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7COM1029 – Network Systems Administration

Task 1- Research

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Introduction

In this research, I am going to talk about issues that are in line with the design, administration and management of networked computing environment. The issues mentioned are a key part of networking because the way a network is designed tells us if the system is redundant or not in cases of failure and if the system was designed following the hierarchical implementation. My research typically focuses on the two points of network resilience and redundancy and hierarchical network design. A computer network is a set of devices that are connected and share resources. According to an article published by (Rak, et al, 2020), resilience is defined as the ability of a network to provide and maintain an acceptable level of service in the face of various faults and challenges to normal operation. Hence, we can redefine the notion of network resilience and redundancy as the ability of the computer network to get back to its state by using alternative links in the event of a failure.

Obreque, et al (2015) claim that Hierarchical Network Design consists of finding the minimum cost spanning a bi-level network, in which the highest (or primary) level sub-network is a path connecting an origin and a destination node, and possibly visiting other nodes. All remaining nodes must be connected to this path through the lowest (or secondary) level sub-network, which is a forest. Usually, the highest-level network is more expensive. And hierarchical network design is the division of network layers into smaller manageable layers. Each layer should provide a function which specifies its role in the overall network.

As defined above every network design should be redundant. An example of redundancy can be if there is a power cut, Uninterrupted Power Supplies can be connected, and they keep the servers and other crucial equipment up while the backup generators turn on and this reduces data loss and improves maximum up-time. So, in cases like these, we can note how much time it took for the network to return to its state. Resilience and redundancy can be implemented by the passive or active configuration of alternate communication pathways, such as backup paths being disconnected from the impacted working paths (Rak, 2015).

In terms of connectivity, we also have network redundancy. This can be achieved by having more than one link pass through a node. A node can be any networking device and the link is the medium of connection between the nodes. Let us see look at the connection of switches and hosts as an example to show the network redundancy.

Diagram

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Figure .1

The above network illustrated by fig 1.1 is a simple switch redundancy in networking. Host A generates a message for host B, and the message is passed to Switch A which in turn broadcasts to all ports of the switch to Switches B and C since they are all connected. Switches B and C will be flooded with the generated broadcast and host B will be able to receive the message.

It is of great importance to have this technique implemented on the network from a business perspective. Large companies require continuity for the service they render. If the network is not properly implemented, it is prone to have many faults. A single fault in the network might cause customer loss, commercial loss and even customer credibility. For instance, if a company offers web hosting services and a fault occurs, and the websites are actively used by customers it results in a loss of customers. Therefore, the web hosting company should optimise their service by having alternative backup or recovery methods to improve the uptime to a maximum.

It makes the network highly reliable. This means that our network’s uptime is maximised, and this results in high network availability to our users, and we will have business continuity. From a security perspective, this is an advantage to the company as it ensures state-of-the-art measures. This means if there is a security threat the engineers can work on isolating it and that makes it much more effective.

The major disadvantage of having such a network is the need to purchase a lot of equipment and that could come costly for companies. Interconnected switches for a loop and when they broadcast information, they could cause a broadcast storm. This will affect the bandwidth and make the network very slow. However, the related optimization problems are frequently NP-hard because they involve NP-hard subproblems (Suurballe's algorithm for resilient path computation). (J. Suurballe, et al, 2010)

Additionally, to the above definition, it is a simple model that uses high-level tools to design a network that can be relied upon. It solves complex problems of large networks by making the network into smaller and more manageable areas. This is helpful to the designer who will know the best software and software to use in building the network.

Diagram

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Figure .1

The hierarchical design has three layers namely the core layer and this is where you find the heart of the network, the core routers and the firewalls. The second layer is the distribution, and, in this layer, you have the Layer 3 devices like Switches which operates on the third layer of the OSI model. On the last layer, we have the access layer where many end devices and a few switches operate in the Layer 2 switch, Desktop Pcs, Laptops etc.

Klincewicz (1998) defines the hierarchical design or model of a network as the “backbone/access structure”. The design for this system has a model that helps us prevent single-edge failure of the network. If one link fails, there is always another link that will be used.

Conclusion

I strongly recommend that we can comprehend the issues discussed in this report and consider the techniques for future designs and administration also in the management of the computer networked environment. As they are the basis of every network architecture of the modern world.

References

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