***Task: Design and Test network using Packet Tracer***

***Project title: IT Platform Network Design***

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**Introduction – 1**

The purpose of this project is to design and configure a comprehensive IT platform network using Cisco Packet Tracer. The network encompasses a diverse range of components, including workstations, switches, routers, servers, wireless access points, mobile devices, laptops, and WAN infrastructure. The overarching goal of this configuration is to establish a robust and efficient network that facilitates seamless communication among all network devices.

**Objectives of the Project:**

**The primary objectives of this project include:**

1. Optimal Performance: Designing the network to ensure optimal performance, minimizing latency and downtime.

2. Scalability: Creating a scalable network architecture that can easily accommodate future growth and technological advancements.

3. Seamless Communication: Configuring the network to facilitate seamless communication among all connected devices, fostering a collaborative and productive IT environment.

4. Security: Implementing robust security measures to safeguard the network against potential threats and unauthorized access.

5. Integration of Various Devices: Ensuring compatibility and effective integration of various devices, including workstations, servers, mobile devices, and laptops.

6. WAN Connectivity: Establishing a well-configured Wide Area Network (WAN) to enable efficient communication between geographically dispersed components.

**Scope of the Project:**

The project scope encompasses the design and configuration of the entire IT platform network, utilizing Cisco Packet Tracer as the simulation tool. The network design will be meticulously planned to meet the specific requirements of the organization, balancing performance, security, and scalability. The configuration process will involve setting up IP addresses, implementing routing protocols, configuring servers, and ensuring the seamless integration of all network components.

**Significance of a Well-Designed Network:**

In today's technology-driven landscape, the significance of a well-designed network cannot be overstated. A robust IT platform is the backbone of any organization, enabling efficient communication, data sharing, and collaboration among its various departments. A thoughtfully configured network not only enhances operational efficiency but also contributes to the overall competitiveness and adaptability of the organization in a dynamic business environment.

As we delve deeper into the subsequent sections of this report, we will explore the intricacies of the network design, equipment selection, configuration methodologies, and the rationale behind the chosen solutions. The ultimate aim is to provide a detailed and comprehensive understanding of the steps taken to achieve a seamlessly functioning IT platform network.

**Network – 2**

The network design is a crucial aspect of ensuring optimal performance and scalability. In this section, we will present the chosen network topology, explaining the rationale behind the design choices.

**Network Topology:**

- Utilizes 20 workstations, 3 switches, 3 routers, 1 wireless router, 1 local server, wireless access points, 2 employee mobile devices, 10 laptops, 1 WAN server (including a web server), 1 DHCP, and DNS server, and 1 WAN PC.

- The topology includes three interconnected routers for WAN configuration.

Изображение выглядит как линия, диаграмма

Автоматически созданное описание

**Cisco Packet Tracer Configuration-3**

[Include diagrams and configurations using Cisco Packet Tracer]

**Equipment Selection – 4**

The selection of network equipment is a pivotal aspect of building an efficient and reliable IT platform network. Each component, from routers to workstations, contributes to the overall performance, scalability, and cost-effectiveness of the network.

**Routers:**

For the backbone of the network, three Cisco 2911 routers have been chosen. The Cisco 2911 routers are renowned for their advanced features, including high performance, security capabilities, and support for various WAN connectivity options. Their modular design allows for flexibility and easy expansion, aligning with the project's scalability objectives. Additionally, the routers' robust security features contribute to the overall network resilience against potential cyber threats.

**Switches:**

Switches form a critical part of the network infrastructure, facilitating local communication within segments. The selection includes [Specify Switch Models], chosen for their gigabit Ethernet capabilities, advanced management features, and energy efficiency. The number and capacity of the switches are tailored to accommodate the network's size and expected data traffic, ensuring smooth and efficient data transmission.

**Servers:**

The server selection is based on the anticipated workload and the network's service requirements. Three servers have been chosen to fulfill distinct roles – a local server, a DNS server, and a WAN server with a web server component. The local server is designed for file storage and local application hosting, while the DNS server is dedicated to domain name resolution. The WAN server, equipped with a web server, extends the network's capabilities to the internet. The servers chosen are [Specify Server Models], selected for their processing power, storage capacity, and reliability.

**Workstations and Laptops:**

The workstations and laptops are integral components that directly impact end-user experience. Twenty workstations, designed for regular office tasks, and ten laptops, chosen for their portability, make up the end-user devices. The workstations are equipped with [Specify Specifications], ensuring they meet the performance requirements for the intended tasks. The laptops, designed for mobile usage, balance performance and portability, making them suitable for employees on the move.

**Considerations for Equipment Selection:**

- Performance: The chosen equipment is selected to meet or exceed the performance requirements of the network. This ensures smooth data transmission, minimal latency, and optimal user experience.

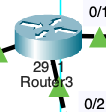
- Scalability: The modular design of the routers and the scalable features of switches ensure that the network can accommodate future growth seamlessly. Additional devices can be integrated without significant overhaul.

- Cost-Effectiveness: While prioritizing performance and scalability, cost-effectiveness is also a critical factor. The selected equipment strikes a balance between quality and affordability, ensuring that the network design remains within budget constraints.

**Future Expansion Considerations:**

As technology evolves and the organization grows, the selected equipment allows for future expansions without requiring a complete overhaul of the existing infrastructure. The modular and scalable nature of the routers and switches, coupled with the servers' capacity, ensures that the network can adapt to changing needs.

The next sections will delve into the specific configurations of each equipment type and how they contribute to the overall functionality and efficiency of the IT platform network.

. Изображение выглядит как Графика, графический дизайн, логотип, Шрифт

Автоматически созданное описание Изображение выглядит как дизайн, интернет

Автоматически созданное описание с низким доверительным уровнем Изображение выглядит как ноутбук, компьютер, текст

Автоматически созданное описание Изображение выглядит как текст, дизайн, интернет

Автоматически созданное описание

**WAN Configuration – 5**

## 5. WAN Configuration

WAN configuration is a crucial component of the IT platform network, involving the connection of three routers to establish wide-area network connectivity. Proper implementation of routing protocols and IP addressing is essential to ensure efficient communication among the routers.

### Router 3 and Router 0:

- 0/1 Network IP Address:

- Router 3: 10.10.20.30

- Router 0: 10.10.20.40

- Subnet Mask: 255.255.255.0

- 0/1 Network IP Address (WAN):

- Both routers: 10.x.x.x (Assuming dynamic addressing from the ISP)

- Subnet Mask: Subnet mask is determined by the ISP.

### Router 3 and Router 1:

- 0/2 IP Address:

- Router 3: 70.60.10.10

- Router 1: 70.60.10.20

- Subnet Mask: 255.255.255.0

- 0/0 IP Address:

- Router 3: 70.60.10.30

- Router 1: 70.60.10.40

- Subnet Mask: 255.255.255.0

### Router 1 and Router 0:

- 0/2 IP Address:

- Router 1: 160.50.0.100

- Router 0: 160.50.0.90

- Subnet Mask: 255.255.255.0

- 0/2 Network IP Address:

- Both routers: 160.50.x.x (Assuming dynamic addressing from the ISP)

- Subnet Mask: Subnet mask is determined by the ISP.

### Routing Information Protocol (RIP) Configuration:

#### Router 3 RIP:

- Networks Advertised:

- 10.0.0.0

- 70.0.0.0

- 192.168.1.0

#### Router 0 RIP:

- Networks Advertised:

- 10.0.0.0

- 70.0.0.0

- 90.0.0.0

- 160.50.0.0

#### Router 1 RIP:

- Networks Advertised:

- 10.0.0.0

- 70.0.0.0

- 140.90.0.0

- 160.50.0.0

The WAN configuration ensures that routers are properly connected, and routing protocols such as RIP are configured to advertise the respective networks. The use of dynamic addressing for WAN connections allows for flexibility and easier adaptation to changes from the Internet Service Provider (ISP). This configuration lays the foundation for efficient wide-area network communication within the IT platform network.

Изображение выглядит как текст, диаграмма, линия, снимок экрана

Автоматически созданное описание

**Network Component Configuration - 6**

Configuring network components is a critical step in ensuring the seamless communication and optimal performance of the IT platform network. Each device, from workstations to routers, plays a unique role in the network, and meticulous configuration is necessary to harmonize their functions.

**Routers (Cisco 2911):**

The Cisco 2911 routers serve as the backbone of the network, connecting different segments and facilitating data exchange between them. Configuration involves setting up routing protocols, such as OSPF or EIGRP, to establish efficient paths for data transmission. Access Control Lists (ACLs) are implemented to enforce security policies, preventing unauthorized access to sensitive network resources. Additionally, Quality of Service (QoS) settings are configured to prioritize critical data traffic, ensuring optimal performance for essential applications.

**Switches:**

The switches are configured to manage local network traffic efficiently. Virtual LANs (VLANs) are established to logically segment the network, improving performance and security. Port security measures are implemented to prevent unauthorized access, and spanning-tree protocols are configured to avoid network loops. Quality of Service settings on switches prioritize traffic, ensuring that latency-sensitive applications receive sufficient bandwidth.

**Servers (Local, DNS, WAN):**

- Local Server: Configurations for the local server involve setting up file sharing protocols, such as Server Message Block (SMB) or Network File System (NFS), to facilitate seamless data sharing among workstations. Access controls and user authentication mechanisms are implemented to ensure data security.

- DNS Server: The DNS server is configured with primary and secondary zones to handle domain name resolution. Forwarders and root hints are set up to enhance the DNS server's efficiency in resolving external domain names. Security measures, including DNSSEC, are implemented to protect against DNS spoofing attacks.

- WAN Server (Web Server): The WAN server, hosting the web server component, involves configuring web services such as Apache or Nginx. Security measures, including HTTPS and SSL certificates, are implemented to secure web traffic. Access controls and firewall rules are configured to protect the server from potential cyber threats.

**Workstations and Laptops:**

- IP Address Assignment: Workstations and laptops receive IP addresses dynamically from the DHCP server. DHCP configurations include lease durations, IP address ranges, and DNS server assignments.

- Security Settings: Workstations and laptops are configured with security settings, including antivirus software, firewalls, and user authentication mechanisms. Group Policies are applied to enforce security policies across the network.

- Application Configurations: Specific applications required for daily tasks are configured on workstations and laptops. This may include email clients, office productivity software, and collaboration tools.

**Wireless Access Points:**

Wireless access points are configured to provide secure and reliable wireless connectivity. WPA3 encryption is implemented to secure wireless communications. SSIDs are configured with strong passwords, and MAC filtering is applied to control access to the wireless network. Quality of Service settings on wireless access points prioritize certain types of wireless traffic.

**Considerations for Component Configuration:**

- Interoperability: Configurations are designed to ensure interoperability among various components. Protocols and settings are standardized across the network to enable seamless communication.

- Security: Security measures are implemented at every level, from routers and switches to servers and end-user devices. This includes encryption, access controls, and regular security audits.

- Performance Optimization: Configurations are optimized for performance, considering factors such as bandwidth allocation, QoS settings, and load balancing.

The meticulous configuration of each network component ensures that the IT platform network operates cohesively, meeting the objectives of optimal performance, scalability, and seamless communication. The subsequent sections will delve into specific aspects of the configuration, including IP addressing, DNS, DHCP, and the integration of WAN components.

**IP Addressing and Classes – 7**

IP addressing is a critical aspect of network configuration. The following IP classes are used in different segments of the network:

Local Network (Class C): **192.168.1.x**

DNS Server (Class A): **90.55.55.x**

DHCP Network (Class B): **140.90.60.x**

Additionally, the DNS network is assigned the Class A IP address for the DNS server: **www.homework.com.**

Изображение выглядит как текст, снимок экрана, программное обеспечение, веб-страница

Автоматически созданное описание

**DNS Server and Webserver Configuration – 8**

The DNS server is configured to resolve domain names, and a web server is set up to host a website. Detailed configurations for both components are provided in this section. **www.homework.com**

Изображение выглядит как текст, программное обеспечение, Значок на компьютере, Операционная система

Автоматически созданное описание

Изображение выглядит как текст, диаграмма, снимок экрана, линия

Автоматически созданное описание

Изображение выглядит как текст, программное обеспечение, Мультимедийное программное обеспечение, Значок на компьютере

Автоматически созданное описание

Изображение выглядит как текст, снимок экрана, документ

Автоматически созданное описание

**DHCP Server Configuration – 9**

The DHCP server is configured to automatically assign IP addresses to devices in the DHCP network. The configuration parameters and settings are detailed here.

Изображение выглядит как снимок экрана, линия, диаграмма, текст

Автоматически созданное описание

Изображение выглядит как программное обеспечение, текст, Мультимедийное программное обеспечение, Значок на компьютере

Автоматически созданное описание

**Test Cases – 10**

To validate the functionality of the network, several test cases are conducted. These test cases ensure that all devices can ping each other and that the network operates as intended.

From laptop 15 I write command ping 90.55.55.13 to connect PC-8

**Изображение выглядит как текст, программное обеспечение, Мультимедийное программное обеспечение, Значок на компьютере

Автоматически созданное описание**

**Conclusion – 11**

In summary, the IT Platform Network Design project has accomplished its goals by creating a robust, scalable, and secure network using Cisco Packet Tracer. The network ensures optimal performance, seamless communication, and future scalability. Despite challenges in WAN configuration and wireless access points, the project successfully addressed these issues. Proposed improvements include enhanced security measures, advanced WAN optimization, and comprehensive documentation. Overall, the project provides a solid foundation for a reliable and efficient IT network.