Chapter 10: Device Discovery, Management, and Maintenance
Chapter 10 - Sections & Objectives

- **10.1 Device Discovery**
  - Use discovery protocols to map a network topology.

- **10.2 Device Management**
  - Configure NTP and Syslog in a small to medium-sized business network

- **10.3 Device Maintenance**
  - Maintain router and switch configuration and IOS files.
10.1 Device Discovery
Device Discovery

Device Discovery with CDP

- CDP Overview
  - Cisco Discovery Protocol
  - Neighbor discovery of physically connected Cisco devices

- Configure and Verify CDP
  - `show cdp neighbors`
  - `show cdp interface`
  - `cdp run`
  - `cdp enable`

- Discover Devices Using CDP
  - Device identifiers - The host name of the neighbor device
  - Port identifier - The name of the local and remote port
  - Capabilities list - Whether the device is a router or a switch
  - Platform - The hardware platform of the device
Device Discovery

Device Discovery with LLDP

- **LLDP Overview**
  - A vendor neutral layer 2 neighbor discovery protocol, similar to CDP

- **Configure and Verify LLDP**
  - `show lldp`
  - `lldp run`
  - `lldp transmit`
  - `lldp receive`

- **Discover Devices Using LLDP**
  - `show lldp neighbors`
10.2 Device Management
Device Management

Implement NTP

- Setting the System Clock
  - Manually configure the date and time
  - Configure Network Time Protocol (NTP)

- NTP Operation
  - Hierarchical system of time sources
  - Stratum 0 – Authoritative time source
  - Stratum number indicates how far the server is from the time source

- Configure and Verify NTP
  - `ntp server ip-address`
  - `show ntp associations`
  - `show ntp status`
  - `show clock`
Device Management

Syslog Operation

- **Introduction to Syslog**
  - Allows devices to send their messages to syslog server
  - Supported by most networking devices
  - Primary functions:
    - log information
    - select the type
    - specify the destinations

- **Syslog Message Format**
  - Severity level from 0 – 7
  - Facility – service identifiers

- **Service Timestamp**
  - Enhances real-time debugging and management
  - *service timestamps log datetime*
Device Management

Syslog Configuration

- Syslog Server
  - Parses the output and places the messages into pre-defined columns
  - Timestamps are displayed if configured on networking devices that generated the log messages
  - Allows the network administrators to navigate the large amount of data compiled on a syslog server.

- Default Logging
  - Send log messages of all severity level to the console
  - `show logging`

- Router and Switch Commands for Syslog Clients
  - `logging ip-address`
  - `logging trap level`
  - `logging source-interface source-interface interface-number`

- Verifying Syslog
  - `show logging`
  - Use the pipe (|) to limit the amount of displayed log messages
10.3 Device Maintenance
Device Maintenance

Router and Switch File Maintenance

- **Router and Switch File Systems**
  - `show file systems` – lists all available file system
  - `dir` – lists the content of the file system
  - `pwd` – verify the present working directory
  - `cd` – changes the current directory

- **Backing up and Restoring using Text Files**
Device Maintenance

Router and Switch File Maintenance (Cont.)

- Backing up and Restoring using TFTP
  - `copy running-config tftp`
  - `copy startup-config tftp`

- Using USB Ports for Backing Up and Restoring
  - `show file systems`
  - `dir usbflash0:`
  - `copy run usbflash0:`

- Password Recovery
  - Enter ROMMON mode
  - Change configuration register to 0x2142
  - Make changes to the original startup config
  - Save the new configuration
Device Maintenance

IOS System Files

- **IOS 15 System Image Packaging**
  - universalk9 images
  - universalk9_npe images
  - Technology packages: IP Base, Data, UC, SEC
  - Data, UC, and SEC technology packages are activated through licensing

- **IOS Image Filenames**
  - Feature sets and version
  - *show flash*
Device Maintenance

IOS Image Management

- **TFTP Servers as a Backup Location**
  - Backup location for IOS images and configuration files

- **Steps to Backup IOS Image to TFTP Server**
  - Verify access to TFTP server
  - Verify sufficient disk space
  - Copy the image to the TFTP server
    - `copy source-url tftp:`

- **Steps to Copy an IOS Image to a Device**
  - Download IOS image from Cisco.com and transfer it to TFTP server
  - Verify access to TFTP server from device
  - Verify sufficient disk space on device
  - Copy the image from the TFTP server
    - `copy tftp: destination-url`

- **The `boot system` Command**
  - Command to load the new image during bootup
  - `boot system file-url`
Device Maintenance
Software Licensing

Licensing Process

- Purchase the software package or feature to install
- Obtain a license
  - Cisco License Manager
  - Cisco License Portal
  - Requires PAK number and UDI
    ```
    show license udi
    ```
- Install the license
  - `license install stored-location-url`
  - `reload`
Device Maintenance
License Verification and Management

- License verification
  - `show version`
  - `show license`

- Activate an evaluation right-to-use license
  - `license accept end user agreement`
  - `license boot module module-name technology-package package-name`

- Back up the license
  - `license save file-sys://lic-location`

- Uninstall the license
  - Disable the license
    - `license boot module module-name technology-package package-name disable`
  - Clear the license
    - `license clear feature-name`
    - `no license boot module module-name technology-package package-name disable`
10.4 Chapter Summary
Chapter Summary

Summary

- CDP is a Cisco proprietary protocol for network discovery on the data link layer. It can share information, such as device names and IOS versions, with other physically connected Cisco devices.

- LLDP is a vendor-neutral protocol used on the data link layer for network discovery. The network devices advertise information, such as their identities and capabilities, to their neighbors.

- NTP synchronizes the time of day among a set of distributed time servers and clients. This allows networking devices to agree on the time a specific event occurred, such as the loss of connectivity between a router and a switch.

- Syslog messages can be trapped and sent to a syslog server where the network administrator can investigate when the link failed.

- Device maintenance includes the tasks of backing up, restoring, and upgrading IOS images and configuration files from an TFTP server or using USB storage devices.

- Upgrading an IOS image also includes tasks related to software licensing.

- Understanding IOS image name conventions can be useful in the determination of included IOS feature sets.