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Computing • IT • Business

Network Management and High Availability

Continuous Assessment 1

Module Title:	**Network Management and High Availability**
Assignment Type:	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)
Project Title:	**Utilizing data centres to improve performance and provide high availability for business data**
Project Date:	15th October 2019
Assignment Compiler:	Greg South, gsouth@cct.ie
Weighting:	30% of CA
Due Date:	10th November 2019 @ 11:55 p.m.
Method of Submission:	Submission through **Moodle** ONLY
Late submissions:	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.

INDIVIDUAL PART : Miqueias Sousa dos Santos 2016287

Sumary

Introduction

Data centre houses critical computing resources in controlled environments and under centralized management, which enable enterprises to operate around the clock or according their business needs (Arregoces & Portolani, 2004) .

The main purpose of a data centre is to store and process data. An on-premises data centre or private data infrastructure is used by companies that keep all of their data and servers in-house.

It gives the company the advantage of having full control over their data and who has access to their systems.

DCS Data Centre Overview

The on-premise DCS data centre will be a strategic component of the enterprise it will house what is useful and valuable to the business.

An on-premise data centre will give DCS the full control of their data, it will facilitate the control of who has access to their systems, it means that only the company has control to their won data, an on-premises data centre helps to keep the data secury from a third party gaining access of a valuable information, it helps the company manage the data controling what should be kept and where it will be storaged and what shoud possible be deleted, control the time for back ups to avoid loos or damage os important informations.

A small on-premises data centre should follow the best practices adopted also in big data centres. Taking the above into consideration when creating the new DCS data centre a set of rules for a better architecture design must be taken in consideration.

A data centre should provide business-oriented goals, it means that it should give support to the business operation around the clock (resiliency), decrease the total cost of operation and maintenance to support the business functions (total cost of ownership) and fast deployment of applications and computing systems (flexibility).When taking these business goals into consideration we will find that we have to look at a number of (IT) initiatives, such as the following:

- Business Continuance: the ability of an organization to maintain essential functions during and after a disaster has occurred.
- Data center security : A set of policies and practices used to avoid unauthorized access, to protect a data centre from external threats and attacks or restrict internal access to the data.
- Server Consolidation: It refers to the cut of expenditure cost, obey server regulations and prevent server sprawl.
- Data Centre Consolidation: Every server has to be functioning at an optimal rate, cut the number of servers that is consuming more resources than necessary and operating at low capacity.
- Application consolidation: It gives the ability to run multiple, independent applications on optimized hardware. It enables you to streamline your resource and remove redundant functionalities. Also, it reduces complexity and allows better

utilization of computing resources.

- Storage consolidation or storage convergence: is a method of centralizing data storage among multiple servers. The objective is to facilitate data backup and archiving in an enterprise,minimizing the time required to access and store data.

These initiatives are a combination of what has to be addressed to the company in a short-term and firm a long-term strategic direction, it requires an architectural approach to avoid unnecessary problems if the data centre network is not flexible to accept and accommodate future changes. The design criteria should consider:

- **Availability** : It has to be available when required to use.
- **Scalability** : It has to be able to grow in volume and size and keep up working well.
- **Security** : It has to be secure, avoid unauthorized access and manipulation of a data center's resources.
- **Performance** : It has to do with the capacity and the ability of the data centre to perform its task and functions.
- **Manageability** : Manageability refers to how easy, less time consuming, efficient, detailed and effective ways are available to manage facilities and IT infrastructure.

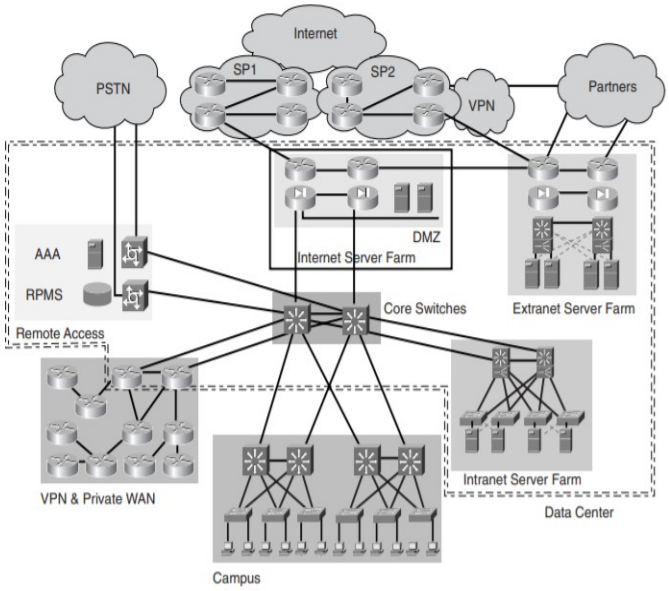
These design structure will be applied to a range of distinct functional areas of a Data Centre network:

- Infrastructure services
- Application services
- Security services
- Storage services
- Business services

These areas aggregates elements that will come together to form a data centre, such as routing, switching, load balance, packet filtering,backup and SAN extension.

Figure 1-1 Data centre on the interprise

source (Cisco Press Data Center Fundamentals)



The image presents the different building blocks used in the typical company network and the location where the data centre is located within that architecture.

The build block includes :

- Campus network
- Private WAN
- Remote Access
- Internet server farm
- Extranet server farm
- Intranet server farm

High Availability Design and plan of Data Centre for DCS

There are three main properties of Data Centre: Scalability, flexibility and high availability, these properties can be summarized as follows:

- **Scalability :** The data centre has to support growth
- **Flexibility** : The data centre must support new services without the need to rebuild its infrastructure.
- **High availability** : The data centre must have no single point of failure.

When planning a data centre we have to take in consideration the needs to address the following areas in the data centre facilities :

- Power capacity
- Cooling capacity
- Cabling
- Temperature control
- Fire and smoke system
- Physical security
- Rack space and raised floors

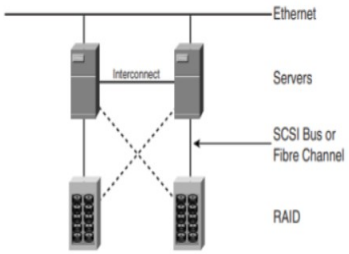
Discussing these aspects is important and essential when planning the creation of the DCS data centre, although it will not go deep in these aspects as the aim here is to give the best way to achieve the high availability in their data centre.

To High availability data centre at DCS we should consider :

- **Clustering:** The use of multiple servers that operate as a single device, in the case DCS case I would recommend just two servers, this way the cost would not be too high and one server could be used as a back up if one fail.

Figure 2-1 A Two-Node Cluster

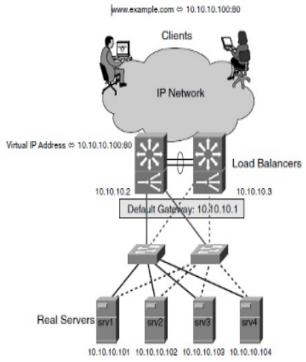
source (Cisco Press Data Center Fundamentals)



- **Redundancy Protocol:** Load balance performs important tasks and their location in the network, load balance is required to provide high availability. Redundancy simply implies the need of a device that can take over the critical functions performed by the load balancer with no disruption or the minimal possible.

Figure 2-2 Redundant Load-Balancing Design

source (Cisco Press Data Center Fundamentals)

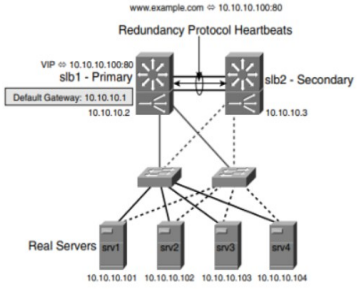


Because redundant designs offer no SPO (Single point of Failure), multiple load balances are required for the same server farm.

The redundancy protocol used between the load balance monitors the status of the load balancer and initiates the action leading for the failover from active to standby, or from the fallback mechanism back to the original active load balancer (Arregoces & Portolani, 2004) .

Figure 2- 3 Redundant Topology Details

source (Cisco Press Data Center Fundamentals)



The active load balance should be directly connected to the Spanning Tree Protocol (STP) root.

- **Connection and session state Failover:** high availability means having the ability to quickly failover to standby hardware, hopefully with no data loss.The connection between the two load balancers is dictated by the needs of the application. It could be a basic web browsing that is characterized by short-lived sessions or long-lived session such as VPN.

  There are three types of state failover:

- Stateless Failover : It offers failover just from primary to the secondary load balancer, this option is ideal for short-lived connections.
- Sticky Failover : It replicates the sticky tables needed to ensure that existing or a new connection are sent to the correct server.
- Stateful Failover : It replicates the connection and session state information between the pair of load balancers. It is suited for long-lives connections or sessions. A stateful Failover would be ideal for DCS data centres as it has to be available all the time.

  When looking at the needs of DCS for high availability we should take in consideration the uptime, a 99.999% uptime is the ideal for most companies.It is having the data available all the time, giving them the best alternative and policies to access, edit and keep it available for the students when they need to make use of the data for their studies as an exemple.

Security

When comes to security would be essential to DCS to have a policies access, to avoid a student to have access for a teacher data as an example, the use of LANs to define who access what is essential, the same measure should be taken when it refers to the physical access, so the data should be kept in a separated and locked room, where only authorized people should have access to it, a firewall should be used to separate these VLANs and server farms.

Port mappings would let them know which applications are used in the Data Centre and let them decide which port/protocol pairs to open on a firewall.

We also should consider security alternatives to prevent the loss of data as an example.We can find more about Data Centrer securty on the images bellow.

Figure 3-1 Security Actions

source (https://www.cisco.com/c/en/us/td/docs/solutions/Enterprise/Security/SAFE_RG/SAFE_rg/chap1.html)

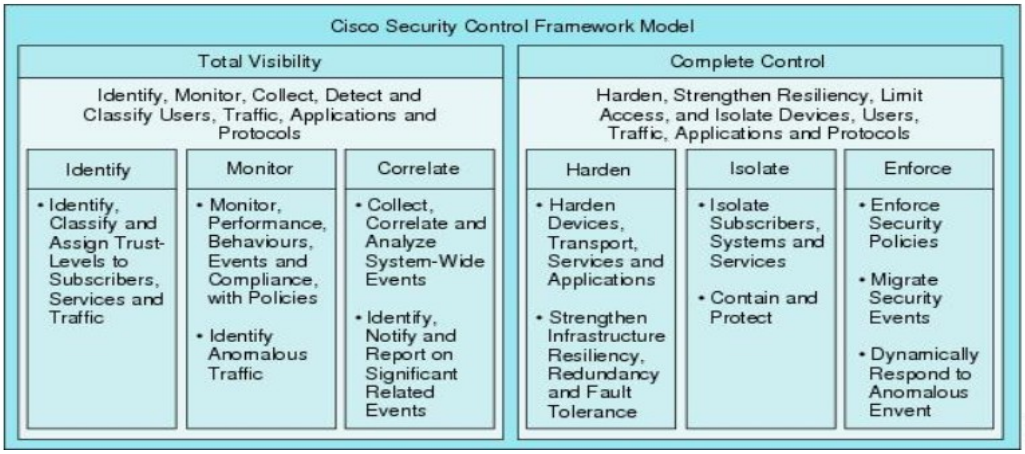
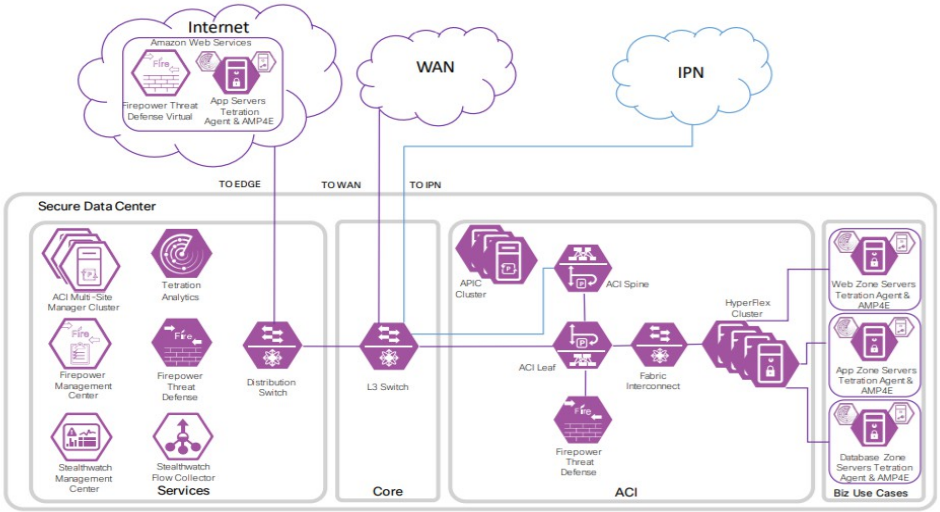


Figure 3-2 Secure Data Center Proposed Design ,single site

- source (https://www.cisco.com/c/dam/en/us/solutions/collateral/enterprise/design-zone-security/safe-secure-dc-architecture-guide.pdf)



Conclusion

To plan and understanding a data centre design and implementation is essential to know what is the main objective and the aim of the data centre, the creation of the design should provide the right levels of redundancy , availability, and predictability, these attributes requires the use of devices,configuration and, practices that will build up together to reach its objective.

Redundancy simply implies the need for backup device, that will take over the critical functions performed by the load balancers with minimal or no disruption.

High availability is related to the expected uptime provides by the system as a whole, it includes the rest of the infrastructure, while the predictability refers to having an environment that offers predictable failover and convergence times, and path able to be predicted during failures and steady state.

Even thougth an on-premisses data centrer is useful and give greats resultus I would suggest DCS to migrets to the cloud in the future.

References

Online

Symantec.com. (2019).*Data Center Security* . [online] Available at: https://www.symantec.com/en/ca/products/data-center-security [Accessed 2 Nov. 2019].

Cisco.com. (2019). [online] Available at: https://www.cisco.com/c/dam/en/us/solutions/collateral/enterprise/design-zone-security/safe-secure-dc-architecture-guide.pdf [Accessed 1 Nov. 2019].

Cisco. (2019).*Cisco SAFE Reference Guide - SAFE Overview [Design Zone for Security]*. [online] Available at: https://www.cisco.com/c/en/us/td/docs/solutions/Enterprise/Security/SAFE_RG/SAFE_rg/chap1.html [Accessed 5 Nov. 2019].

Epsilon. (2019).*On-Premises Data Centres Role Redefined in Cloud Era | Epsilon Blog*. [online] Available at: https://www.epsilontel.com/blogposts/redefining-the-role-of-on-premises-data-centres-in-the-cloud-era/ [Accessed 29 Oct. 2019].

Cisco. (2019).*Cisco Data Center Solutions & Services*. [online] Available at: https://cisco.com/c/en/us/solutions/data-center-virtualization/index.html#~products [Accessed 27 Oct. 2019].

En.wikipedia.org. (2019).*Data center*. [online] Available at: https://en.wikipedia.org/wiki/Data_center [Accessed 25 Oct. 2019].

Webopedia.com. (2019).*What Is On-Premises? Webopedia Definition*. [online] Available at: https://www.webopedia.com/TERM/O/on-premises.html [Accessed 26 Oct. 2019].

Hpe.com. (2019).*On-Premises Data Centres vs. Cloud Computing*. [online] Available at: https://www.hpe.com/ie/en/what-is/on-premises-vs-cloud.html [Accessed 25 Oct. 2019].

Books

Kulkarni, S. and Agrawal, P. (2014).*Analysis of TCP Performance in Data Center Networks*. 1st ed. New York, NY: Springer.

Avramov, L. and Portolani, M. (2014).*The policy driven data center with ACI*.1st ed. Indianapolis, IN: Cisco Press

Lammle, T. and Swartz, J. (2013).*CCNA data center*. Indianapolis, IN: Sybex.

Arregoces. and Portolani. (2004).*Data Center Fundamentals*. 1st ed. Indianapolis, IN: Cisco Press

Santana, G. (2014).*Data center virtualization fundamentals*. 1st ed. Indianapolis, IN: Cisco Press

Geng, H. (2014).*Data Center Handbook*. 1st ed. Hoboken, NJ: Wiley.

Hintz, C., Obediente, C. and Karakok, O. (2016).*CCNA data center DCICN 200-150 official cert guide*. 1st ed. Indianapolis, IN: Cisco Press

Individual contribution report

i. **What parts did you participate in for Parts 3 and 4 ?**

We had a few meetings in the past days, normally after class and during the reading week, so we could work on it together and make all decisions as a group, so I feel that the work presented is the result of the group collaboration, where I participated in both of the parts 3 and 4.

ii. **What did you learn from working within a team?**

When working in team I think that our productivity and performance was increased, working together makes us achieve much more than if we were working on our own. Also, we could apply our individual skills to the group work, share and discussing our ideas, what helped us to understand better the work and to clarify some particular areas when someone had some doubt about it, so we could work together to get in a common sense.It also helps with our interpersonal skills such as speaking and listening.I also think that collaborating with others will help identify our own strengths and weaknesses.

iii. **What would you do differently if you had to build it again?**

Think that we did a good work in the group part.I would take more time doing some research to do my individual part, I found a good number of sources, but wish I had more time to discuss it better and go deep when comparing my learning with the DCS needs.

iv. **What did you find most difficult to implement or understand.**

Think that it was hard to get the balance between the DCA needs and what we learned in college, sometimes it id difficult to understand that something that we consider good is not what the client needs, so find the middle road between what is the ideal for the client is quite complicated to understand.

v. **What do you wish you could have implemented if you had more time? Any other thoughts?**

I am not sure if I would have implemented anything else, but if I had to look back at it I would look at the security part.

Think that we did a good work, we worked well together, think that the time was a problem as we had to work on other things at the same time.