

Research Document

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The Open Window

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1 INTRODUCTION

As the IT Specialist in an advisory role for Glen Hub, a video streaming start-up similar to Netflix, my primary responsibility is to provide guidance on the setup and launch of their website and services. To begin with, I will focus on four key areas: Internal Networking Plan, Hosting Plan, Threat Analysis, and Implementation Budget.

1. **Internal Networking Plan:** I will assess the office space and design an internal networking plan to ensure seamless communication and data flow among employees.
2. **Hosting Plan:** I will evaluate various hosting options to determine the most suitable solution for Glen Hub's video streaming website.
3. **Detailed Threat Analysis:** I will conduct a comprehensive threat analysis to identify potential risks associated with Glen Hub's website and infrastructure. By identifying these risks, I will develop security measures and protocols to mitigate the threats effectively.
4. **Implementation Budget:** To ensure a successful launch, I will assist Glen Hub in preparing an implementation budget that covers all the necessary IT infrastructure, networking equipment, hosting expenses, and security measures.

2 INTERNAL NETWORK PLAN

In devising the internal network plan for the company, Glen Hub, I have evaluated various topologies, including star, bus, mesh, and hybrid. Glen Hub operates within three rooms: a reception office, a developer workspace accommodating 15 developers, and a director's office. With these specifications in mind, we will now proceed to analyse the topologies. Given our specific requirements and setup, we can eliminate the bus topology as the first choice.

While the bus topology offers certain advantages, the disadvantages outweigh them in this particular case.

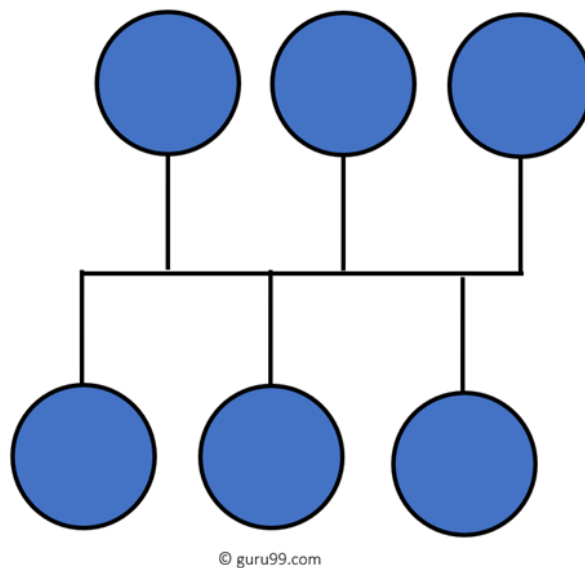


Figure 1: Lawrence Williams, Bus Topology, 2021. guru99.com.

Advantages: The bus topology proves to be efficient for small networks like Glen hub, as in the case with a startup company (Sunbird [sa]). Its installation is both easy and cost-effective, allowing for hassle-free addition or removal of devices without significant expenses related to IT installation services (Sunbird [sa]). Additionally, the bus topology requires less cabling compared to alternative topologies, aligning with the aforementioned advantages (Sunbird [sa]).

Disadvantages: For Glen Hub, a bus topology is not suitable due to its nature as a video streaming service. If the cable experiences damage, the entire network will either fail or be divided (Sunbird [sa]). This would result in server downtime, damaging the company's reputation and potentially leading to customer loss. Moreover, the time required to resolve such issues can further harm the company's reputation, especially considering the challenges of troubleshooting problems in a bus topology (Sunbird [sa]). Additionally, bus topologies are relatively slow and less suitable for larger networks, which could pose problems as our company expands in the future (Sunbird [sa]).

Now let's consider the star topology as a potential solution for Glen Hub's network setup.

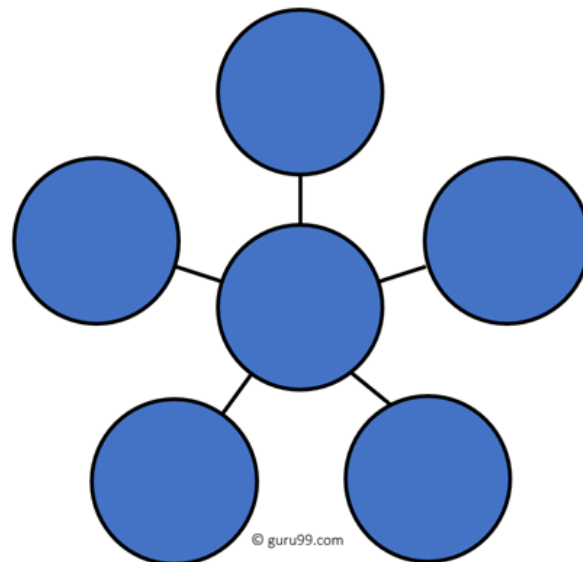


Figure 2: Lawrence Williams, Star Topology, 2021. guru99.com.

Advantages: The star topology offers advantages due to its structure, where devices are connected to a central switch rather than directly to each other. This arrangement minimises the impact of a single point of failure since each device is isolated by its connection to the switch (Sunbird [sa]). It also ensures high performance by eliminating data collisions (Sunbird [sa]). Additionally, the simplicity of requiring only one port for each device to connect to the switch makes troubleshooting more manageable (Sunbird [sa]).

Disadvantages: While the star topology offers the advantage of connecting devices to a central switch, it is important to note that its disadvantages are closely tied to this aspect. If the switch malfunctions, all connected devices become inactive (Sunbird [sa]). The switch requires additional resources and maintenance (Sunbird [sa]), and the overall performance of the network relies on the proper functioning of the switch (Sunbird [sa]).

Next, we turn our attention to the mesh topology, which emerges as the most suitable solution for Glen Hub's specific requirements.

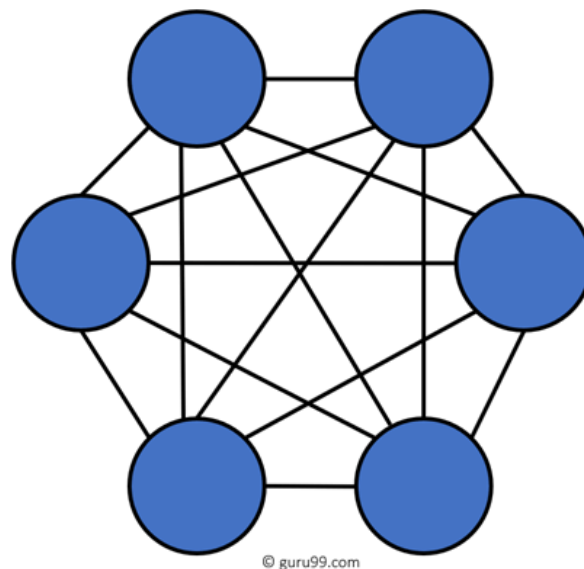


Figure 3: Lawrence Williams, Mesh Topology, 2021. guru99.com.

Advantages: The mesh topology offers the advantage of facilitating simultaneous data transmission among multiple devices, enabling efficient handling of high traffic volumes (Sunbird [sa]). This characteristic proves particularly advantageous for a video streaming service like Glen hub. Additionally, in terms of customer service, the mesh topology ensures that if one device fails, the rest of the network remains unaffected in terms of data transmission (Sunbird [sa]). Furthermore, the company can expand the network seamlessly without the need to shut down the server since adding devices to the network does not disrupt ongoing data transmission (Sunbird [sa]).

Disadvantages: In this case, the drawbacks of implementing a mesh topology are primarily linked to expenses, making it challenging for startup companies. Firstly, the installation and maintenance of the network demand significant time and resources (Sunbird [sa]). Additionally, due to the need for constant activity of all devices, there is a high power requirement (Sunbird [sa]), necessitating the provision of generators or similar equipment in the event of power outages. Furthermore, the mesh topology

requires a substantial amount of cables and ports to establish the network infrastructure (Sunbird [sa]).

While the mesh topology is the ideal choice for Glen Hub, its implementation can be costly. As a cost-effective alternative, I recommend initially adopting a hybrid topology that combines elements of both mesh and star topologies. This way, they can begin with a star topology and gradually transition to a mesh topology in the future. By starting with a star topology, we can effectively manage expenses and smoothly migrate to the more robust mesh topology over time.

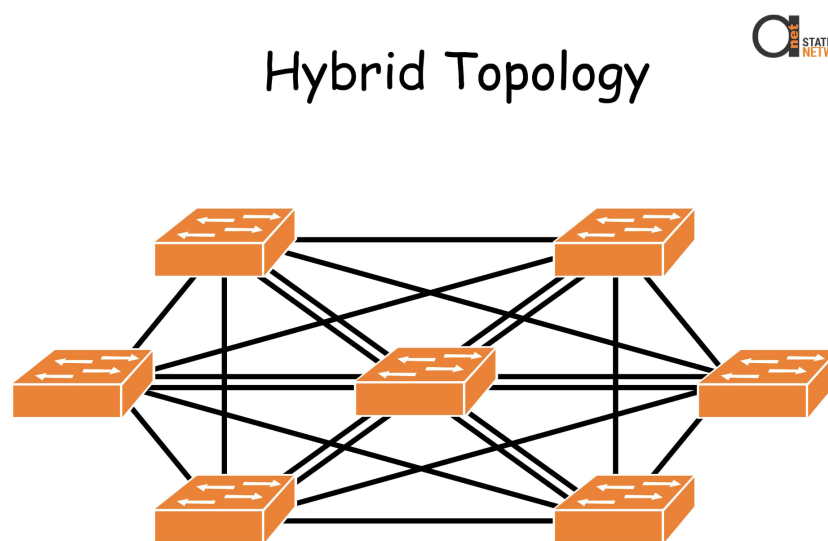


Figure 4: Hybrid Topology, 2018. ad-net.com.

Moving over to transmission media that the company can use there are a few options they can choose from:

Ethernet cables: Ethernet cables such as Category 7 cables, are a popular choice for wired connections in a mesh topology. They provide reliable and high-speed data transmission, making them suitable for connecting nodes that are in close proximity. The company in this case, however, should make sure to get Cat7 cables as they are most fit to handle high speed transmissions. Cat7 cables can transmit up to (10Gbps) 10000 Mbps at 100m (RS [sa]). Ethernet cables offer good performance

and are relatively cost-effective compared to fibre optic cables, especially for shorter distances within the premises.

Fibre Optic Cables: Fibre optic cables are an excellent choice for a video streaming company employing a mesh topology. They offer high bandwidth and can support the fast transmission of large amounts of data, which is essential for delivering high-quality video content. Fibre optic cables also provide low latency and are resistant to electromagnetic interference, ensuring reliable and consistent data transmission.

Wireless Transmission: In a mesh topology system, wireless transmission can be employed to connect nodes without the need for physical cables. Wi-Fi (IEEE 802.11) or other wireless mesh networking technologies (such as IEEE 802.11s) can be utilised to facilitate wireless communication between nodes. This is particularly useful in scenarios where running cables is impractical or when establishing connections in challenging or remote locations.

3 HOSTING PLAN

Considering the expected user base and the number of videos available for streaming on GlenHub's website, it is crucial to choose an appropriate hosting plan that can accommodate the anticipated traffic and provide a seamless streaming experience. Here are some considerations for selecting a hosting plan:

Scalability: With a projected user base of 1,200,000 users in Southern Africa and 500,000 users in the midwest region of the United States, GlenHub should opt for a hosting plan that offers scalability. This ensures that the hosting resources can be easily adjusted and expanded as the user base grows. Look for providers that offer solutions such as cloud hosting.

Bandwidth: Streaming videos requires a significant amount of bandwidth to deliver a smooth playback experience. GlenHub should choose a hosting plan that provides ample bandwidth to handle the anticipated number of users and video streams.

Consider hosting providers that offer high-bandwidth plans or even dedicated hosting options to ensure sufficient resources for video streaming.

Content Delivery Network (CDN): To enhance the streaming performance and reduce latency for users in different regions, GlenHub should consider incorporating a CDN into their hosting plan. A CDN helps distribute content across multiple servers geographically, improving the delivery speed and reducing buffering for users accessing the website from various locations.

Storage Capacity: With an expected video library of 500,000 to 1,000,000 videos, GlenHub will require substantial storage capacity for hosting and managing these files. Choose a hosting plan that offers ample storage space to accommodate the growing video collection.

The company will also have to calculate the hosting plan option they'll have to purchase:

Starting with the storage capacity, To calculate the total storage requirement: Multiply the average file size per video by the estimated number of videos you anticipate having available. This will give you the total storage requirement for your video library. For example, if the average file size is 500 MB and you plan to have 500,000 to 1,000,000 videos, the total storage requirement would range from 250 TB to 500 TB. They will also need to take into account the total storage per user: To calculate this, multiply the average video size by the number of videos each user is expected to stream over a given time period. This can be an average number based on industry standards or user behaviour research. For instance, if you estimate each user will stream 10 videos on average, multiply the average video size (500MB) by 10 to get the total storage per user (5,000MB or 5GB). Furthermore the estimated total storage for each region: Multiply the total storage per user by the number of users in each region. For Southern Africa with 1,200,000 users, the estimated storage capacity would be $1,200,000 \text{ users} * 5\text{GB} = 6,000,000 \text{ GB}$ or 6,000 TB.

Similarly, for the Midwest region with 500,000 users, the estimated storage capacity would be $500,000 \text{ users} * 5\text{GB} = 2,500,000 \text{ GB}$ or 2,500 TB.

To summarise the total amount of storage the company will need, we can add up the storage requirements for the video library and the storage requirements for each region:

Total Storage Requirement for Video Library:

- Range: 250 TB to 500 TB

Total Storage for Southern Africa (1,200,000 users):

- 6,000 TB

Total Storage for Midwest region of the United States (500,000 users):

- 2,500 TB

To get the total storage needed, we sum up the above values:

$$\begin{aligned} \text{Total Storage} &= \text{Video Library Storage} + \text{Southern Africa Storage} + \text{Midwest Storage} \\ &= (250 \text{ to } 500 \text{ TB}) + 6,000 \text{ TB} + 2,500 \text{ TB} \end{aligned}$$

The total storage requirement will vary depending on the number of videos in the library. However, based on the estimates provided, the total storage needed will fall within the range of approximately 6,750 TB to 8,000 TB.

4 THREAT ANALYSIS

There are many underlying threats that can be a danger to a company such as Glen hub. A few of the bigger problems can be:

DDoS attacks: A distributed denial-of-service (DDoS) attack is an intentional and malicious act aimed at disrupting the regular flow of traffic to a targeted server, service, or network (Cloudflare 2022). The attacker achieves this by overwhelming the target with an excessive amount of internet traffic, causing it or its surrounding infrastructure to become inaccessible (Cloudflare 2022). To address this issue, one effective approach is the implementation of Blackhole routing. This solution is available to network administrators and involves creating a designated route, often referred to as a blackhole route. By employing this method, both legitimate and malicious network traffic are directed towards this route, effectively routing them to a null destination or blackhole, where they are discarded and no longer affect the network (Cloudflare 2022).

Data Breach: A data breach occurs when unauthorised individuals gain access to and extract information from a system, without the knowledge or permission of the system's owner (TREND MICRO 2015). This can happen to both small companies and large organisations. The stolen data may include sensitive, confidential, or proprietary information, such as credit card details, customer records or trade secrets (TREND MICRO 2015). To mitigate the risk of data breaches, enterprises can adopt certain measures. One effective strategy is to patch systems and networks regularly (TREND MICRO 2015). IT administrators should ensure that all systems within the network are updated and patched, minimising the chances of attackers exploiting vulnerabilities present in outdated or unpatched software. Another approach involves educating and enforcing security practices among employees (TREND MICRO 2015). By raising awareness about potential threats, training staff to recognize social engineering tactics, and implementing guidelines on how to handle security incidents, organisations can enhance their overall security posture and reduce the likelihood of data breaches.

A man-in-the-middle attack: A man-in-the-middle (MITM) attack refers to a situation where an attacker positions themselves between a user and an application, secretly intercepting their communication (Imperva 2019). This can be done either to listen in on the conversation or to impersonate one of the parties involved, creating the illusion of a normal exchange. The objective of such an attack is to steal personal

information, such as login credentials, account details, and credit card numbers (Imperva 2019). The primary targets are usually users of financial applications, software-as-a-service (SaaS) businesses, e-commerce websites, and other platforms that require login credentials. To mitigate the risks associated with MITM attacks, website operators can implement secure communication protocols like Transport Layer Security (TLS) and Hypertext Transfer Protocol Secure (HTTPS) (Imperva 2019). These protocols ensure that data transmitted between users and the website is encrypted and authenticated, making it difficult for attackers to intercept site traffic and decrypt sensitive information like authentication tokens. By employing these security measures, website operators can effectively safeguard against MITM attacks, enhancing the security of their users' personal information.

Viruses: A computer virus is a form of malicious software, also known as malware, that spreads among computers and causes harm to data and software (Fortinet. [sa]). The primary objective of computer viruses is to disrupt computer systems, leading to significant operational problems and potential loss or leakage of data. To address this threat, one effective measure is to utilise a reliable antivirus product. Trusted antivirus software plays a critical role in preventing malware attacks and safeguarding computers against virus infections (Fortinet. [sa]). By performing regular scans, these antivirus programs detect and block malware, ensuring that devices remain protected from potential threats. Implementing such antivirus solutions is an essential step in defending against computer viruses and maintaining the security of computer systems.

5 IMPLEMENTATION BUDGET

When compiling the budget for Glen Hub's storage capacity, we considered the estimated range of 6,750 TB to 8,000 TB. To determine the costs associated with these storage requirements, we explored the pricing options offered by Oracle Cloud. Based on the images provided, we can see the corresponding prices for the two storage capacity ranges. These prices indicate the cost of utilising Oracle Cloud's storage services for Glen Hub's video streaming company. It is important to

note that the prices displayed in the images may vary based on factors such as location, specific storage service selected, and any additional features or services required. By considering the estimated storage capacity and the associated prices provided by Oracle Cloud, Glen Hub can calculate the projected costs and incorporate them into their budget planning for the deployment in the cloud.

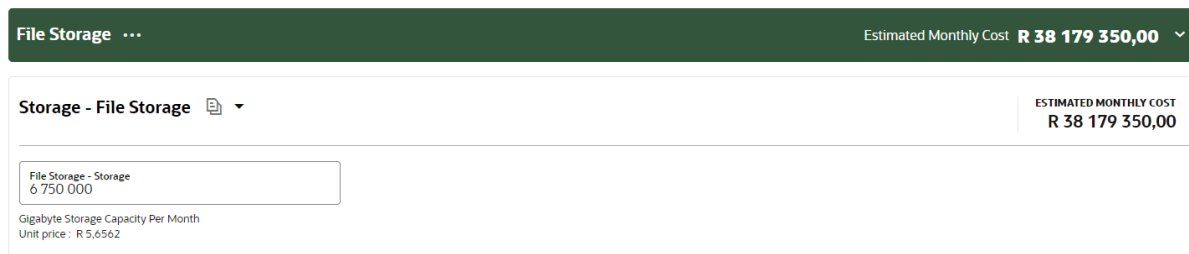


Figure 5: Mareli Lourens, Implementation Budget 6750 TB, 2023. Artwork in possession of the artist.

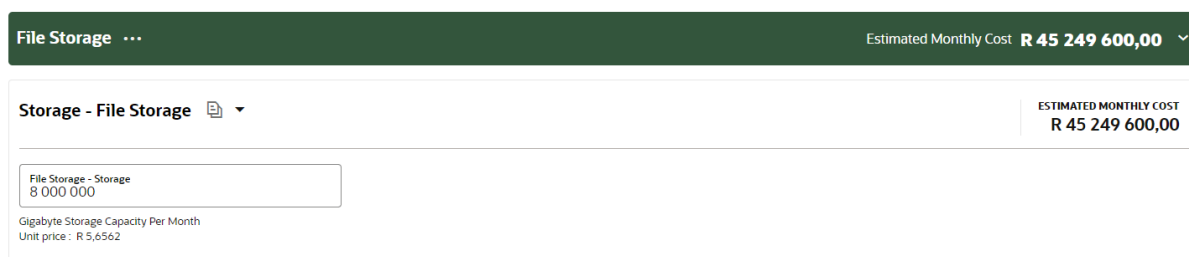


Figure 6: Mareli Lourens, Implementation Budget 8000 TB, 2023. Artwork in possession of the artist.

6 CONCLUSION

In conclusion, as the IT Specialist advising Glen Hub, a video streaming start-up, I have covered four key areas: Internal Networking Plan, Hosting Plan, Threat Analysis, and Implementation Budget. By addressing these key areas, Glen Hub can establish a robust internal network, choose a suitable hosting plan, implement effective security measures, and plan the necessary budget for a successful launch of their video streaming website. These considerations will contribute to providing a seamless user experience, safeguarding data and infrastructure, and positioning Glen Hub for growth and success in the competitive streaming industry.

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