**Secure Network Services – Final Assessment**

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# Introduction

Corona Fightback Solution is a company that specializes in medical research and strives to make a difference in the fight against the COVID-19 pandemic. The company's **200 staff members** are distributed across multiple departments**: Medical Research, Marketing, Accounts, Technical Research, Managers, and Receptionists.** To ensure seamless communication, collaboration, and secure data sharing, the company requires a well-designed network infrastructure that is both robust and scalable.

This report will outline the essential aspects of the company's network design, including the **network topology, subnetting and IP addressing, VLAN implementation**, and **other network features that contribute to a reliable and efficient networking environment.** The proposed network solution will not only provide high-performance connectivity but also facilitate secure data sharing and collaboration among different departments, ultimately supporting the company's mission in the fight against the pandemic.

By addressing the unique requirements of each department and implementing a cohesive network design, Corona Fightback Solution can create an optimized infrastructure that promotes productivity, efficiency, and innovation while ensuring data security and seamless communication among its staff members.

# Network Topology Design

The proposed network topology for Corona Fightback Solution is a hierarchical design, consisting of a core layer, distribution layer, and access layer.

The **core layer** is responsible for high-speed data routing between the distribution layer switches, ensuring efficient data transfer and minimizing latency. This layer acts as the backbone of the network, providing high-speed connectivity and enabling seamless communication between different network segments.

The **distribution layer** provides routing, filtering, and VLAN traffic management for the access layer. This layer plays a critical role in managing network traffic and maintaining performance, as it handles inter-VLAN communication and enforces access policies to secure network resources.

The **access layer** connects end-user devices to the network, such as computers, servers, and printers. This layer serves as the entry point for users and devices, providing connectivity and enforcing security measures such as VLAN, access control lists (ACLs), and port security.

By adopting a hierarchical network topology, Corona Fightback Solution can achieve scalability, reliability, and ease of management for their network infrastructure. This design facilitates growth and expansion, as new devices and departments can be easily integrated into the existing structure. Additionally, the separation of network functions into distinct layers enables better control over network resources and improved fault isolation, resulting in a more stable and secure environment.

# Subnetting and IP Addressing

**Subnetting and IP Addressing** are crucial for efficiently organizing a network. In this design, **Variable Length Subnet Masking (VLSM)** was utilized to minimize IP address waste and optimize the allocation of IP addresses. The table below presents the IP address breakdown for each subnet:

* **Medical Research**: With 140 hosts needed, this subnet has been assigned a /24 prefix, resulting in 254 available addresses. The **Network Address** is 172.16.0.0, with a **Subnet Mask** of 255.255.255.0. The **Usable Range** is from 172.16.0.1 to 172.16.0.254, and the **Broadcast** address is 172.16.0.255. The **Wildcard** is 0.0.0.255.
* **Marketing**: This subnet requires 20 hosts, leaving 30 unused addresses. The **Network Address** is 172.16.1.0, with a /27 prefix and a **Subnet Mask** of 255.255.255.224. The **Usable Range** spans from 172.16.1.1 to 172.16.1.30, and the **Broadcast** address is 172.16.1.31. The **Wildcard** is 0.0.0.31.
* **Accounts**: With a need for 10 hosts, this subnet has 14 unused addresses. The **Network Address** is 172.16.1.32, with a /28 prefix and a **Subnet Mask** of 255.255.255.240. The **Usable Range** goes from 172.16.1.33 to 172.16.1.46, and the **Broadcast** address is 172.16.1.47. The **Wildcard** is 0.0.0.15.
* **Technical Staff**: Also requiring 10 hosts, this subnet has 14 unused addresses. The **Network Address** is 172.16.1.48, with a /28 prefix and a **Subnet Mask** of 255.255.255.240. The **Usable Range** spans from 172.16.1.49 to 172.16.1.62, and the **Broadcast** address is 172.16.1.63. The **Wildcard** is 0.0.0.15.
* **Managers**: This subnet needs 10 hosts, leaving 14 unused addresses. **The Network Address** is 172.16.1.64, with a /28 prefix and a **Subnet Mask** of 255.255.255.240. The **Usable Range** goes from 172.16.1.65 to 172.16.1.78, and the **Broadcast** address is 172.16.1.79. The **Wildcard** is 0.0.0.15.
* **Receptionists**: With a need for 10 hosts, this subnet has 14 unused addresses. The **Network Address** is 172.16.1.80, with a /28 prefix and a **Subnet Mask** of 255.255.255.240. The **Usable** Range spans from 172.16.1.81 to 172.16.1.94, and the **Broadcast** address is 172.16.1.95. The **Wildcard** is 0.0.0.15.

By implementing this IP addressing scheme, the network design for the Corona Fightback Solution company ensures efficient allocation and management of IP addresses across different departments.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Hosts Needed | Unused Hosts | Network Address | Slash | Mask | Usable Range | Broadcast | Wildcard |
| Medical Research | 140 | 254 | 172.16.0.0 | /24 | 255.255.255.0 | 172.16.0.1 – 172.16.0.254 | 172.16.0.255 | 0.0.0.255 |
| Marketing | 20 | 30 | 172.16.1.0 | /27 | 255.255.255.224 | 172.16.1.1 – 172.16.1.30 | 172.16.1.31 | 0.0.0.31 |
| Accounts | 10 | 14 | 172.16.1.32 | /28 | 255.255.255.240 | 172.16.1.33 – 172.16.1.46 | 172.16.1.47 | 0.0.0.15 |
| Technical Staff | 10 | 14 | 172.16.1.48 | /28 | 255.255.255.240 | 172.16.1.49 – 172.16.1.62 | 172.16.1.63 | 0.0.0.15 |
| Managers | 10 | 14 | 172.16.1.64 | /28 | 255.255.255.240 | 172.16.1.65 – 172.16.1.78 | 172.16.1.79 | 0.0.0.15 |
| Receptionists | 10 | 14 | 172.16.1.80 | /28 | 255.255.255.240 | 172.16.1.81 – 172.16.1.94 | 172.16.1.95 | 0.0.0.15 |

# VLANs

VLAN implementation is crucial for segmenting the network and ensuring efficient resource allocation, security, and manageability. The proposed **VLANs** for each department are as follows:

1. **VLAN 10** will be designed for the Medical Research Department and will be assigned the IP address of 172.16.0.2.
2. **VLAN 20** will be designed for the Marketing Department and will be assigned the IP address of 172.16.1.2.
3. **VLAN 30** will be designed for the Accounts Department and will be assigned the IP address of 172.16.1.34.
4. **VLAN 40** will be designed for the Technical Research Department and will be assigned the IP address of 172.16.1.50.
5. **VLAN 50** will be designed for the Managers Department and will be assigned the IP address of 172.16.1.66.
6. **VLAN 60** will be designed for the Receptionists Department and will be assigned the IP address of 172.16.1.82.

By implementing VLANs in the network, it will provide benefits such as improved **network performance, enhanced security, easier network management,** and **cost savings.** By segmenting networks into smaller, more manageable units, VLANs reduce broadcast traffic, increase security by limiting access to sensitive data, and simplify network administration.

# Email Server

To facilitate better communications and collaboration among the different departments in the company, an **email server** in the Receptionists department would be essential. With a dedicated email server, staff members in the company can send and receive messages, documents, and other important files, regardless of their physical location.

The email server acts as a central hub for all internal and external communications, providing **a secure** and **reliable platform** for exchanging information. With the ability to set up different accounts for staff members, the email server ensures that messages are delivered to the intended recipient quickly and efficiently. This enables seamless communication within the company and helps to maintain a smooth flow of information.

Furthermore, by implementing an email server in the Receptionists department, administrative tasks such as scheduling meetings, managing events, and sharing company-wide announcements can be managed effectively. This not only improves the overall efficiency of the department but also strengthens the company's **organizational structure** and promotes better coordination among all departments.

By investing in an email server, Corona Fightback Solution will be able to maintain a professional, organized, and secure communication system, which is crucial for the company's success in the fast-paced and demanding environment of medical research.

# Web Server

Each network department at **Corona Fightback Solution** has its own **customized HTTP web server** as part of the network design, providing a range of benefits and features that support the company's objectives. The web servers allow each department to create a **distinct web presence**, reflecting their unique identity and objectives. This helps promote a sense of unity within the department and makes it easier for employees to identify with their specific team.

The web servers also act as a **central hub for departmental information**, hosting crucial documents, project updates, and other relevant resources. This makes it easy for employees to access the information they need, minimizing delays and fostering a more **efficient work** **environment.** By using web servers, departments can **efficiently communicate** with one another, share resources, and collaborate on projects. This eliminates communication barriers and facilitates cross-departmental teamwork, enhancing the company's overall performance.

Each department's web server can be configured with **robust security measures**, ensuring that sensitive information is protected from unauthorized access. This is particularly important for departments that handle confidential data, such as financial or client information. Web servers make it simple for departments to **keep their online resources up to date**, ensuring that all employees have access to the latest information and that the company remains agile in response to changes in the business environment.

Web servers can also be equipped with **monitoring and analytics tools**, allowing departments to track usage patterns, user behaviour, and other valuable insights. This data can be used to improve the user experience, identify bottlenecks, and optimize departmental workflows.

By incorporating customized HTTP web servers into each department's network infrastructure, Corona Fightback Solution can facilitate **seamless communication**, promote collaboration, and **enhance overall productivity** throughout the organization. This strategic investment in network infrastructure is a critical component of the company's ongoing success and growth.

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# DHCP

The **Dynamic Host Configuration Protocol (DHCP)** is a network protocol that streamlines the assignment and management of IP addresses and network resources. By implementing a **DHCP server** in Corona Fightback Solution's **Technical Department**, numerous benefits can be provided.

The **DHCP server** will automatically **assign IP addresses, subnet masks, default gateways**, and **DNS servers** to devices that join the network, eliminating the need for manual configuration. This saves time and effort for network administrators while reducing the chance of human errors.

A **DHCP server** will manage the **IP address pool** and lease information for the entire company, including the **Technical Department**, ensuring that IP addresses are efficiently utilized and preventing IP conflicts. As the company grows and new devices are added to the network, the **DHCP server** can dynamically allocate **IP** **addresses** from the available pool, making it easy to scale the network. **The DHCP server** can also support different **subnets** and **VLANs**, offering flexibility in network design and expansion.

By automating **IP address**, **DHCP** reduces the workload on network administrators, allowing them to focus on other tasks and maintain network stability. Additionally, **DHCP** can be configured to provide other network settings, such as **Network Time Protocol (NTP) servers** and **Windows Internet Naming Service (WINS)** servers, further simplifying network management.

**Reduced downtime** is another benefit of implementing a **DHCP server**. **DHCP servers** can be set up in a redundant configuration, ensuring that if one server fails, another can take over the role of assigning **IP addresses,** preventing network downtime, and maintaining business continuity.

By implementing a **DHCP server** for the **Technical Department**, Corona Fightback Solution can streamline the management of **IP addresses** and **network resources**, ensuring a seamless and efficient experience for users connecting to the network. This will contribute to a more robust and reliable network infrastructure, ultimately supporting the company's growth and success.

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# OSPF

By implementing OSPF, Corona Fightback Solution can