Networking Fundamentals

Topics To be Covered

- Demystifying the OSI Model
- TCP /IP Model
- Common Terminal Commands
- DNS and DHCP
- Active Directory

Common Terminal Commands

- Ip config
- Ip address show
- Net user <username> /dom

Demystifying Network Fundamentals

- **The OSI Model - 7 Layers**
  Physical, Data Link, Network, Transport, Session, Presentation, Application

- **OSI Model Functionality**
  Provides a standardized framework for data communication between devices

- **TCP/IP Model - 4 Layers**
  Link, Internet, Transport, Application

- **TCP/IP Model Advantages**
  Flexible, Scalable, Widely Adopted, Enables Internetworking

- **DNS - Domain Name System**
  Translates domain names to IP addresses, enabling web browsing

- **DHCP - Dynamic Host Configuration Protocol**
  Automatically assigns IP addresses, subnet masks, and other network configuration to devices

- **Active Directory (AD)**
  Centralized directory service for managing user accounts, devices, and policies in a Windows network

The 7 Layers of the OSI Model

- **PHYSICAL LAYER**

  Defines the electrical, mechanical, functional, and procedural specifications for the physical connection between network devices. This includes the physical equipment involved in the network, such as cables, connectors, and network interface cards.

- **DATA LINK LAYER**

  Responsible for reliable data transfer between network nodes, error detection and correction, and media access control. It organizes bits into frames and handles media access, flow control, and error checking.

- **NETWORK LAYER**

  Determines the path that data should take from the source to the destination. It is responsible for logical addressing, such as IP addresses, and routing mechanisms to forward data packets through the network.

- **TRANSPORT LAYER**

  Ensures the complete and reliable transfer of data between applications. It manages end-to-end communication, segmentation and reassembly of data, and flow control to prevent the sender from overwhelming the receiver.

- **SESSION LAYER**

  Establishes, maintains, and synchronizes communication sessions between applications. It provides checkpointing, restart, and restart capabilities to ensure the seamless continuation of a session if an interruption occurs.

- **PRESENTATION LAYER**

  Defines the data format, encryption, compression, and conversions required for the application layer. It ensures that data sent by one application can be read by another, even if they use different internal data representations.

- **APPLICATION LAYER**

  Serves as the interface for network services to the user, providing applications such as email, file transfer, and web browsing. It defines protocols for specific applications and how software applications access the network.

The TCP/IP Model

- **Layers of the TCP/IP Model**

  The TCP/IP model consists of four layers: Application, Transport, Internet, and Network Interface

- **Application Layer**

  Provides services directly to the application, such as HTTP, SMTP, and FTP

- **Transport Layer**

  Ensures reliable and efficient data transfer between devices, using protocols like TCP and UDP

- **Internet Layer**

  Handles the addressing and routing of data, using the IP protocol

- **Network Interface Layer**

  Defines the physical and data link protocols for local network communications

Common Terminal Commands in Networking

- **ping**
  Check the connectivity and responsiveness of a network device

- **traceroute**
  Trace the path of a network packet to its destination

- **netstat**
  Display information about active network connections and network interfaces

- **ifconfig**
  Configure and manage network interfaces

- **tcpdump**
  Capture and analyze network traffic for troubleshooting

Exploring DNS and DHCP

DNS (Domain Name System)

Translates human-readable domain names into IP addresses for network communication

DNS Server

Responsible for resolving domain names to IP addresses, enabling internet connectivity

DHCP (Dynamic Host Configuration Protocol)

Automatically assigns IP addresses, subnet masks, default gateways, and other network configuration parameters to devices on a network

DHCP Server

Dynamically allocates and manages IP addresses for devices on a network, simplifying network administration

DNS and DHCP are essential protocols that work together to provide seamless network connectivity and management. DNS translates domain names to IP addresses, while DHCP automatically configures network settings, ensuring efficient and reliable communication across the network.

Introduction to Active Directory

Active Directory (AD)

A directory service developed by Microsoft for Windows domain networks

User Authentication

Manages user accounts and their access permissions within a network

Resource Management

Centrally controls and organizes access to shared network resources

Group Policy

Allows administrators to define and enforce security and configuration settings across a network

Active Directory is a powerful and versatile directory service that provides centralized user and resource management, authentication, and policy enforcement - essential for secure and efficient Windows-based networks.

THM Rooms Used

- https://tryhackme.com/room/dnsindetail
- https://tryhackme.com/room/dnsmanipulation
- https://tryhackme.com/room/winadbasics
- https://tryhackme.com/room/digdug
- https://tryhackme.com/room/networkingconcepts