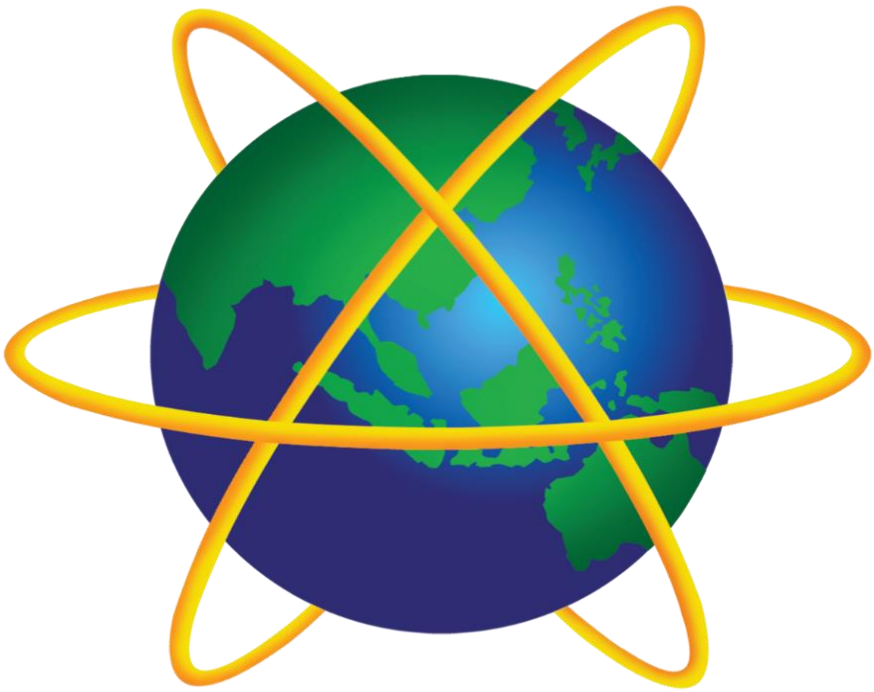

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ASIA PACIFIC UNIVERSITY
OF TECHNOLOGY & INNOVATION

ALTERNATIVE ASSIGNMENT
CT109-3-2-DCI
INTAKE ADP2F2102IT(NC)

NAME: TRESOR KALEMBO TSHIBANGU
TP NO: TP058435
SUBJECT: DATA CENTER INFRASTRICTURE
LECTURER NAME: Dr. KURUVIKULAM CHANDRASEKARAN ARUN
DUE DATE: November 2021

Question 1

Based on the requirement given by the management of Mapsis, the best option for the type of tier will be a tier IV data centre. The data centre needs to have a downtime of no more than 25 minutes per year and its uptime must be able to reach 99.995%. A tier 4 data centre is currently the best or highest level possible to reach in a data centre design when it comes to downtime and uptime.

It has a maximum downtime of 26.3 minutes per annum which is the closest to the requirement needed compared to tier I,II and III. It also has an uptime of 99.995% which is the highest among all the 4 tiers. (Hewlett Packard Enterprise Development LP, 2021)

A tier 4 data centre has 0 points of failure this means it provides a protection of data stream as well as a good redundancy for every component on the cite. This will be useful when there is any type of failure of a certain system and a second system will kick in to provide support to make sure that the process is not stopped for any reason. (Hewlett Packard Enterprise Development LP, 2021)

An example to illustrate this point is when there is power cut from the main source the UPS kicks in to allow the equipment to be powered down properly if there is no other power source that can be used to provide electrical power.

A tier IV data centre is designed to have an infrastructure that is based on a 2N+1 which meaning it has twice the capacity required for the operation plus a backup. This way it completes itself to be fully redundant. (Sunbird Inc, 201)

On top of that a tier IV has a 96 hours power outage protection. Which means that the generators used in a tier IV data centre can operate for up to 96 hours so that the data centre can be provided enough electrical power without outside getting it from outside. (Sunbird Inc, 201)

The only bad side of tier IV is the high cost due to satisfy the tier IV requirement for example the fact that it needs to have equipment that can support up to 3 times the workload required by the clients.

Why choosing a tier 4 over tier 1,2 or 3?

A tier 1 has an uptime of up to 99.671% and up to 28.8 hours of downtime which is equal to 1728 minutes per year while a tire 2 has an uptime of up to 99.741% and up to 22 hours of downtime which is equal to 1320 minutes per year and a tier 3 has an uptime of up to 99.982% and up to 1.6 hours of downtime per year which is equal to 96 minutes while a tier 4 has a uptime of 99.995% and up to 26.3 minutes of downtime per year. This makes

tier 4 the best option regarding the downtime and uptime requested by management of Mapsis. (Hewlett Packard Enterprise Development LP, 2021)

Unlike tier 1,2 and 3, a tier 4 is designed in a way to be fault tolerant which means there is always a second components to cover the failure of the main system, on top of that the data centre has a redundancy for every single component on the cite which promote the zero single.

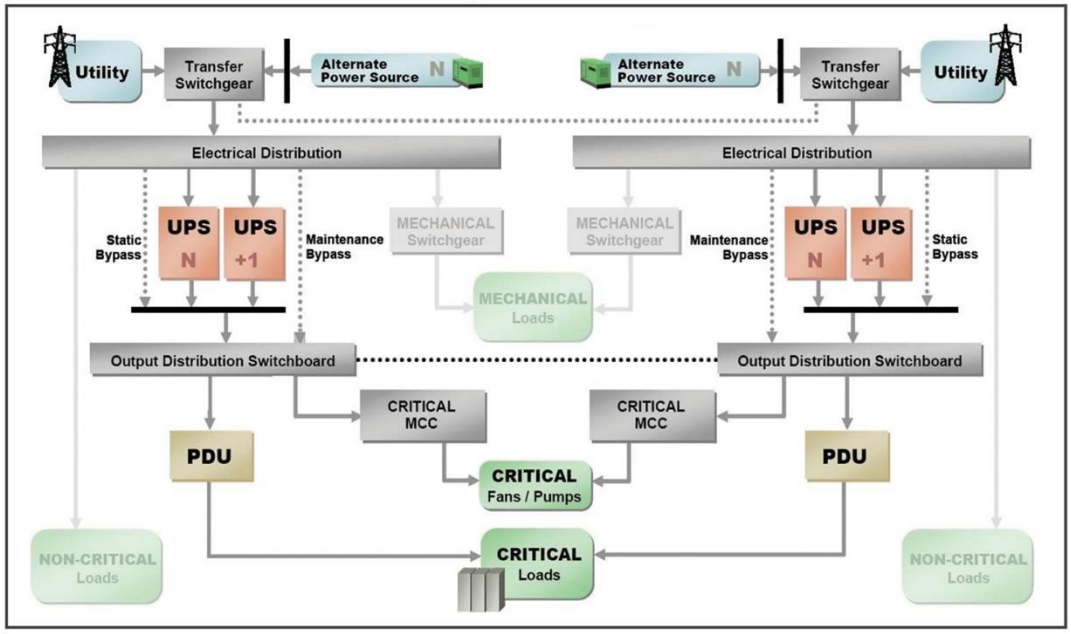

figure 1 : power redundancy paths diagram of Technopark (Karpov, 2014)

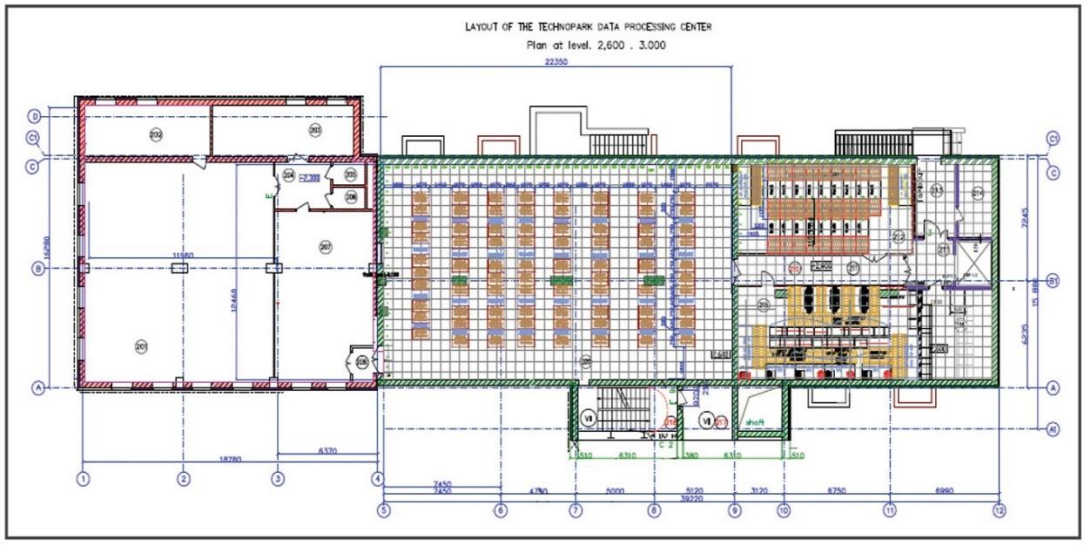

figure 2 : data processing layout of Technopark (Karpov, 2014)

Reference

Allen, M. (23 November, 2014). *Tier III vs Tier IV Data Center – What's the Difference?* Retrieved from datacenters.com: https://www.datacenters.com/news/tier-iii-vs-tier-iv-data-center-what-s-the-difference

Hewlett Packard Enterprise Development LP. (23 November, 2021). *What are data center tiers?* Retrieved from hpe.com: https://www.hpe.com/uk/en/what-is/data-center-tiers.html

Karpov, A. (23 November, 2014). *Russia's First Tier IV Certification of Design Documents*. Retrieved from journal.uptimeinstitute.com: https://journal.uptimeinstitute.com/russias-first-tier-iv-certification-design-documents/

Sunbird Inc. (23 November, 201). *Tier 4 Data Center*. Retrieved from sunbirddcim.com: https://www.sunbirddcim.com/glossary/tier-4-data-center

Question 2

Hierarchical network model

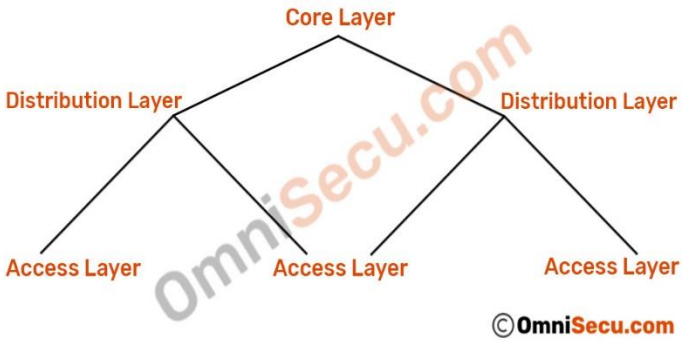

figure 3: illustration of a hierarchical network design (omnisecu.com, 2021)

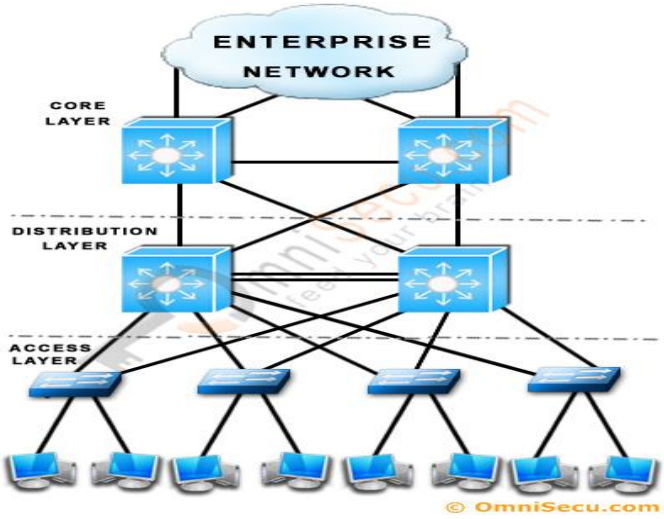

figure 4: hierarchical network design (omnisecu.com, 2021)

A hierarchical network model is considered to be a very helpful and important tool to design a network infrastructure that we can rely on because of its ability to make a network more manageable by dividing a given network into smaller areas. (omnisecu.com, 2021)

This type of model design has primarily 5 main advantages which are used to help designing, deploying, and maintaining the scalability, reliability as well as keeping the process cost friendly in the connection between networks. (omnisecu.com, 2021)

Access layer

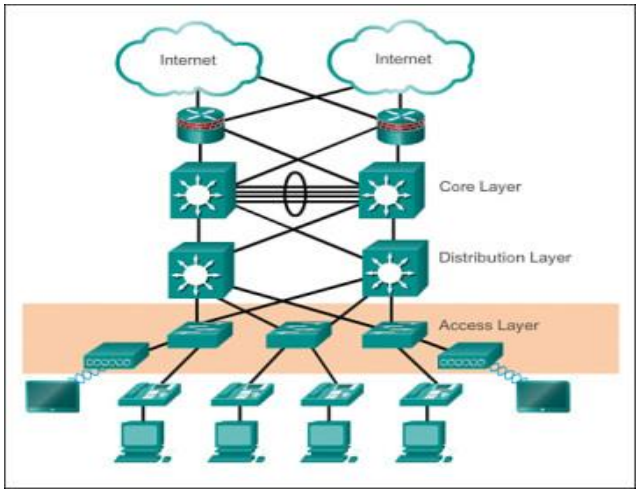

figure 5: access layer (Cisco Press, 2014)

In a local area network also known as LAN, an access layer is layer in which the connection between a network and end nodes are found. The access layer incorporates access switches that are associated with the end gadgets such as computers, printers, servers… switches in the access layer are used to guarantee that the end users receive the packets sent to them. (Network Direction, 2021)

Distributed layer

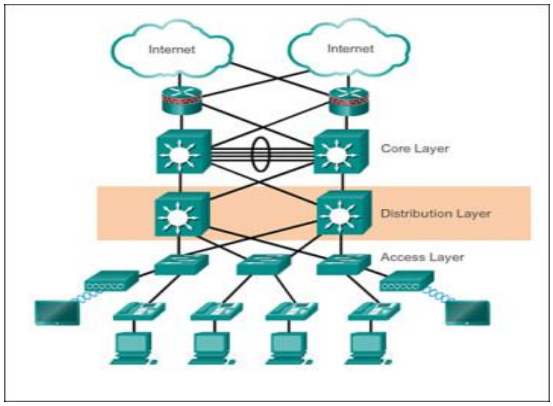

figure 6: distribution layer (Cisco Press, 2014)

Located between a core and access layer, the distribution layer has the purpose to provide boundary definition, this is done by implementing access control lists and other type of filters. This layer is also used to facilitate and guide the transfer of packets between the different virtual local area networks and subnets in the network. Therefore, distribution layer is considered as the layer that defines different policies the hierarchical network model. This layer is considered to house end-hand layer 3 switches. (Network Direction, 2021)

Core layer

A core layer which is the top layer in the design, is the layer that houses all the core routers which are usually expensive, amazingly big, and fast. It is also the layer that is considered as the backbone layer because it houses routers which facilitate the connection or communication between a data center and to the outside world. (Cisco Press, 2021)

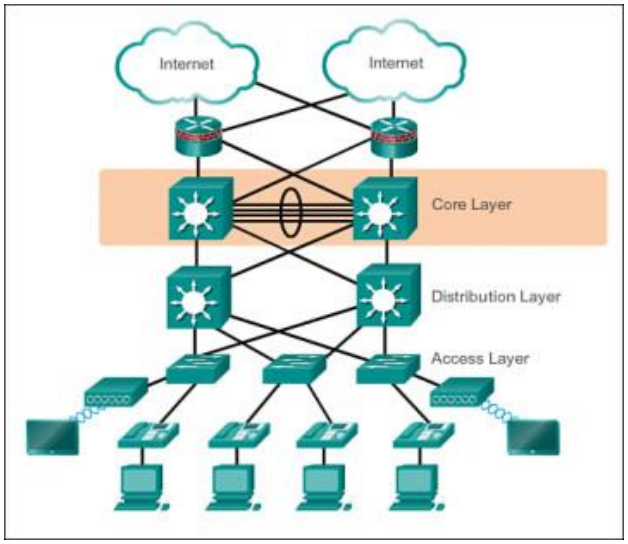

figure 7: core layer diagram (Cisco Press, 2014)

References

Cisco Press. (9 May, 2021). *Cisco Networking Academy Connecting Networks Companion Guide: Hierarchical Network Design*. Retrieved from ciscopress.com: https://www.ciscopress.com/articles/article.asp?p=2202410&seqNum=4

Network Direction. (26 November, 2021). *Hierarchical Network Model*. Retrieved from networkdirection.net: https://networkdirection.net/articles/network-theory/hierarchicalnetworkmodel/

omnisecu.com. (25 November, 2021). *Cisco's Three-tier Hierarchical Network Model*. Retrieved from omnisecu.com: https://www.omnisecu.com/cisco-certified-network-associate-ccna/three-tier-hierarchical-network-model.php

Question 3

According to data center standards TIA 942 the space must be divided into 5 parts namely entrance room, main distributed area, horizontal distribution area, zone distribution area, and equipment distribution area.

- Entrance room is a place where all third-party gadgets are found such as the internet provider equipment. Security is quite low here because it is the area of a data center where almost everyone can have access to, this is due to the sensitivity of the information found in a data center and in case there is something wrong with those gadgets, the effect on the data center will not be very big and in case there is a need to troubleshoot those gadgets, the technician will not have to go through the whole security process.
- Main distributed area is the place of the data center where routers, backbone LAN/SAN switches, PBX, and M13 Muxes are found. It can also be seen as a place where all the core gadgets used for internetworking connection are found.
- Horizontal distribution area is the place of the data center where switches are found.
- Zone distribution area and Equipment distribution area, here all end-user gadgets are found such as computers, servers, and storages devices. The way the equipment is designed depends on the gadgets categories called zone distribution area in a way such as zone 1 will be the zone where computers and phone will be found, zone 2 where servers are located and finally zone 3 where storage devices can be found.

References

Services, E. D. (Director). (2021). *TIA 942 Data Center Standard (Full Webinar)* [Motion Picture]. Retrieved from https://www.youtube.com/watch?v=NlUMHFCUG0w

Question 4

In order to build a successful data center, a couple of parameters must be taken in consideration namely the selection of the land where the data center must be built on ,selection of the type of hardware and software to be used for the data center. Beside that there is a couple of other parameters which can be considered as technical goal in an ordinary network to satisfy and kept at the highest priority for an effectiveness of a good data center.

Availability

It can be seen as the extent or an amount of time for which a system can be accessed and operated on. It is addressed by proportion of framework uptime to add up to time:

Availability = System Uptime/Total Time (Uptime + Downtime)

Availability and data center are interconnected in a way that every availability level there is tier located for it like in a tier 1 data center there is a guaranteed availability of 99.671%, a tier 2 data center there is a guaranteed availability of 99.741%, a tier 3 data

center there is a guaranteed availability of 99.982%, and finally a tier 4 data center there is a guaranteed availability of 99.995%. (Industry Perspectives, 2021)
High availability of hardware of a data centre is to be conserved when designing a data centre. In view of necessities, bunching, load adjusting, repetitive frameworks should be planned. (Industry Perspectives, 2021)

Capacity

Satisfactory assets to productively store and cycle enormous and expanding measures of information. Limit boundary is urgent to know the size of a data center as well as different offices to be planned. It addresses greatest burden that can be dealt with by a data center. The aim of capacity as a parameter is to ensure that there is enough of everything to make as smooth as possible the availability any components at a data center. (Industry Perspectives, 2021)

Criticality

Criticality of the services that are provided to the clients is another major key parameter that is to be considered when designing a data center. Considering that the type of service that is being provided is very high critically speaking and that its downtime is not cost friendly to the company, the data center and IT infrastructure must depend on it. (Industry Perspectives, 2021)
The level of criticality can be viewed in a scale of 1 to 5 with 1 being the lowest level and 5 being the highest level of criticality. For example, while designing a data center for an entity like a bank the level of criticality should be a level 5. (Industry Perspectives, 2021)

Data Integrity

Information is put away and recovered precisely as it was gotten. The data is only accessible by the authorized clients.

Density

It is a key parameter that is coupled firmly with other factors such as efficiency, scalability, and availability. Density can be referred to as the amount of accessible data that can be stored in a certain storage device. (Industry Perspectives, 2021)

Efficiency

It is another important key parameter that is used to determine the ration of the amount of energy or electric power and amount of energy used by all the IT hardware that is being used by the data centre. (Industry Perspectives, 2021)

Growth plans

Development plan is one more central point which will give us data on what can be generally anticipated throughout some stretch of time as far as burden and necessity. server farm ought to be intended to deal with the heap according to the development plans throughout the long term. Factor-in development plan as it will assist with adding equipment and offices at required timetables, hence setting aside cash by not keeping them inactive. (Industry Perspectives, 2021)

Manageability

It alludes to how simple, proficient, less tedious, itemized, and viable ways are available to oversee offices and IT foundation. Capacity to oversee gadgets of various sellers. Autonomous foundation the executive’s stage for the data center and clients to deal with the network. This component will assist with making server farm activities, the board and observing simpler and secure. (Industry Perspectives, 2021)

Performance

Information that is conveyed rapidly or with low idleness.

Reliability

High unwavering quality guarantees effective tasks of the data center . If the client experience on big business administrations falls apart because of data center network blames, the help extension of an endeavor will be impeded, and clients won't utilize the administrations, diminishing the benefits. Dependability is a significant viewpoint when planning an endeavor data center organization. The dependability configuration is accomplished through excess connections, key gadgets, and key help modules. (Industry Perspectives, 2021)

Scalability

The adaptability of capacities empowers the data center to help esteem added administrations. The data center gives capacities, for example, load adjusting, dynamic substance replication, and virtual local area network to help esteem added administration development. (Industry Perspectives, 2021)

Security

Security in data center is enforced by the monitoring of the entire network as well as the data center physical space. an integral security policy is provided by the data center to ensure its own security. (Industry Perspectives, 2021)

Serviceability

It alludes to the how easy it is to retrieve the source cause of a problem and its solution. While the data center is being designed the level of serviceability should be kept in mind so that troubleshooting is much easier to do as well as a failure of a components should not paralyze the data center. (Industry Perspectives, 2021)

Reference

Industry Perspectives. (28 November, 2021). *Parameters to Consider for a Successful Data Center Design Project*. Retrieved from datacenterknowledge.com: https://www.datacenterknowledge.com/archives/2013/12/11/parameters-consider-successful-data-center-design-project