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Letterkenny Institute of Technology

Assignment 1

Lecturer:	John O'Raw
Report Title:	Assignment 2
Submit to:	Blackboard with all files as specified in the assignment, submitted as a single ZIP folder.
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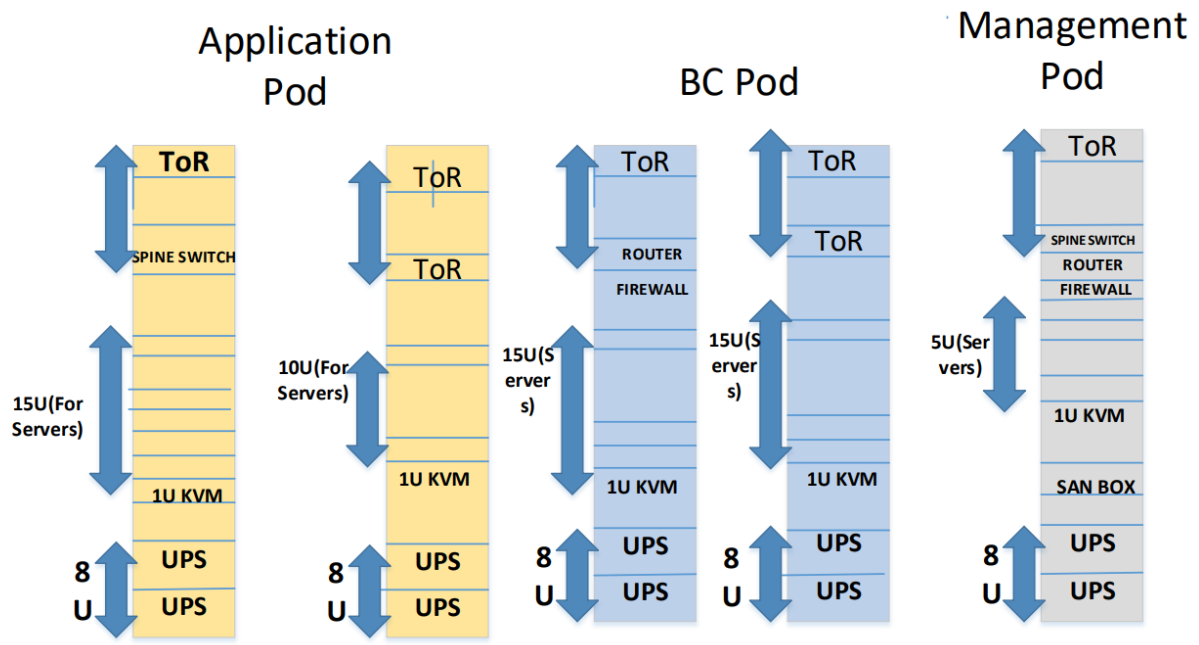
Student Name:	Mamta Mittal
Student Number:	L00161832
Programme of Study:	M.Sc. in Cloud Technology
Module:	Private Cloud Technology

Please refer to the Institute's Quality Assurance Handbook, Version 3.0, September 2018

1. Practical work, forming part of the CA of a module, will only be assessed if the student has attended the relevant practical classes.
2. CA work must be completed within the schedules and specifications (specified in the CA brief). Students who submit CA late may forfeit some or all the marks for that wor
   k.
   a. The total marks available for an assessment be reduced by 15% for work up to one week late; i.e. a grade of 50% would become (50*0.85) = 42.5%
   b. The total marks available be reduced by 30% for work up to two weeks late i.e. a grade of 60% would become (60*0.7) 42%
   c. Assessment work received more than two weeks late should receive a mark of zero.

   Work is deemed late when an unauthorized missing of a deadline has occurred.
3. CA must be the student's own work, refer to Plagiarism Policy, in section 5.7 of the QA manual.

Cork Data Center Cabinet Diagram



Technical Description

Colt Data Centre has been designed to handle 60 remote sites using VMWare ESXi as virtualization platform. There are three pods (group of services working together in a data center) Management Pod, Business Continuity Pod and Applications Pod. A management cluster/pod will have 5 host servers which will host VMs for services such as AD (Active Directory)/DNS/DHCP, Syslog, NTP (Network Time Management). These services will be used by all the pods in date center. Another Management Pod will be placed data center in Donegal for failover and geographical redundancy as these services are very critical.

Business Continuity Pod consists of total 30 host servers which will be hosted in 5 clusters each containing 6 hosts. Each host will have 5 VMs. There will be 60 VMs for Domain Controllers, one for each site and 60 File Servers (FSs) for replicating file server from 60 sites. Separate fileserver for each site is provided so that if fileserver at remote site goes down, users can still use the fileserver at data center. Similarly, if domain controller at an individual site goes down, the one in data center can be used. Each Domain Controller VM has been allocated HDD of 200GB and File Server VMs have been allocated 1TB each. Considering 60 VMs for DCs and 60 for FSs, total HDD Capacity for DCs and FSs sums to 72TB.Considering 4TB space per host server, 18 servers would be required for all the VMs. It has been assumed that there is 60% utilization on Day1 and 18 servers were divided by 0.6 to get total servers required considering future usage. This led to total 30 server requirement for BC Pod. These 30 servers have been put into 6 clusters of 5 host each. HA has been implemented in these clusters so that if a host goes down, its VM will be restarted in another host. If Load Balancing is required it can be implemented using DRS feature where running VMs can be moved from one host to another automatically using vMotion.

Application pod will have 25 servers which will be hosted in 5 clusters with each cluster containing 5 hosts. Five separate applications will be hosted in these clusters. Actual resources

used by clusters will be dependent on the type of applications used. Details of compute, networking requirement, business continuity, disaster recovery, storage, cluster availability requirement etc. are needed to calculate the exact number of resources required.

vCenter which is the centralized portal for managing virtualization setup will be used for managing all the clusters in all the data centers and sites. There will be one vCenter (vCenter Server Appliance) in Colt Data Centre Management Pod and another in Donegal Data Centre Management Pod for failover. vCenter version 7.0 has been recommended as ESXi 7.0 is being used and using same version provides better compatibility. vSphere 7 Enterprise plus license and maintenance, which includes vCenter license has been ordered for 1 year.

Dell R640 Server of the below configuration has been used for host servers in all the PODs.

1. 256GB in 16GB DIMMs
2. 2 x 480GB SSD for Cache in vSAN.
3. 3 x 1.2TB HDDs for vSAN data.
4. Total capacity and cache disk = 3.6TB+960GB=4.560TB
5. 2 x 1GB/s on board Ethernet cards
6. 2 x 10GB/s Ethernet cards on a mezzanine board.
7. 2x64GB SD Card for Operating System
8. HBA330 12Gbps SAS HBA Controller (NON-RAID)

Windows 2016 Server Data Center edition has been used as Operating System on all the VMs. vSAN with High Availability (HA) has been configured in all the clusters for shared storage. Standard vSAN cluster needs atleast 3 hosts, which can tolerate one host failure. Since all the clusters have 5 hosts, vSAN can be implemented in all of them. Special license is required for vSAN Cluster. There are different types of licenses such as Standard, Advanced, Enterprise, Enterprise Plus for vSAN and Advanced license has been used ads it provides advanced features like RAID- 5/6 Erasure Coding, deduplication, compression etc. One-year license and maintenance has been ordered for vSAN Advanced. ESXi v 7.0 Update 1 has been recommended to use most of the features of vSAN.

VMs will continue to work if vCenter goes down. However, since it is a management interface for configuring clusters, no changes can be made in cluster configuration. If still changes are required in VM configuration, it can be done via ESXi interface of individual host. HA will continue to work if vCenter goes down as vCenter is not required for its function and required just to configure it. DRS and vmotion will not work if vCentre goes down, as movement of VMs is performed by vCentre.

UPS are provided in each cabinet as maintained power is not provided by data center provider. One KVM is provided in each cabinet for troubleshooting servers. Each server in all the Pods will connect to two data switches using 10G port for better speed and performance. Since two switches are used if one switch goes down another will handle servers thus providing redundancy. These switches are put on top of each rack and are called ToR switches. Top rack switches will be connected to Spine switches, which will be connected to router for external connectivity. Two spine switches and routers have been provided for redundancy. Spine-Leaf architecture has been used to design data center network.

Considering each ESXi Server needs minimum 6 ethernet ports, out of which 4 of 10Gbps for connection to storage, iDRAC, trunk/tagging and 2 of 1G for management interface, total ports required for a cabinet with 15 servers would be 90 ports of 10Gbps and 30 ports of 1Gbps. To handle this, after taking redundancy into consideration, four 48 port switches with SFP and two 1G/10Gbps, 48 port switches have been recommended for a cabinet with 15 servers. Similarly,

calculation for other cabinets has been done and every cabinet will have four 48 SFP port switches and two 1G/10G 48 port switches.

Appendix

R640 Specifications

PowerEdge R640
PowerEdge R640 Server
Motherboard
PowerEdge R640 MLK Motherboard
Trusted Platform Module
No Trusted Platform Module
Chassis Configuration
2.5” Chassis with up to 8 Hard Drives and 3PCIe slots
Shipping
PowerEdge R640 Shipping
Shipping Material
PowerEdge R640 x8 Drive Shipping Material
Regulatory
PowerEdge R640 CCC and BIS Marking, No CE Marking
Processor
Intel® Xeon® Gold 5217 3.0G, 8C/16T, 10.4GT/s, 11M Cache, Turbo, HT (115W) DDR4-2666
Additional Processor
Intel® Xeon® Gold 5217 3.0G, 8C/16T, 10.4GT/s, 11M Cache, Turbo, HT (115W) DDR4-2666
Processor Thermal Configuration
Standard Heatsink for 2 CPU
Memory DIMM Type and Speed
3200MT/s RDIMMs
Memory Configuration Type
Performance Optimized
Memory Capacity
(16) 16GB RDIMM, 3200MT/s, Dual Rank
RAID Configuration
C1, No RAID for HDDs/SSDs (Mixed Drive Types Allowed)
RAID/Internal Storage Controllers
HBA330 12Gbps SAS HBA Controller (NON-RAID), Minicard
Hard Drives
(2) 480GB SSD SATA Read Intensive 6Gbps 512 2.5in Hot-plug AG Drive, 1 DWPD, 876 TBW; (3) 1.2TB 10K RPM SAS 12Gbps 512n 2.5in Hot-plug Hard Drive
Operating System
No Operating System
OS Media Kits
No Media Required
Embedded Systems Management
iDRAC9, Express
Group Manager
iDRAC Group Manager, Disabled
Password
iDRAC,Factory Generated Password
PCIe Riser
Riser Config 4, 2x16 LP
Network Daughter Card
Broadcom 57416 Dual Port 10GbE BASE-T & 5720 Dual Port 1GbE BASE-T, rNDC
Additional Network Cards
(2) QLogic FastLinQ 41162 Dual Port 10GbE BASE-T Adapter, PCIe Low Profile
IDSDM and VFlash Card Reader
IDSDM and Combo Card Reader
Internal SD Module

2x 64GB microSDHC/SDXC Card

Internal Optical Drive

No Internal Optical Drive

Fans

8 Standard Fans for R640

Power Supply

Dual, Hot-plug, Redundant Power Supply (1+1), 495W

Power Cords

(2) NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord, North America

Bezel

No Bezel for x4 and x8 chassis

Quick Sync 2 (Wireless At-the-box mgmt)

No Quick Sync

BIOS and Advanced System Configuration Settings

Performance BIOS Setting

Advanced System Configurations

UEFI BIOS Boot Mode with GPT Partition

Rack Rails

No Rack Rails or Cable Management Arm

System Documentation

No Systems Documentation, No OpenManage DVD Kit

Virtualization Software and Support

VMware vSphere 7 Enterprise Plus for 1 CPU, up to 32 cores, 1 Year License and Maintenance; VMware vSAN 7 Advanced, 1 CPU (max 32 cores/CPU socket), 1YR License/Maintenance

Shipping Information

US No Canada Ship Charge

Remote Consulting Services

Declined Remote Consulting Service

Dell Services: Hardware Support

Basic Next Business Day 36 Months, 36 Month(s)

Dell Services: Extended Service

ProSupport and 4Hr Mission Critical, 36 Month(s)

Deployment Services

No Installation