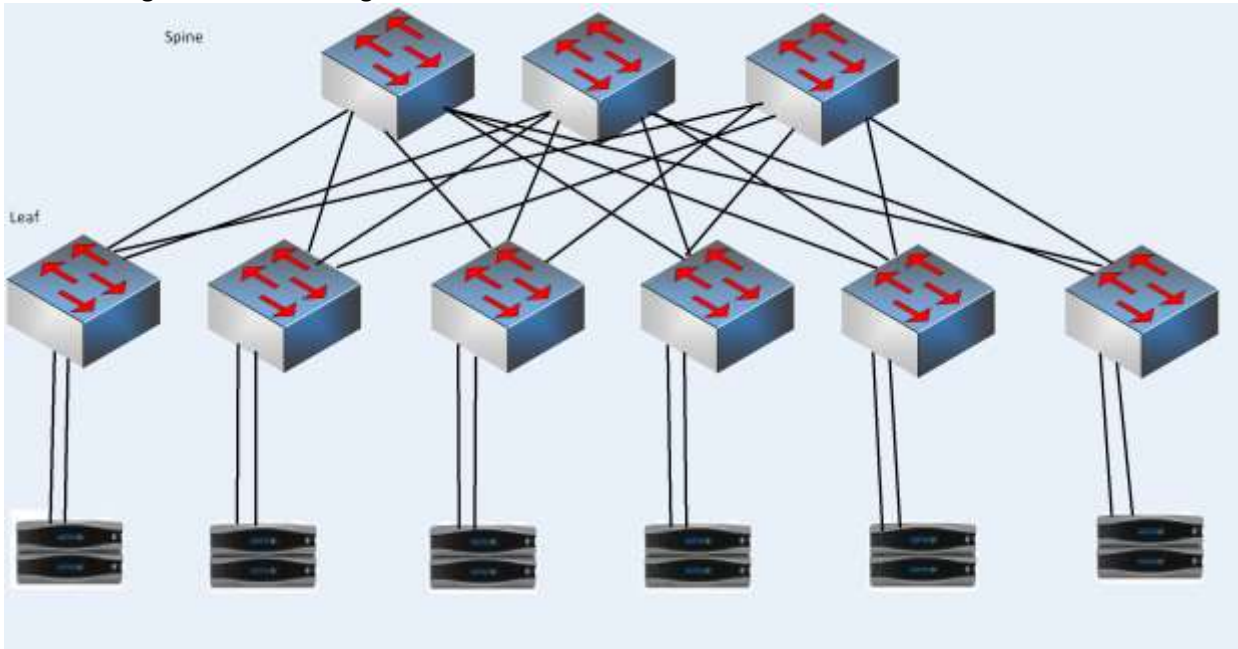
The virtualization infrastructure will be based on the VMWare vSphere, and will include a highly available management cluster. The virtual servers supporting the Environmental Support/Green House Control/Unknown application will reside on a separate cluster of nodes managed by VMware vSphere.

Network

Three DC's will be connected by 40 GBE link and will utilize leaf and spine model, the links will be redundant and will provide intranet for operating the DC's under and extended layer 2 domain.

Figure 2- High-Level Inter-DC Network Layout

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VMware Management Cluster

The management cluster will reside on two physical nodes (Nutanix node 1, and node 5) and is based on a HA application topology.

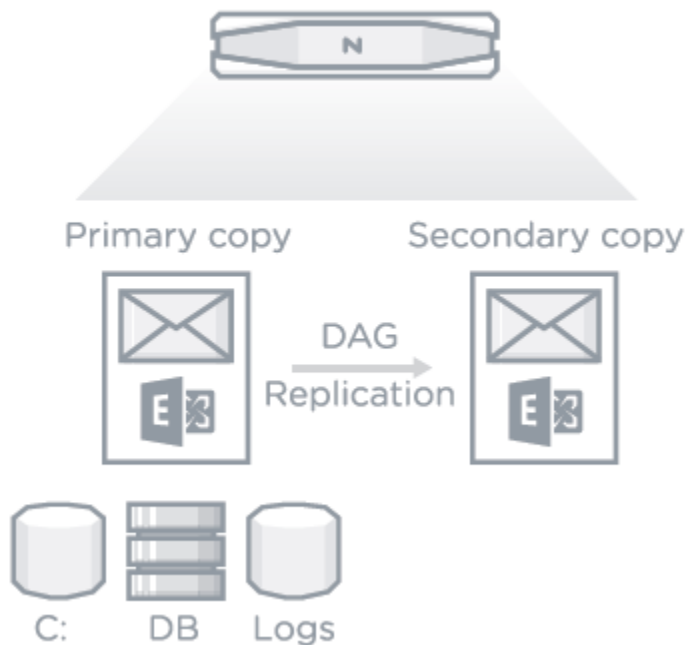
The chosen hypervisor version will be ESXi 5.5 U2 for the install, the management components within the cluster will reside on virtual machines, running on top of the ESXi hypervisor. The Operating system of choice would be windows 2012 R2 for key components (like AD/DNS/SSO/vCenter/VUM/Veeam master/proxy etc.)

Application Cluster

The default choice for hypervisor will be ESXi 5.5 U2 for the install on Nutanix node 2-3-4, and 6-7-8), and will be managed by Management Cluster. The environmental support/green house application will utilize web scale architecture for high-availability and distributed components architecture.

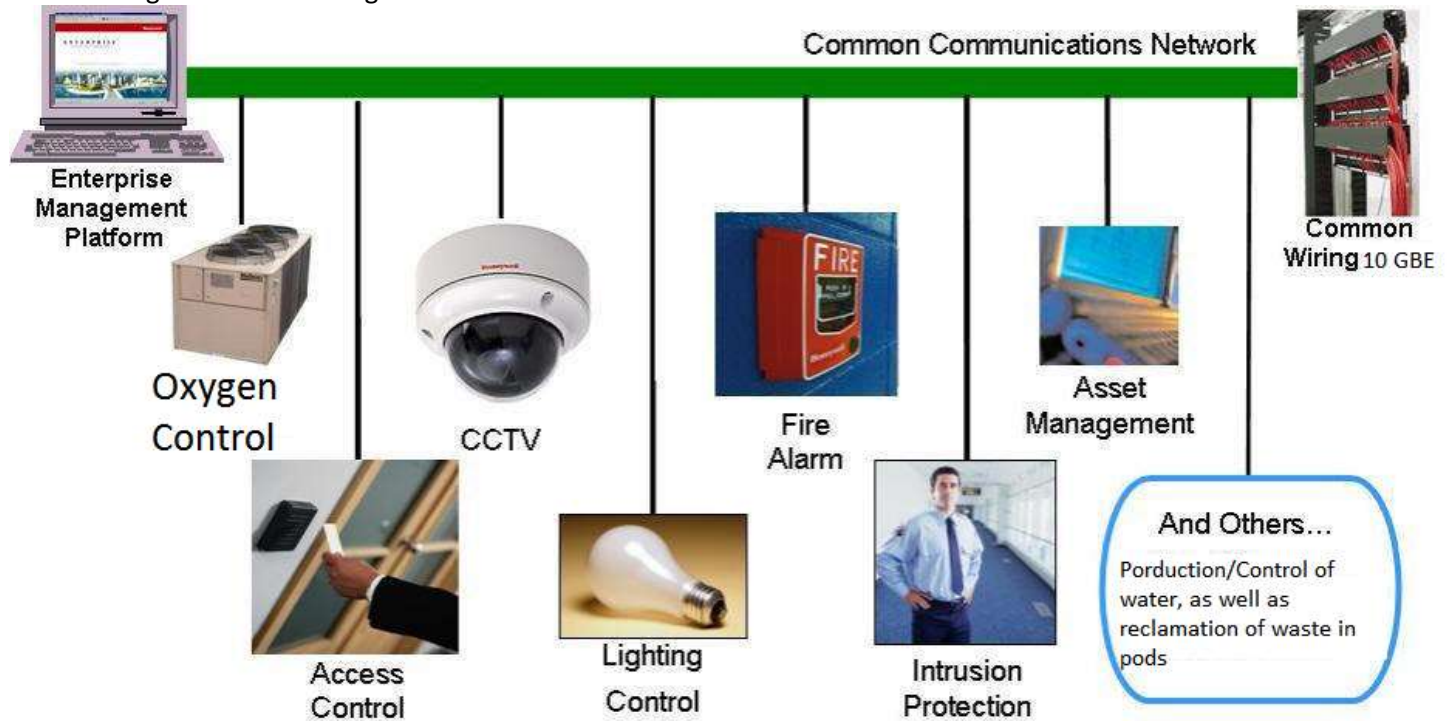
Messaging/Collaboration application

Thousands of mailboxes / 2 rack units

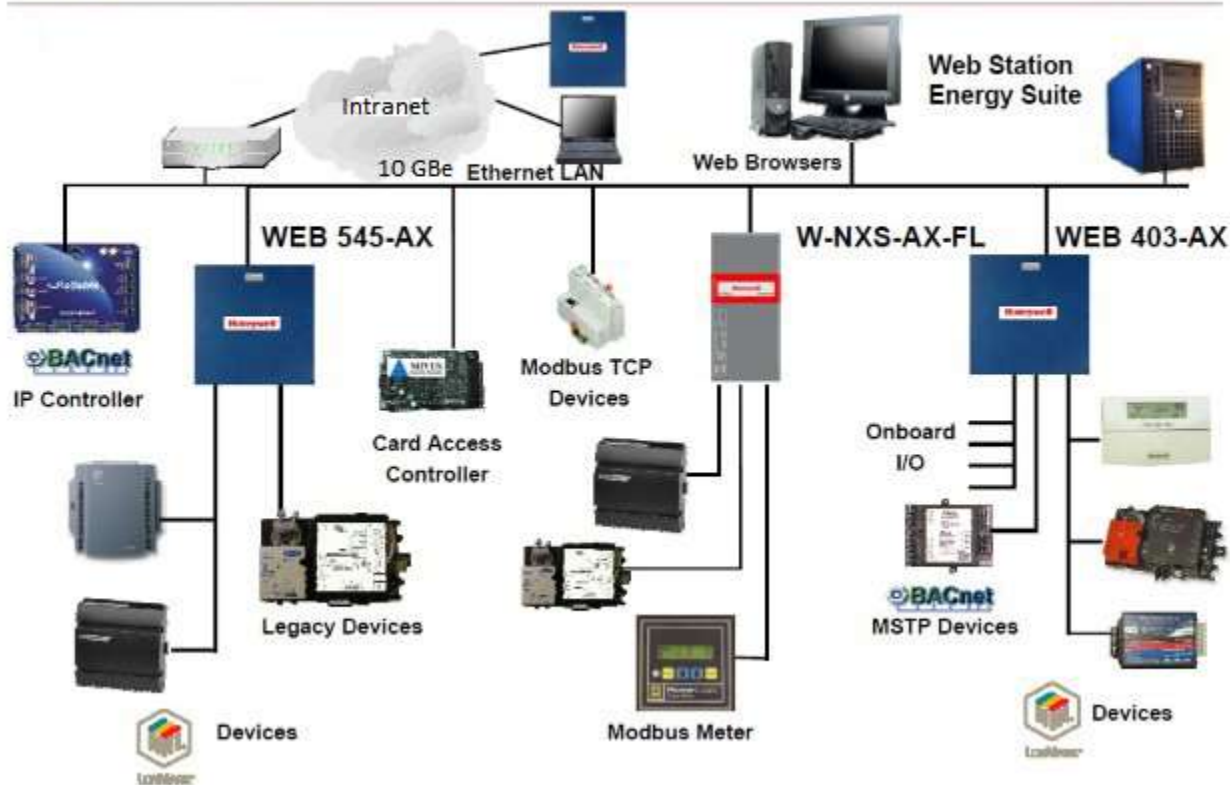


Environmental Management systems

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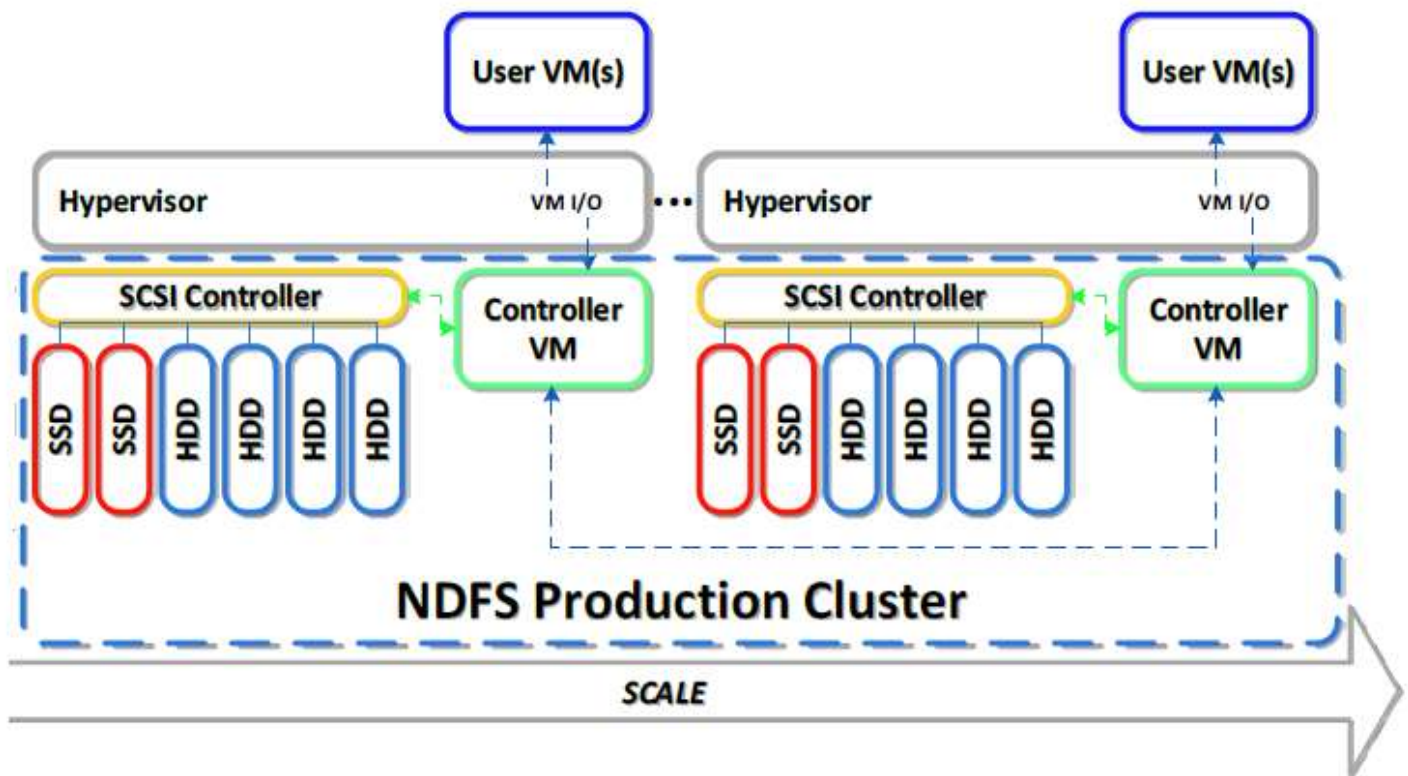


Typical Architecture – Systems Integration



Storage

The storage utilized by the physical nodes will be presented by the Nutanix HCI system in the form of NFS shares. The management and application servers will reside on separate mount points, as well as any additional special configuration required for the highly available databases.



- Required images, virtual templates
- Virtual servers
- Application and management databases

The diagram illustrates the architecture of NDFS for backup and recovery, showing a Veeam Repository connected to a Hypervisor, which manages multiple VMs (User VM(s) and Controller VM). The architecture is divided into two main clusters: NDFS Secondary Cluster and NDFS Production Cluster. The NDFS Secondary Cluster contains a SCSI Controller with SSD and HDD storage. The NDFS Production Cluster contains a SCSI Controller with SSD and HDD storage, and a Controller VM. The architecture is labeled "SCALE".

It is assumed that any of the DC's, may lose connectivity with one or another. In the case of temporary loss of connectivity, the DC's will continue to support as they are fully independent of one another.