Lutfor Rahman Lipu

Student ID: 0344420

As the Songlarp Harbees Corporation (SHC) plans on upgrading their network system to a better and more modern version, they have clear plans to do so. As they plan to get their own fixed IP and a private IP for their internal use, they also plan to subnet their network into 4 different networks for their different departments in the organization. This will allow each department to have their own specific private IP address which other departments will not be able to access. They also require that all services have their own appropriate servers to support their web hosting using a Microsoft solution while incorporating a MySQL database. The organization also plans on upgrading the employees' computers to the latest Windows operating systems with the addition of the servers to their latest version. Additionally, one of the requirements of the SHC is that all network solutions are made wireless besides the ISP connection, and that the server room is enlarged and renovated to allow for the addition of the Development Department. They also desire new broadband services to be subscribed to and direct internet access with the addition of sufficient servers and printers for their staff and management. Finally, the organization will be adopting all security policies, standards and procedures that follow with the new and updated network. All these requirements are needed to be fulfilled in a cost effective and a secure manner for the network.

Design Layout

- Network Diagram

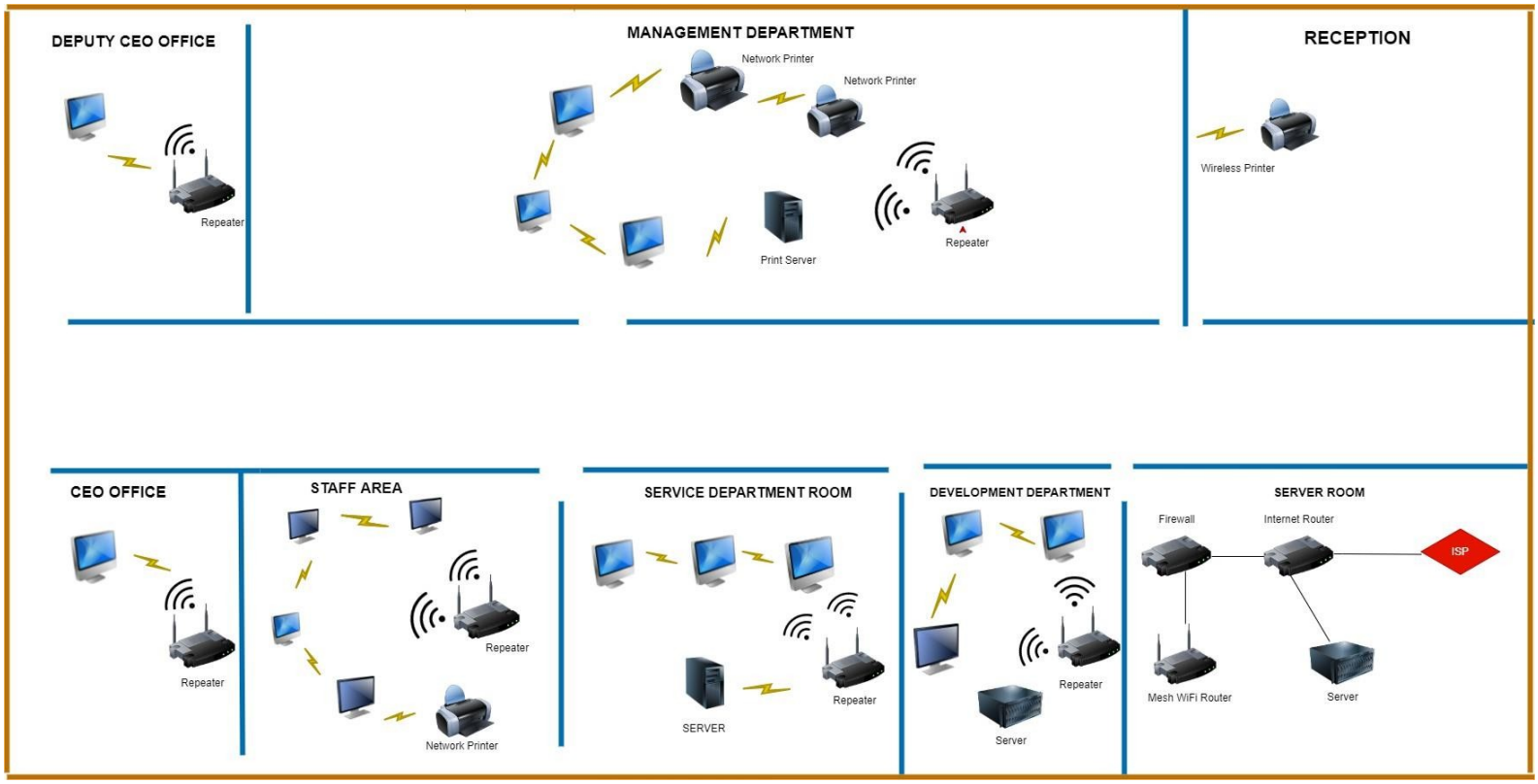

Fig: Office network infrastructure diagram

Network diagram explanation

- Networked devices

1) Servers

Location: Server room, Development department, Services department

Justification: Servers are placed in the Server room and are connected to the office network infrastructure using a WiFi Mesh Network Gateway router. Servers are also placed in the Development section to allow the developers to perform test runs on new updates and changes made for the company servers before pushing the update to the live production servers in the Services department.

2) **PCs**

Location: Development department, Services department,Staff department,Management department
Justification: PCs will be used by the company personnel to perform all the tasks of the respective departments and will be the primary media of access to the company network. The PCs will be strategically placed in the various departments to ensure they can connect to the company WiFi network and optimum signal strength will be ensured so that the PCs can get the maximum speed possible.

3) **Internet Router**

Location: Server room

Justification: The Internet Router will be used to connect to the ISP's network and will act as the primary gateway to the internet for the company. The router will interface with the main WiFi mesh network router to facilitate internet access for the entire office space.

4) **WiFi Mesh Network Gateway router**

Location: Server room

Justification: The WiFi Mesh Network Gateway router will act as the primary wifi router for the company's network infrastructure. The repeaters placed in the various departments of the company will connect to the main gateway router.

5) **Hardware Firewall**

Location: Server room

Justification: Hardware firewalls use Stateful Packet Inspection (SPI) to inspect inbound and outbound packets in the network to provide an extra layer of protection against network attacks. The network administrator can also configure the firewall to create and enforce access controls and security policies for the network.

6) **WiFi Repeater**

Location: Development department, Services department, Staff department, Management office, CEO office, Deputy CEO office

Justification: Wifi repeaters will be used to extend the coverage of the WiFi mesh network. They will be strategically placed in the different departments of the office to ensure the WiFi signal reaches all parts of the office.

7) **Wireless Modem:**

Location: Staff department, Management office, CEO office

Justification: Wireless modems would be used for granting direct access to the internet for some users in case the company network gets slow and congested. This will also work as a load-balancer for the company's total internet bandwidth.

8) **Print Server**

Location: Staff department, Management office

Justification: Print servers will be used to handle and manage print jobs and queues at the network-level. The wireless printers will be connected to the print server via the WLAN network and company employees would be able to connect and perform print jobs on the printers from their PCs.

9) **Network Printer**

Location: Staff department, Management office, Visitor's Area

Justification: Network printers will connect to the print servers for serving print requests from the respective departments in the office.

- Operating Systems

Windows 11 for Enterprise (Employee PCs): Windows 11 is the latest version of Windows currently on the market. It has the latest security patches and updates from Microsoft. It is the single most popular consumer OS in the existing market.("Desktop Operating System Market Share Worldwide | Statcounter Global Stats", 2022) It has a user-friendly interface which allows for easy navigation throughout the OS and allows users to perform tasks with relative ease. It has the largest selection of applications to cater for every need of the users including a vast collection of first-party Microsoft applications i.e. Office which is a quintessential application for businesses and enterprises. Since, security is a top priority for businesses around the world, Windows 11 has the latest security updates and patches to ensure the highest level of security and confidentiality for the user. IT administrators have full control over the operating system deployment and can configure the operating system for the users from the cloud. Moreover, since it is the latest iteration of Windows, Microsoft will update the operating system for a long time to patch critical security vulnerabilities as well as add new features.

Windows Server 2021 and MySQL (Company Servers): Microsoft's Windows Server operating system is designed specifically for usage on servers. Servers are computers that are meant to run continuously and supply resources to other computers. As a result, Windows Server is virtually exclusively employed in corporate settings. Windows Server 2021 is the latest iteration of Microsoft's Windows Server line of Operating Systems. Therefore, it has the latest updates and security patches from Microsoft. Servers need to have a strong line of defense against attackers and hackers alike and need regular maintenance to update them with the latest updates and patches by IT professionals. Windows Server can be configured to be used as a web server for hosting purposes.

MySQL server can also be set up for the company's database requirements. It is an open-source relational database system that has the widest compatibility.("What is MySQL? Everything You Need to Know", 2022) Furthermore, due to its relational nature, it is also the easiest to use and deploy. ("What is MySQL? Everything You Need to Know", 2022)The company IT administrators can set up and configure a MySQL database in their Windows Server operating system to facilitate the company's server database.

Ubuntu (Development Department PCs): Ubuntu is one of the more prominent and popular distributions of the Linux operating system. It is an Unix operating system that can be used in businesses and enterprise settings because it is highly configurable and requires no cost for deployment.(McFadden et al., 2022) The operating system is also open-source which means the organization can modify the operating system to cater for their specific requirements. (McFadden et al., 2022) This operating system is much preferred for development purposes due to its

flexibility and developer-focused features.(McFadden et al., 2022) It can be used by the development team to test out new features and patches before deploying onto the live production servers. Moreover, developers could also perform quality assurance testing and debugging of the patches to make sure it’s stable and bug-free before deployment.

IP addressing scheme:

Since the internal IP needs to be divided into 4 segments for each of the departments in the organization. We will be dividing the internal IP address into 4 different subnets so each department can access their own subnet only and can not view other files in the other subnets. The fixed IP that will remain the same is 202.100.2.3/24 is a class C IP address that contains 256 hosts. Similarly the private IP is 192.168.19.0/24 which is also a class C IP address, but this will be further subnetted into 4 subnets that will consist of 64 hosts each. Using a binary system we can see below in the subnet mask of the private IP that 2 bits are borrowed from the host section

Subnet mask: 11111111.11111111.11111111.<u>11</u>000000

The IP address of the 4 subnets with their corresponding subnet masks will be:

IP Address	**Subnet mask**
192.168.19.0/26	255.255.255.192
192.168.19.64/26	255.255.255.192
192.168.19.128/26	255.255.255.192
192.168.19.192/26	255.255.255.192

Information Security Standard Implementation

In regards to the proposed new network configuration for Songlarp Harbees Corporation (SHC), the most appropriate information security framework and standards has to be introduced and implemented to maintain the internal employee integrity and proficiency against any possible or potential wireless network threats. Information Security Standards is highly crucial and it is most commonly observed as a set of procedures for an organization to abide to achieve a more steadfast security framework.Therefore, the most recommended information security standards to Songlarp Harbees Corporation (SHC) will be informatively introduced in this section of the report.

The first recommended Information Security Standards is the “NIST SP 800-53” which is a very well known cyber security standard for government agencies as well as private sectors such as Songlarp Harbees Corporation itself. NIST SP 800-53 offers a set of procedures and protocol cyber security compliances tailored for multiple and diverse job scopes in an organization. For instance when it comes to Songlarp Harbees Corporation, the control families of the NIST SP 800-53 information security standards will fall under Accounting & Auditing. Additionally, NIST SP 800-53 also proposed a set of privacy and control terminologies which benefits Songlarp Harbees Corporation (SHC) with the intention of shifting their network paradigm and framework to play a part in this modern era. The terminology proposed by the NIST SP 800-53 which benefits SHC is as follows:

- Human Errors (Intentional and Unintentional)
- Organizational Structural Failures
- Cyber Attacks
- Natural Disasters

As analyzed from the detrimental errors which may result Songlarp Harbees Corporation in great loss as a small accounting firm once the modern compliance proposed in this report is being implemented, NIST SP 800-53 provides a set of guidelines for Songlarp Harbees to achieve a greater and more secured organizational infrastructure.

However, when it comes to network security, another set of Information Security Standards known as the 802.11i which is a revamped version of Information Security standards whereby most of the strength and weaknesses of a wireless network which is being implemented in the new network compliance in Songlarp Harbees Corporation are being revised. The robustness of the 802.11i developed by the IEEE task group is able to enhance the organization's network security by revising the organization’s wireless network strength and weaknesses. 802.11i standards are highly beneficial for Songlarp Harbees Corporation (SHC) which newly abides with modern network compliances and framework to further understand their own network security as well as what are the way forwards for the organization to achieve a more secured network framework. The 802.11i framework introduce 2 terminology, one is to authenticate the network access control and the second terminology is to provide encryption and data integrity

towards the organization such as Songlarp Harbees Corporation which holds a great number of confidential auditing and accounting data outputs. Therefore, with the implementation of the standards mentioned above, it delivers a set of policies for Songlarp Harbees Corporation to abide by, as modern solutions come with modern risks.

Cybersecurity Policies

Data breach response policy

- Prepare storage redundancy to guard against data loss due to hardware failure as well as deliberate damage from a malicious assault.
- Utilize penetration testing services to test your systems vulnerabilities and social engineer your employees to establish a safe and controlled environment.
- Secure policies will be implemented to include role-based segmented access, secure password policies and multi-factor authentication.

Remote access policy

- Employees agree to never disclose their passwords to anyone, particularly to family members if business work is conducted from home.
- All remote access users using personal devices connected to the SHC network must maintain all required security standards on working devices including updated virus and malware protection, having up to date operating systems and application security patches.
- Additionally, the remote access user must agree and accept that the user's access and connection to the SHC network may be monitored in order to track unusual usage patterns or other suspicious conduct by recording dates, times, and length of access.

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