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 of the assignment or project involves providing storage solution for petrol-electric station project considering future expansion in mind. The existing setup already has servers, networking setup and the storage solution needs to be integrated to the network. Servers, cabinets, ancillary equipment etc are taken care by vendor and Dell R440 servers used are already functional. There are two Data Centres, one at Sligo and Cork with connectivity setup already done. The Storage Solution will be implemented at both the Data Centres for geographical redundancy, so that if one Data Centre goes down, still the storage at another DC will be available. Third party consultant has done a study of the setup and provided metrics for storage which have been used to provide storage solution for data centres. Initially, storage disk space of 10TB is required and the requirement is expected to grow to 100TB in a span of 5 years. There will be over 100 applications that will be used and considering 10 instances per application, a total of 1000 virtual machines will be required. Each application instance will server one country in EU, so a total of 10 countries will be served by 10 instances. The design uses five Dell R440 servers in a cluster in the initial phase to support 100 Virtual Machines. As the requirement for VMs increases with time, more Dell Servers will be required. It is advisable to seek approval for servers in advance considering the 5-year expansion plan to avoid delay in procuring them. UC3200 is rack-mountable and can be fit into an existing rack.

Synology Unified Controller UC3200, Active-Active IP SAN was chosen due to its affordable cost and simple management interface. This solution has dual controllers and provides high availability of storage controllers as the two controllers work in active-active mode. If one of the controllers fails or needs to be removed, the UC3200 will automatically move the operations to another controller. The solution is thus ideal for both small and midsize companies if they are keen about storage solution downtime. The solution supports both SAS HDDs and SDDs, so if higher performance is required SDDs can be chosen. Expansion ports for SAS drives are available, hence if storage space requirement increases more drives can be added using expansion units. Maximum 500TB storage space is provided by UC3200 and the two controllers can be managed using a single web portal. UC3200 supports various virtualization platforms like VMWare vSphere, Hyper -V, OpenStack etc. Requirement of storage space as suggested by consultant is 100TB. However, UC3200 with 200 TB disk space was used for the design as RAID10 when implemented for hard disk failure protection, reduces the actual space to half.

UC3200 has redundant power supplies and provides 5 years warranty which starts from the day of purchase. There are no details on support maintenance offers available on Synology website .It was assumed that the required cabinets, UPSs, PDUs for storage solution and servers are available and none of them have been billed/ordered. Two ethernet switches with support for 10G ports are required

for connecting UC3200 and cluster of servers. Two ports of 10G in each switch for controllers of UC3200 and 5 ports in each switch for servers are required. Each VM has been assigned a space of 20GB and while calculating disk space required for each VM (Virtual Machine), it was assumed that Linux Operating System along with associated Linux based applications for web server, code server, database is used. Security was kept in mind while choosing the storage solution and one of the key features available in UC3200 that provides security at hardware level is SED (Self Encrypting Drive) which encrypts data to hard drives.

Update the storage solution is important and one of the challenges that organizations face is handling manual updates and associated downtime with it. In UC3200, each controller has a SATA DOM which runs DSM (Disk Station Manager), which is the Operating System used in Synology SAN and separates this DSM from the rest of the data present in the drive. This enables automatic updates to be applied in turn avoiding downtime. Data protection is provided using Snapshot Replication based on Btrfs file system, where snapshots for volumes are created. This provides instant recovery of VMs present in iSCSI Volumes if a disaster happens.

Pricing of Storage Solution involves UC3200 (diskless), separate hard disks and two add-In Card E10G18-T1 with one 10GBASE-T port, which are required for dual connection from each controller to two different switches. Cost of UC3200 including hard disks and additional 10G port cards = €121868.76.

Total Cost including labor charge and CAT6 cables is €15167.88