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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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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 work.
    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.

Summary

The scope involves adding another server at Sligo site, implementing shared storage, making sure that failure of one server does not stop operations, providing basic plan and design for Cork Data Center to support 60 remote sites along with pod (a group of services in data center working together) for applications considering future expansion in mind. The connectivity between Sligo and Cork Data Center already exists and has not been looked into. Existing server model has been replaced with Dell R640 as Dell440 does not support newer version of virtualization software vSphere. Three Dell R640 server have been used (existing setup had 2 servers) at Sligo site to form a cluster (logical grouping of hosts) of three servers/hosts in High Availability mode such that if one server goes down, VMs of that host will be restarted on another host.

VMWare ESXi hypervisor has been used as virtualization platform and vSAN (Virtual Storage Area Network) has been used to provide shared storage across the clusters where local disks and memory from all the three servers will be used to create a big pool of storage which can be used by all the three servers in the cluster, thus providing efficient utilization of memory and hard disk. This has been implemented in Sligo as well as Data Center to provide higher performance. Separate license is required for vSAN and 1 CPU (max 32 cores/CPU socket), one-year license and maintenance has been ordered for it. If required, more license needs to be ordered. Maximum vSAN features can be implemented as Version 7.0 Update 1 of ESX has been used which supports most of the features. If load balancing is required amongst Virtual Machines (VMs), DRS (Distributed Resource Scheduler) feature of cluster can be used where VMs get automatically vMotioned (moved) from host to host for load balancing purpose. vCenter Server Appliance has been recommended to manage various clusters and virtual machines at various sites and data centers. License and maintenance for vCenter has been ordered for a year which needs to be extended in future.

A new file server at data center has been created to replicate File server at Sligo thus making sure data is available even if Sligo file server goes down and business continues. Design has been provided to replicate file servers from all the 60 sites. These file servers will be in 12 clusters with each cluster having 5 file servers. Same hardware as at Sligo site has been used and vSAN will be implemented too. It will be implemented in clusters in all the sites and data centers. Domain Controller at Sligo has been made a child domain (sligo.ads.electric-petrol.ie) to the parent domain(cork.ads.electric-petrol.ie) at Data Center. 60 Domain Controllers for the remote sites have been designed such that synchronization can happen between remotes site and Colt Data Centre. Thus, making sure operations do not get affected If domain controllers at remote sites face an issue. Business continuity pod has been designed considering 60% utilization on Day 1 and additional servers have been provided to handle the extra load in future. Business Continuity Pod, consists of 5 clusters with each cluster having 6 servers.

An application Pod consisting of 5 clusters with 5 servers in each cluster has been designed to accommodate various applications. This has been designed considering future expansion in mind and enough servers have been provided. Total 25 servers have been allocated for it. Management Pod consisting 5 clusters with 5 servers each with services like AD, DHCP, DNS etc. has been designed. A VCenter will be used to manage clusters and VMs in all the sites and data centers. It has been assumed that Data Centre (DC) at Donegal is a replication of Cork Data Centre (DC) and that Management Pod in Donegal DC will take care of geographical redundancy of Cord DC.A SAN (Storage Area Network) Box has been provided at Cork DC for additional data storage requirement and has been put in Management Pod cabinet as this cabinet has just 5 servers and there is enough space available. Also, while planning cabinets only 60%-70% space has been used at maximum to leave free space for future expansion. Magnetic Tape is

recommended for long term backup though it has not been costed in the design and can be placed in cabinet which has Management Pod 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 take care of 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. Aruba switches have been used in the design.

KVM (Keyboard, Video and Mouse) a hardware using which multiple computers can be controlled has been provided at Data Centre for easier troubleshooting but not at Sligo site. It is assumed that it is already present in the cabinet at Sligo. Two UPS have been provided in each cabinet redundancy in Cork date center as maintained power is not provided by the service provider. UPS have been provided for Sligo site as well assuming that existing UPSs in Cabinet might not be enough for additional power required by new server. PDUs have been provided in all the cabinets and also additional PDUs for the third server in Sligo has been provided.

VMware vSphere 7 Enterprise Plus, 1 Year License and Maintenance along with VMware vSAN 7 Advanced, 1YR License/Maintenance has been ordered. vCenter 7 license is included in vSphere 7 license. ProSupport and 4Hr Mission Critical, 36 Month(s) has been chosen for Dell R640 servers. Dual Power supply has been provided in each server.

Total Cost for Cork Data Centre devices = € 19,15,562.04
Note: Cabinet Switches along with Routers, Firewalls have not been costed. Costs of vSAN and vSphere licensing are included server cost.

Total Cost for Sligo Site devices = € 46,923.90
Note: - It has been assumed that KVM is already present in the cabinet and not included in Sligo BOM. Costs of vSAN and vSphere licensing are included server cost.