# Assignment 1

| Lecturer: | John O'Raw |
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| Report Title: | Assignment 2 |
| Submit to: | Blackboard with all files as specified in the assignment, submitted as a single ZIP folder. |
| Date Submitted: | 07 Mar 2021 |

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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.

## Service Station Redesigning

The existing setup consists of two Dell R440 servers, one at Forecourt and another in Test/Service of below configuration:

- 256GB in 16GB DIMMs
- 2 x 240GB SSD in RAID 1 for the operating system
- 4 x 1TB HDDs in RAID5
- 2 x 1GB/s on board Ethernet cards
- 2 x 10GB/s Ethernet cards

Various applications as below are installed as Virtual Machine (VM)

1. Windows 2016 Domain Controller (DCx) using 4GB RAM. This is connected to Galleon NTS-6002-GPS time server via Ethernet.
2. Windows 2016 File Server (FSx) using 8GB.
3. Windows 2016 Database Server running MSSQL(DBx) using 24GB.
4. Ubuntu 2004 Syslog Server (SLx) using 8GB.

Existing IP21 47U, 1000d x 800w cabinet in Forecourt building will be used to install third server and will be configured to form a cluster with other two servers.

However, current setup uses Dell R440 as host hardware which will be replaced with Dell Server 640 due to the following reasons:
1. No support for ESX7.0
2. ESX6.7 supported which will be end of General Support in 2022.
3. Does not support 10G NIC ports.

VMWare has been chosen as virtualization vendor and ESXi version 7.0 Update1 will be installed on the three hardware servers(hosts). Each ESXi host been provided with 6 ports on NIC card, 2 of 1G for Management and remaining four of 10G for connection to storage, iDRAC, trunk/tagging. Ideally, 7 ports are required as redundancy for every port is preferred. All the VMs present in the two servers will be installed on the new third server.

R640 has been recommended as new server hardware for hosts as it supports ESXi version 7.0, HBA and 10Gbps NIC ports. Configuration of new server R640 is as below

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)

The three servers, ESXi hosts, will be configured to form a cluster. A cluster is a logical grouping of hosts. If a host fails, its VMs will be restarted on another host, this is called High Availability. A cluster is required for High Availability (HA) to be enabled. A cluster is also required to enable DRS (Distributed Resource Scheduler), where a VM gets automatically vMotioned (moved) from host to host for load balancing purpose. Setting up vSAN needs cluster as well. Right version of VSphere, vCenter and supported hardware are required for vSAN and have been ordered. VMkernal ports need to be set up for vSAN on each ESXi host, and will be used by VMs for transmitting traffic related to vSAN from host to host. Each ESXi host will have two 10GB physical NIC port which will be connected to two different data switches. Some of the design best practices incorporated are: -

1. Physical Redundancy- Two physical switches, so that if one switch fails, all the hosts would still be able to send all the necessary traffic via another switch.
2. There is a dedicated network just for vSAN traffic.

When VMs have Read/Write to execute they will be pushed to the physical network over VMkernal port to the destination host. Hybrid configuration has been used for vSAN where each ESXi host has traditional magnetic devices HDD (capacity devices) for capacity (storing data) and SSD for cache. SSD is sued as Read Cache where most frequently used data will be stored. A copy of the same data will be in HDD as well. A Cache miss happens if the data is not present in SSD and it is fetched from HDD. This fetch from HDD will be slower. SSD is a lot faster than traditional HDD devices and more expensive. VMDK copies for a VM will be present in multiple hosts(mirrored), so if one host fails, virtual machine data is not lost. When a write needs to be executed by a VM, it will be sent to both the hosts that have vmdk (it will be mirrored, similar to RAID). One copy of data will be sent to each host so each has current version of vmdk always.

Special license is required for vSAN Cluster. There are different types of licenses such as Standard, Advanced, Enterprise, Enterprise Plus. ESXi Standard or Advanced license has been used for the design. Advanced license includes advanced features like RAID- 5/6 Erasure Coding, deduplication, compression etc.

vCenter will be used for managing virtual cluster infrastructure including vSAN. VMs will continue to work if vCenter goes down, however, since it is management interface for configuring clusters, no changes can be made in cluster configuration. If changes in VM configuration are required, it can be done from ESXi interface of individual host. HA will continue to work if vCenter goes down as vCenter is not required for its function but needed just for configuration. DRS and vMotion will not work if vCenter goes down, as movement of VMs is performed by vCenter.

The ESXi cluster at Sligo will be connected to Data Centre in Colt which in turn is connected to another data center and head office. Windows 2016 File Server data has been replicated to File Server at Data Center in Colt. Domain Controller at Sligo remote site will also by synced with domain controller in Colt Data Centre. This domain controller will be a child domain(sligo.ads.electric-petrol.ie) to parent domain in Colt Data Center (colt.ads.electric-petrol.ie).

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