

# Network Management and High Availability

## Continuous Assessment 1

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<b>Module Title:</b>	<b>Network Management and High Availability</b>
<b>Assignment Type:</b>	Part 1: Research Report (Individual assignment) Part 2: Report (Individual contribution/reflection) Part 3: Implementation in Packet Tracer (Group – max size 4) Part 4: Justification (Group – max size 4)
<b>Project Title:</b>	<b>Utilizing data centres to improve performance and provide high availability for business data</b>
<b>Project Date:</b>	15 <sup>th</sup> October 2019
<b>Assignment Compiler:</b>	Greg South, gsouth@cct.ie
<b>Weighting:</b>	30% of CA
<b>Due Date:</b>	10 <sup>th</sup> November 2019 @ 11:55 p.m.
<b>Method of Submission:</b>	Submission through <b>Moodle</b> ONLY
<b>Late submissions:</b>	Will be accepted up to 5 days after the deadline. All late submissions are subject to a penalty of 10% per day. Submissions received more than 5 days after the deadline above will not be accepted.

### Module Learning Objectives

1. Design and implement a solution to meet availability and redundancy requirements (Linked to PLO 2, 3, 4)
2. Evaluate and improve current architectures to meet mission-critical standards (Linked to PLO 3, 4)
3. Recommend strategies to migrate existing networks to a fault tolerant infrastructure (Linked to PLO 1, 4, 5)

### Assignment Introduction

You work in a small business named Dublin Computer School (DCS) who are a small college specializing in IT training that were established 15 years ago. You work as the IT intern and you report into the Infrastructure Manager. The company has a total of twenty full-time staff members. The business is home grown in Dublin and the organization is expanding rapidly both in Dublin and in many sites around Ireland (due to open a training site in Galway, Limerick, Athlone, Cork and Sligo with another ten staff to be recruited shortly). There is a small on premises data centre in the Dublin office (currently it is a small room in the basement but doesn't have any specialist equipment such as UPS or additional links). It mainly composed of a flat network with just the bare minimum to support the current users. The infrastructure manager predicts that by December 2019, they will have on average 500 users on the Dublin network at any given time during the day.

DCS now require a new Moodle system for all training resources and a CRM system for the Marketing department to help advertise and attract students to the college. The infrastructure manager wishes to have all servers to be placed in the data centre on site in the Dublin headquarters. The managing director has given a modest budget for a new data centre to house the new servers and it will need to be built for reliability and availability. They would like to achieve five nines availability across their infrastructure and servers. The infrastructure manager has asked you to evaluate data centres in areas such as security, availability along with other key factors.

**Part 1: Conduct an individual research report:**

You will need to create a **1500 word** (+/- 10%) research report illustrating the importance of on-premises small data centres today and the potential of housing the businesses critical data for these departments and students to access. Your report should include sections on the following:

- a) Design and plan for high availability of data for DCS in a new on-premises small data centre in the Dublin office.
- b) Make recommendations on how security of data (**both physical and virtual**) can be enforced to best practices in the new on-premises data centre. Make recommendations on how to meet mission critical standards such as five nines for DCS.
- c) Recommend strategies to migrate existing networks to a fault tolerant infrastructure. As the college is now increasing year on year they need to have a network that can scale and is resilient.

**IMPORTANT NOTE: Use references (both text and images) in each of the above to help backup the points you make. Note the Harvard referencing system should be used.**

For each of the above, ensure to keep cognisant the importance of data to the college and why each of the above are required for sending/storing critical data for DCS in today's digital world.

**(Part 1: 40 marks)**

**Part 2: Append in your submission in part 1, an individual contribution report (max 300 words):**

**Answer these questions after completing parts 3 & 4 below:**

- i. What parts did you participate in for Parts 3 and 4 below.
- ii. What did you learn from working within a team?
- iii. What would you do differently if you had to build it again?
- iv. What did you find most difficult to implement or understand.
- v. What do you wish you could have implemented if you had more time? Any other thoughts?

**(Part 2: 5 marks)**

**Part 3: Group - Design and implement a network using Packet Tracer to Model the following network:**

Include TWO networks – the Dublin HQ and the Galway office.

**In the main Dublin office implement the following:**

- a) Create different VLANs (at least 4 VLANs – name these with relevant departments e.g. SALES, MARKETING etc)
- b) Implement inter-VLAN communication between all of these VLANs.
- c) Implement **rapid** spanning tree between switches.
- d) Show evidence of Etherchannel being implemented (add links to implement this)-ensure the root bridge is in a suitable position in the network.
- e) Configure a highly available secure wireless access for a GUEST wifi network in the main Dublin office. Show evidence of these PC's connecting to the network (ensure that PC's connect using DHCP).

**On the WAN:**

- f) The organization requires you to create a WAN network bridging across their different sites. Each site has a WAN connection and all other sites will need to be connected e.g. Cork, Limerick, Athlone. The IT infrastructure manager has specified your main concern is the interconnection of Dublin and Galway sites but you are required to route through other sites to connect Dublin to Galway. Create a WAN network using private addresses from the 10.0.0.0 network which must provide connectivity to the Galway office. This WAN network will include a redundant path from the Dublin office through the Sligo office to Galway. However, this redundant path is known to have a slow connection.
- g) Utilizing a routing protocol of your choice to ensure all Dublin HQ PC's can communicate with the Galway branch. (note more points will be awarded for ability to demonstrate control of traffic through the network). Ensure that the main gateway router can be managed remotely from the Dublin site using a secure protocol (SSH protocol).

**In the Galway office:**

- h) Create a small LAN in the Galway office showing at least 2 switches and multiple PC's.
- i) Implement HSRP and provide redundant default gateways for end-user devices within the network if one of the routers fails.
- j) Ensure all PCs in the Galway office can communicate with PC's / servers in the Dublin's office.

**(Part 3: 40 marks)**

**Part 4: Group Justification Report**

Justify the design choices you made in Part 3. Use screen shots to provide key samples of why you did things for your implemented parts a) – j) (in part 3 above). **Note: Five additional marks can be scored if other best practice configuration and security is completed in part 3 and documented in part 4.**

**(Part 4: 15 marks)**

Your submission must be your own work and once completed, must be uploaded to Moodle within the time frame above. Any student found breaking College regulations will receive zero marks.

Copying and pasting large sections of text directly from web sites is NOT permitted and will result in zero marks awarded. **Read the assignment carefully and answer the questions that have been asked.**

## Specific Requirements

- For report sections: create using MS Word OR similar software and **upload as a PDF document**. Each member to upload group Packet Tracer file.
- You will need to supply the following:
  - **Individual** report – Part A
  - **Individual** contribution / reflection – Part B
  - **Group** Packet Tracer file – Part C
  - **Group** Justification report – Part D

## Marking Scheme Summary

Description	Weighting
<b>Report</b> Part 1: a) Design and planning for HA of data in the data centre	0 to 15 marks
1 b) Security of data in the data centre	0 to 10 marks
1 c) Scalability in the data centre - Availability and Benchmarking of data	0 to 10 marks
Part 2: Contribution and Reflection	0 to 5 marks
Referencing, professionalism / spelling / grammar	0 to 5 marks
<b>Implementation</b>	
Part 3: a – j Using Packet Tracer	
Dublin office	0 to 20 marks
WAN	0 to 10 marks
Galway office	0 to 10 marks
Part 4: Design choices well supported in report	0 to 10 Marks
Note: Five additional marks can be scored if other best practice configuration is completed and justified in section 4.	0 to 5 marks
<b>TOTAL</b>	<b>100 Marks</b>