Instructor Materials
Chapter 10: Device Discovery, Management, and Maintenance

CCNA Routing and Switching

Routing and Switching Essentials v6.0

Cisco | Networking Academy®
Mind Wide Open™

Chapter 10: Device Discovery, Management, and Maintenance

Routing and Switching Essentials v6.0

Cisco | Networking Academy®
Mind Wide Open™

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 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

CDP Advertisements

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`**

LLDP Advertisements

10.2 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**
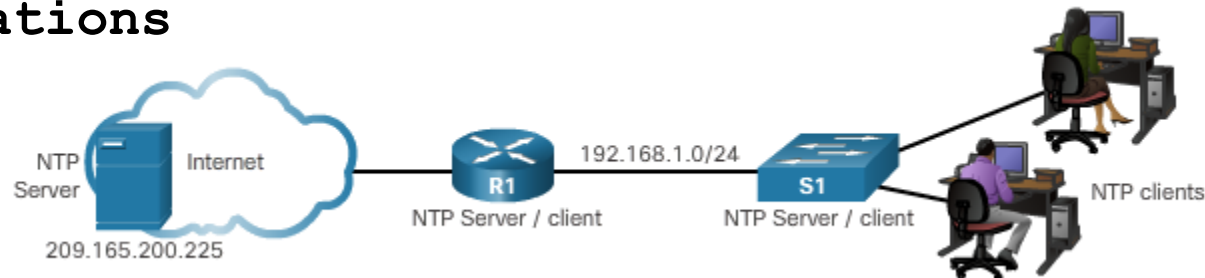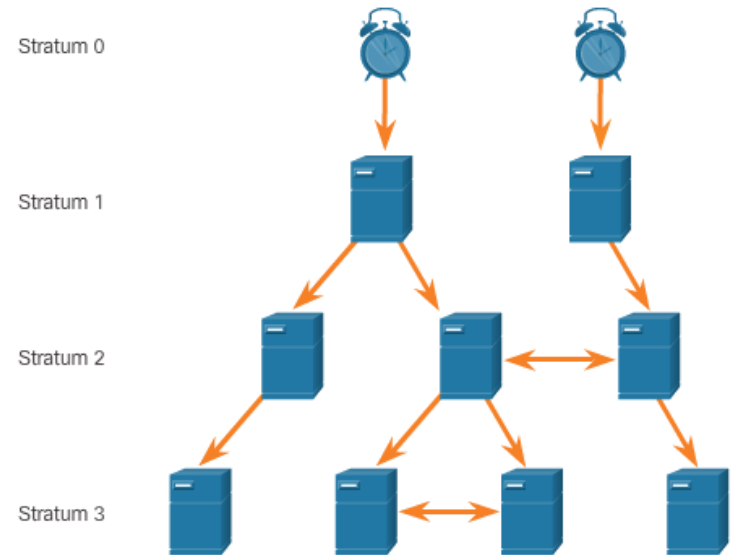
Syslog Operation

- **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`
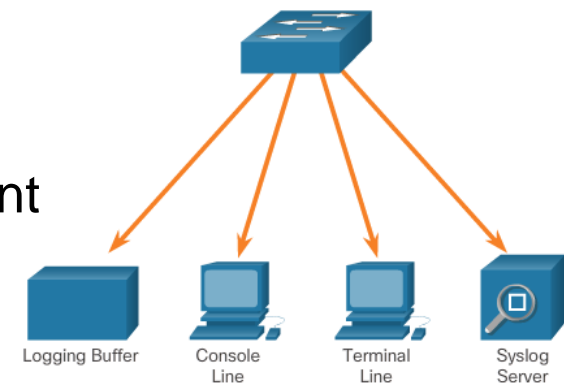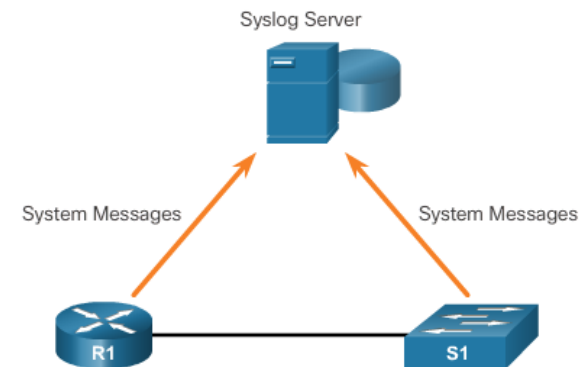
Syslog Configuration

- 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
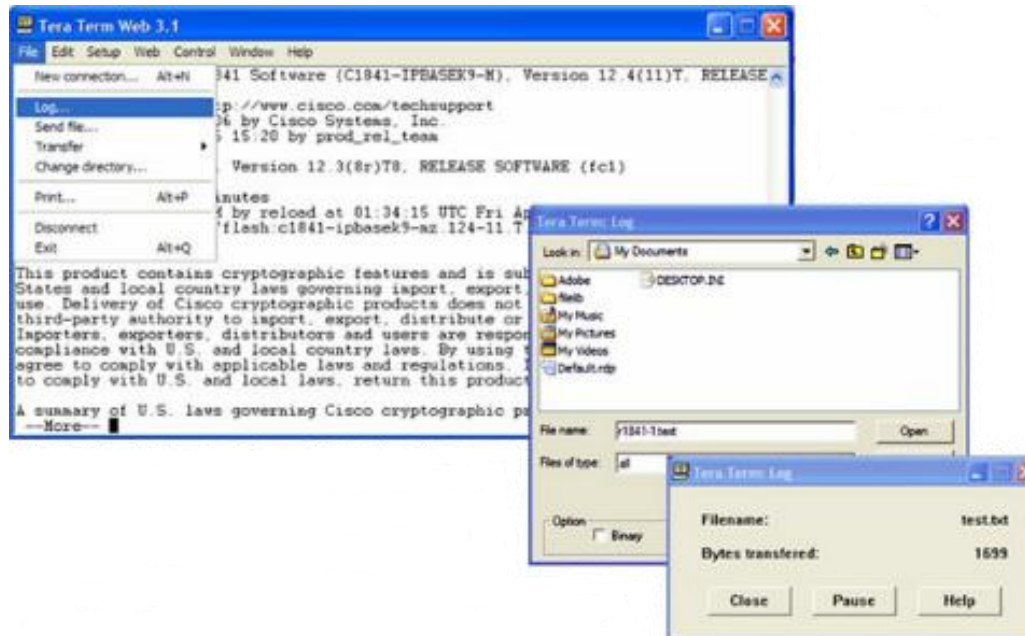
10.3 Device Maintenance

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

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:/`

USB Ports

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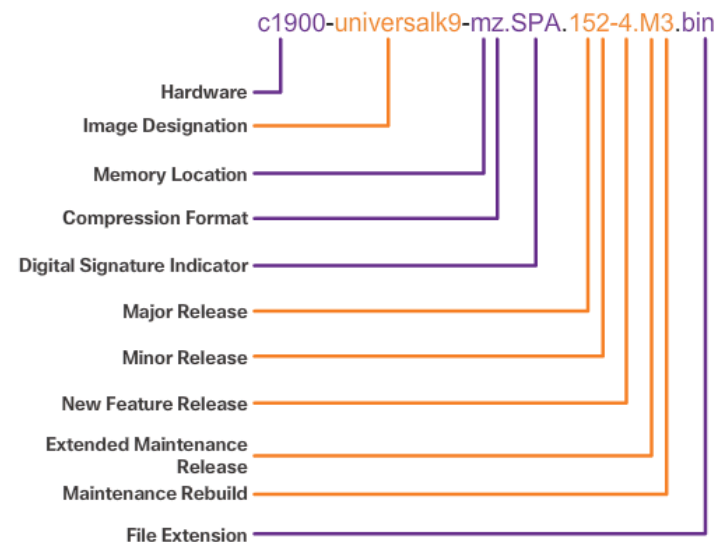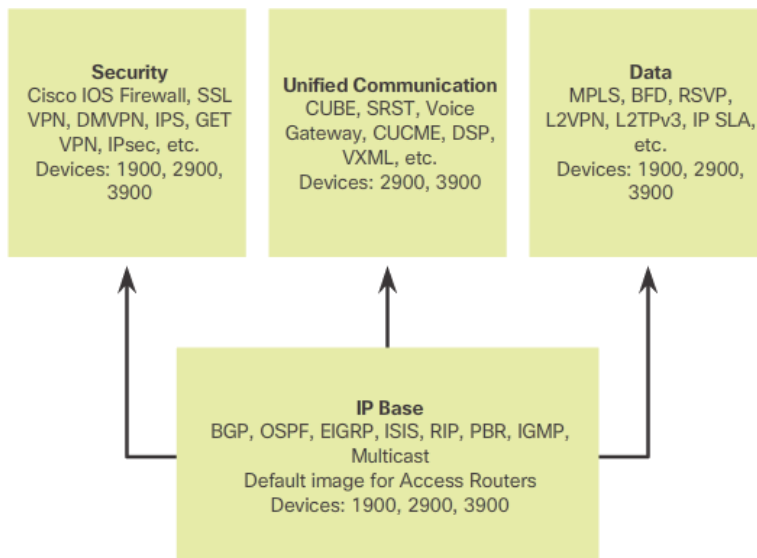 - Save the new configuration

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`**

Security
Cisco IOS Firewall, SSL VPN, DMVPN, IPS, GET VPN, IPsec, etc.
Devices: 1900, 2900, 3900

Unified Communication
CUBE, SRST, Voice Gateway, CUCME, DSP, VXML, etc.
Devices: 2900, 3900

Data
MPLS, BFD, RSVP, L2VPN, L2TPv3, IP SLA, etc.
Devices: 1900, 2900, 3900

IP Base
BGP, OSPF, EIGRP, ISIS, RIP, PBR, IGMP, Multicast
Default image for Access Routers
Devices: 1900, 2900, 3900

c1900-universalk9-mz.SPA.152-4.M3.bin

- Hardware
- Image Designation
- Memory Location
- Compression Format
- Digital Signature Indicator
- Major Release
- Minor Release
- New Feature Release
- Extended Maintenance Release
- Maintenance Rebuild
- File Extension

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*

Flash

R1

TFTP Server

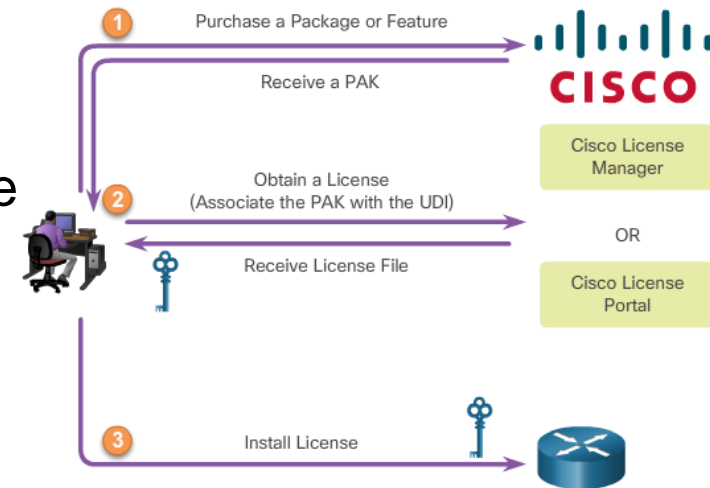c1900-universalk9-mz.SPA.152-4.M3.bin
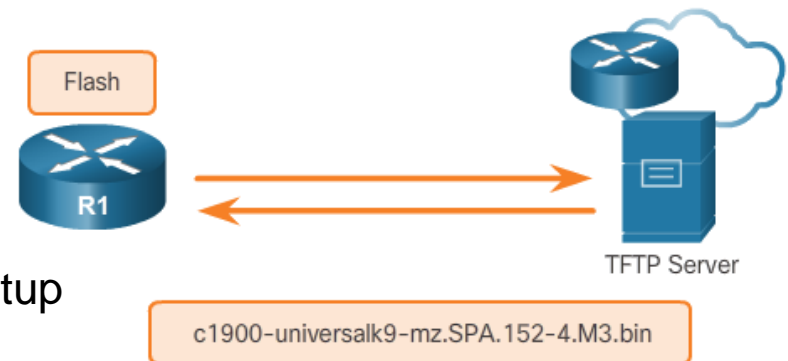
Software Licensing

- ## Licensing Process

  - Purchase the software package or feature to install

  - Obtain a license

    - Cisco License Manger

    - Cisco License Portal

    - Requires PAK number and UDI

          show license udi

  - Install the license

    - `license install` *stored-location-url*

    - `reload`

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**

Uninstalling the License

10.4 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 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.

Cisco Confidential