Chapter 9: IOS Images and Licensing

Scaling Networks

Chapter 9

Chapter 9: Objectives

- Understand the necessity of managing IOS system image files to increase network reliability in a small-to-medium-sized business network.

- Explain the Cisco IOS image naming conventions.

- Calculate memory requirements needed when upgrading an IOS system image.

- Explain the licensing process for the Cisco IOS software in a small-to-medium-sized business network.

- Configure a router to install a Cisco IOS image license.

Introduction

This chapter describes the following Cisco IOS concepts and features:

- The Cisco IOS portfolio supports a broad range of technologies and features.

- Customers choose an IOS based on a set of protocols and features supported by a particular image.

- The Cisco IOS 12.5 and 15 packaging and naming conventions.

- Beginning with IOS 15, Cisco also implemented a new packaging format and licensing process for IOS.

- Process of obtaining, installing, and managing Cisco IOS 15 software licenses.

# Cisco IOS Software Release Families and Trains

- A software release family is comprised of multiple IOS software release versions that:

  - Share a code base

  - Apply to related hardware

  - Overlap in support coverage

- Examples of IOS releases, within a software release family, include 12.3, 12.4, 15.0, and 15.1.

- A Cisco IOS train is a version of the software released to implement bug fixes and add new features.

Cisco IOS 12.4 Mainline and T Trains

- The Cisco IOS software 12.4 train is considered the mainline train.

  - It receives mostly software (bug) fixes

  - Releases are designated as Maintenance Deployment (MD) releases

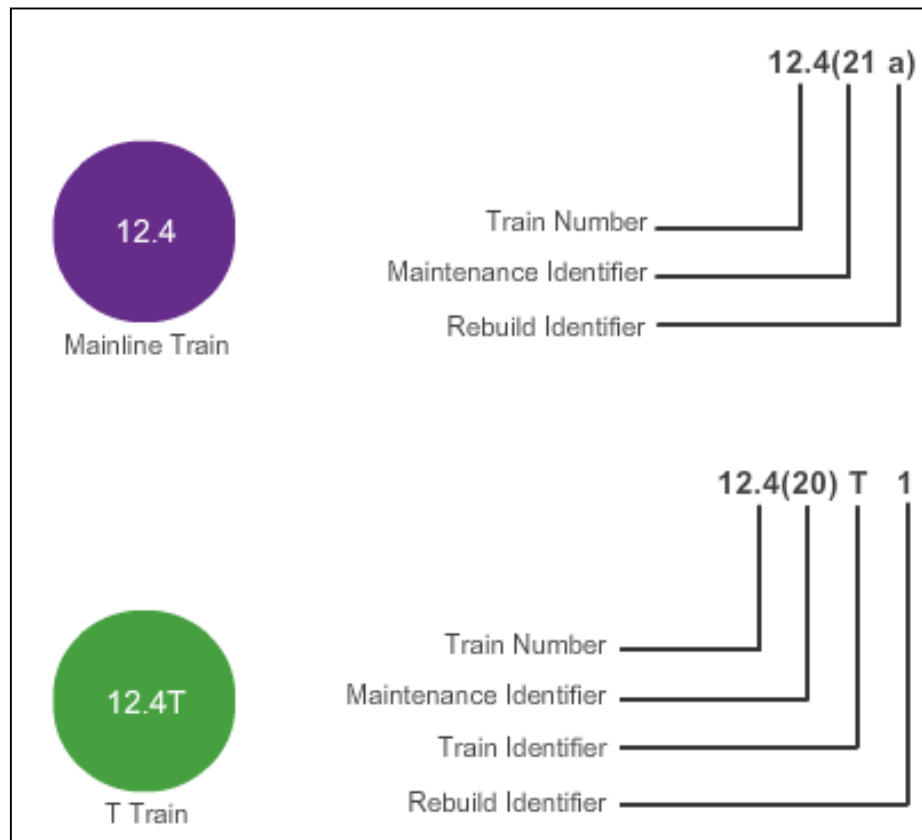 - Is always associated with a technology train (T train)
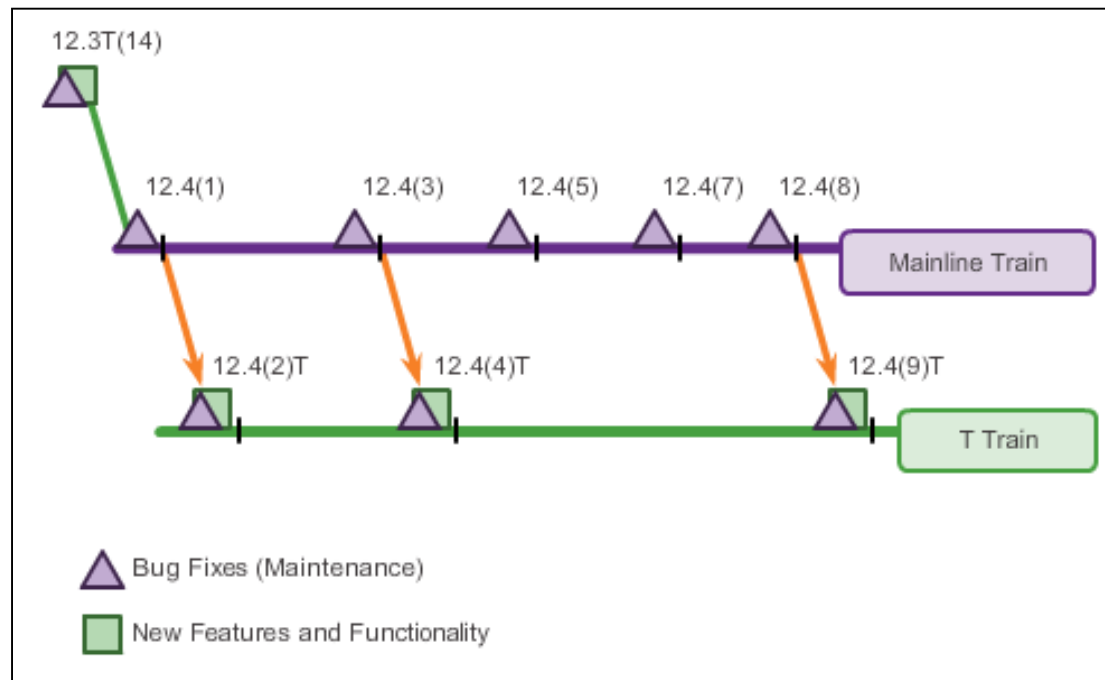
Cisco IOS 12.4 Mainline and T Numbering

The IOS release numbering convention is used to identify the release of the IOS software, including any bug fixes and new software features.
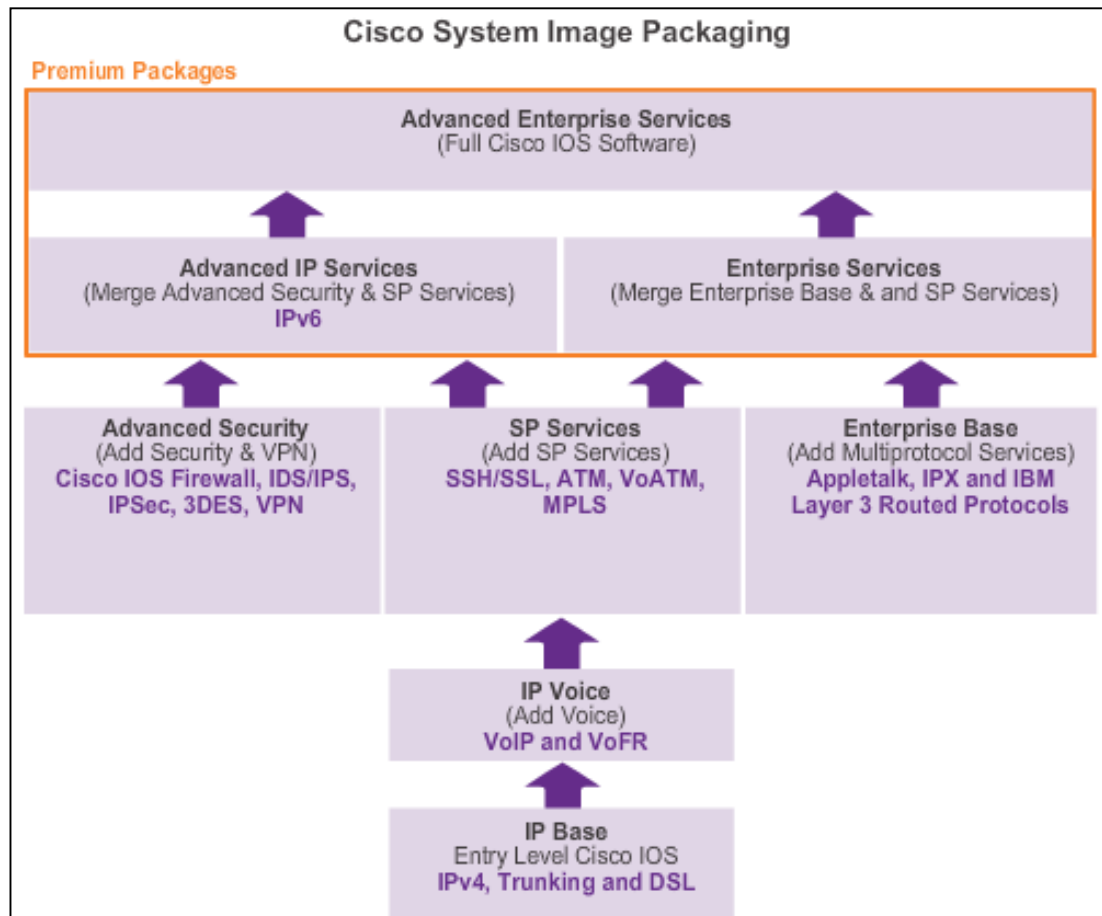
Cisco IOS 12.4 System Image Packaging

Pre Cisco IOS Software Release 15.0, the Cisco IOS Software Packaging consisted of eight packages for Cisco routers.

Cisco IOS 15.0 Train Numbering
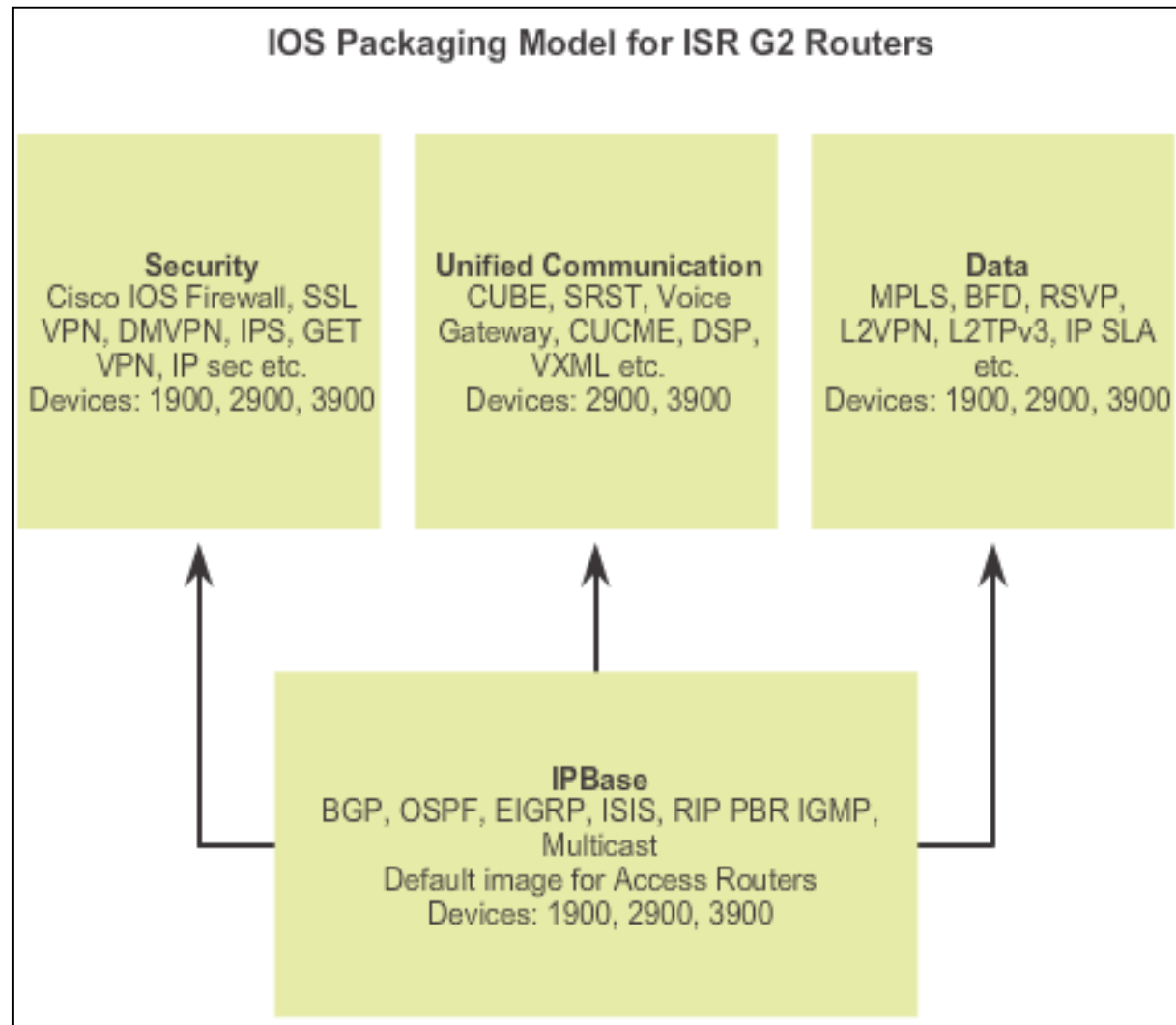
- **Extended Maintenance (EM) Release** – The EM release is ideal for long-term maintenance, which enables customers to qualify, deploy, and remain on the release for an extended period.

- **Standard Maintenance (T) Release** – The T release is used for short-deployment releases, which is ideal for the latest new features and hardware support before the next EM release becomes available.
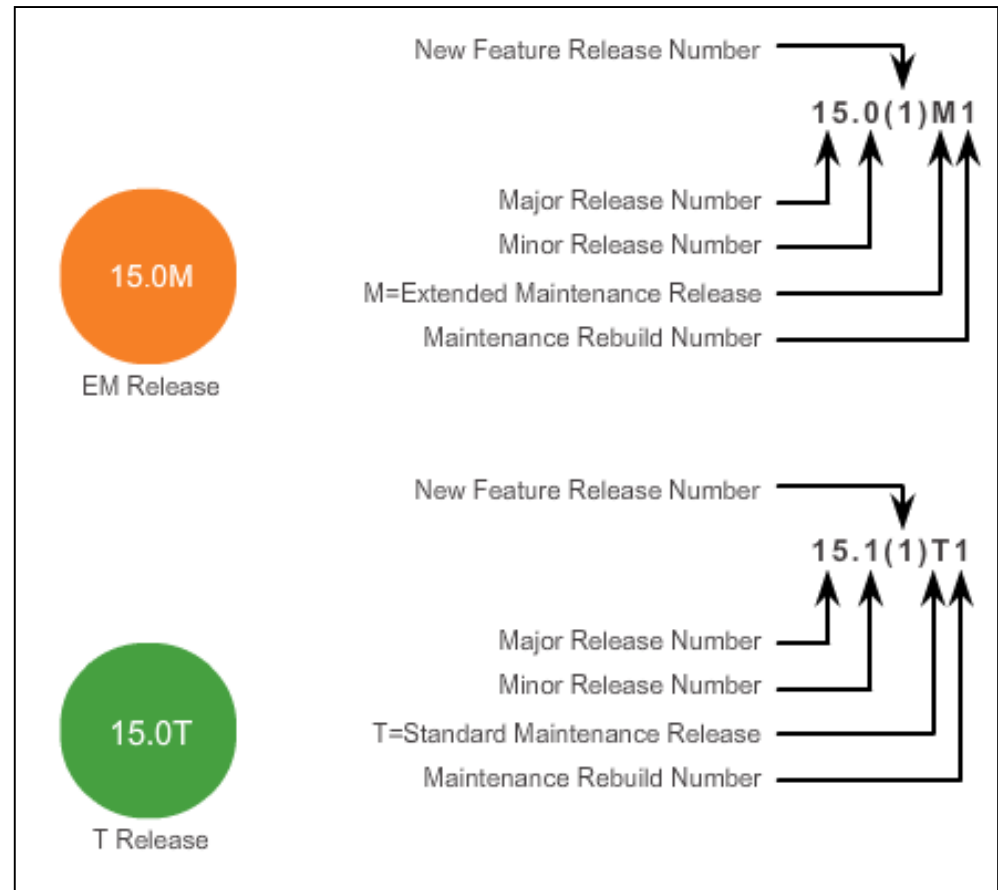
IOS 15 System Image Packaging

IOS Packaging Model for ISR G2 Routers

Security
Cisco IOS Firewall, SSL VPN, DMVPN, IPS, GET VPN, IP sec 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

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

IOS 15 System Image Packaging (cont.)

Suggested Transition from IOS 12 to 15

Reformation Packaging	Suggested Transition to Simplified Packaging
IPBase	IPBase
IP Voice	Unified Communications
Enterprise Base	Data
Enterprise Services	Data + Unified Communications
SP Services	Data + Unified Communications (for feature parity and Enterprise features)
Advanced Security	Security
Advanced IP Services	Security + Unified Communications + Data (for feature parity and Enterprise features)
Advanced Enterprise Services	Security + Unified Communications + Data

IOS Image Filenames

Displaying the Cisco IOS image.

```
R1# show flash0:
-# - --length-- -----date/time------ path



8    68831808    Apr 2 2013 21:29:58 +00:00 c1900-universalk9-
mz.SPA.152-4.M3.bin


182394880 bytes available (74092544 bytes used)
```
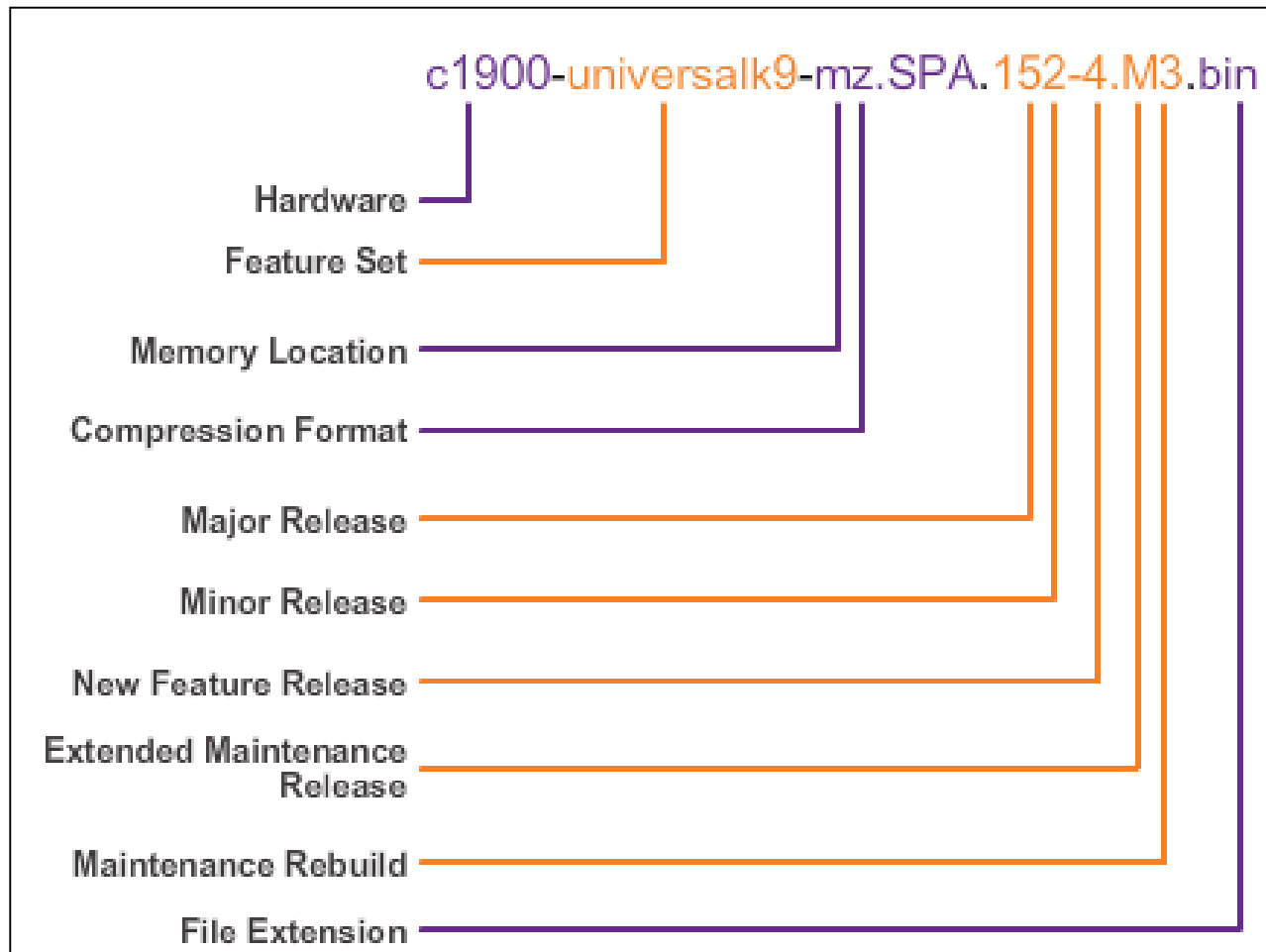
IOS Image Filenames (cont.)

Example of a Cisco IOS 15.2 Image name.

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

- Hardware
- Feature Set
- Memory Location
- Compression Format
- Major Release
- Minor Release
- New Feature Release
- Extended Maintenance Release
- Maintenance Rebuild
- File Extension

TFTP Servers as a Backup Location

- Cisco IOS Software images and configuration files can be stored on a central TFTP server.

- It is good practice to keep a backup copy of the Cisco IOS software image.

- Using a network TFTP server allows image and configuration uploads and downloads over the network.
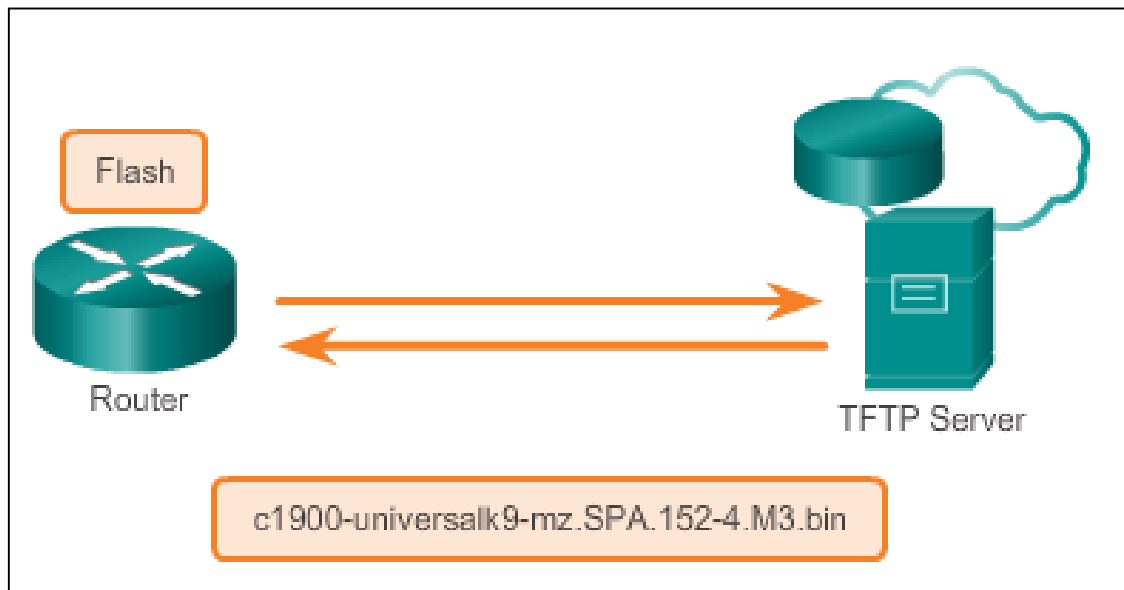
Creating Cisco IOS Image Backup

To create a backup of the Cisco IOS image to a TFTP server, perform the following three steps:

Step 1. Ensure that there is access to the network TFTP server. Ping the TFTP server to test connectivity.

Step 2. Verify that the TFTP server has sufficient disk space to accommodate the Cisco IOS Software image. Use the `show flash0:` command on the router to determine the size of the Cisco IOS image file.

Step 3. Copy the image to the TFTP server using the `copy` *source-url destination-url* command.
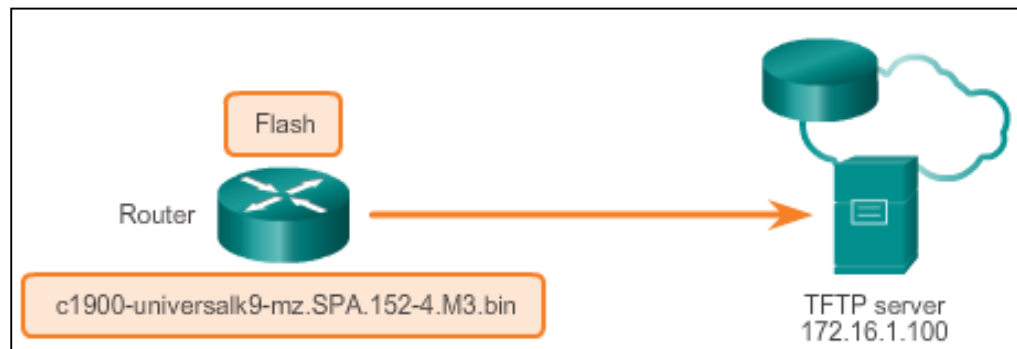
Copying a System IOS Image

Follow these steps to upgrade the software on the Cisco router:

Step 1. Select a Cisco IOS image file that meets the requirements in terms of platform, features, and software. Download the file from http://www.cisco.com and transfer it to the TFTP server.

Step 2. Verify connectivity to the TFTP server. Ping the TFTP server from the router.

Step 3. Ensure that there is sufficient flash space on the router that is being upgraded. The amount of free flash can be verified using the `show flash0:` command.

Step 4. Copy the IOS image file from the TFTP server to the router using the `copy tftp: flash0` command. After issuing this command with specified source and destination URLs, the user is prompted for the remote host's IP address, source filename, and destination filename. The transfer of the file then begins.

Boot System

- The **boot system** commands specify the name and location of the Cisco IOS Software image to load. Several **boot system** commands can be entered in sequence.

- Specify the flash device as the source of the Cisco IOS image:

  ```
  Router(config)# boot system flash0://c1900-
  universalk9-mz.SPA.152-4.M3.bin
  ```

- Specify the TFTP server as a source of the Cisco IOS image, with ROMmon as the backup:

  ```
  Router(config)# boot system tftp://c1900-
  universalk9-mz.SPA.152-4.M3.bin
  ```

  ```
  Router(config)# boot system rom
  ```
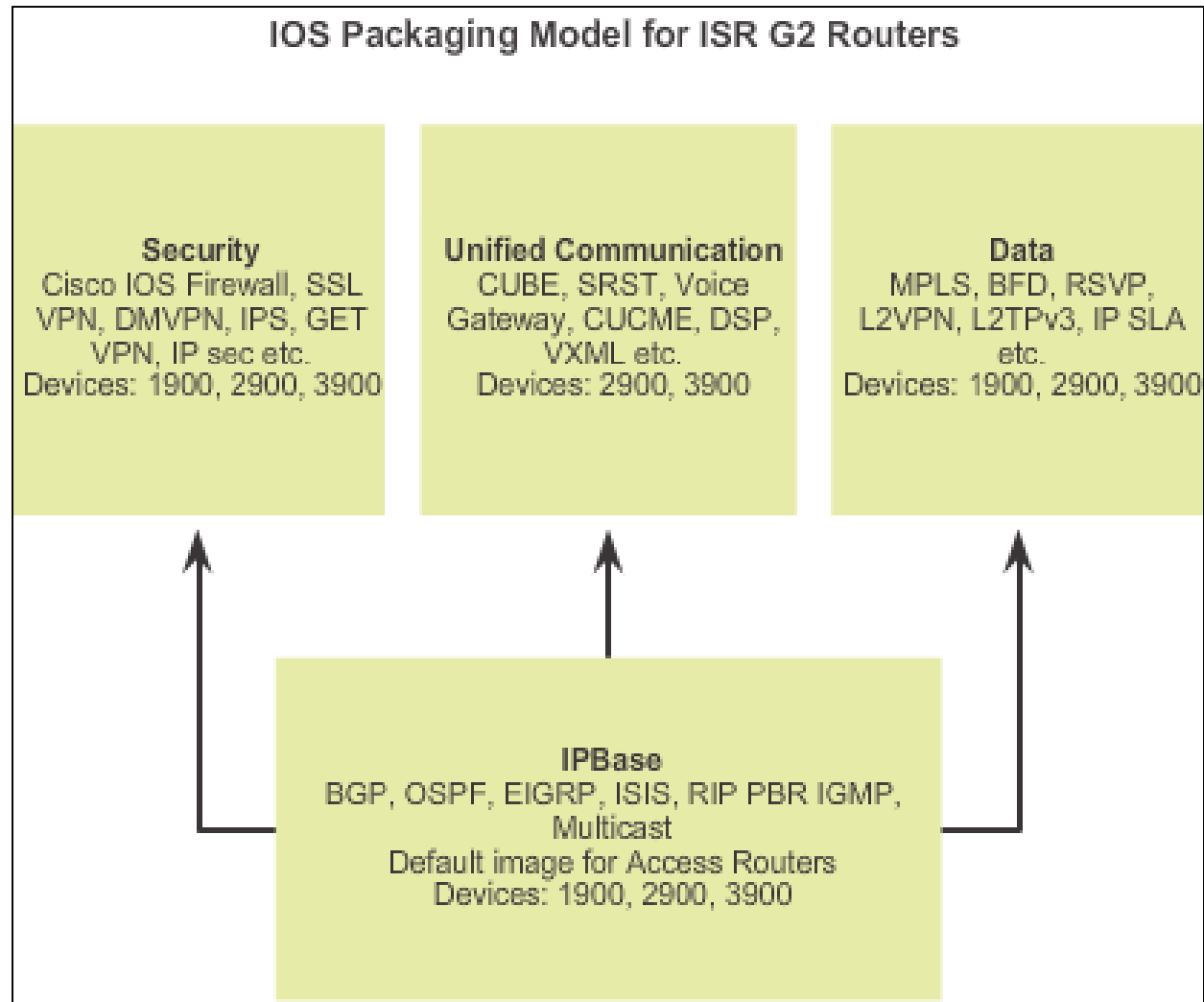
Licensing Overview

- The Cisco IOS Software Release 15.0 incorporates cross-platform feature sets to simplify the image selection process.

- Each device ships with the same universal image.

- Technology packages are enabled in the universal image via Cisco Software Activation licensing keys.

- Technology package licenses are supported on Cisco ISR G2 platforms (Cisco 1900, 2900, and 3900 Series routers).

- Use the `show license` feature command to view the technology package licenses and feature licenses supported on the router.

Licensing Overview

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

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

Licensing Process

- A new router is shipped preinstalled with the software image and the corresponding permanent licenses for the customer-specified packages and features.

- Also comes with the evaluation license, known as a temporary license, for most packages and features supported on the specified router for customer review.
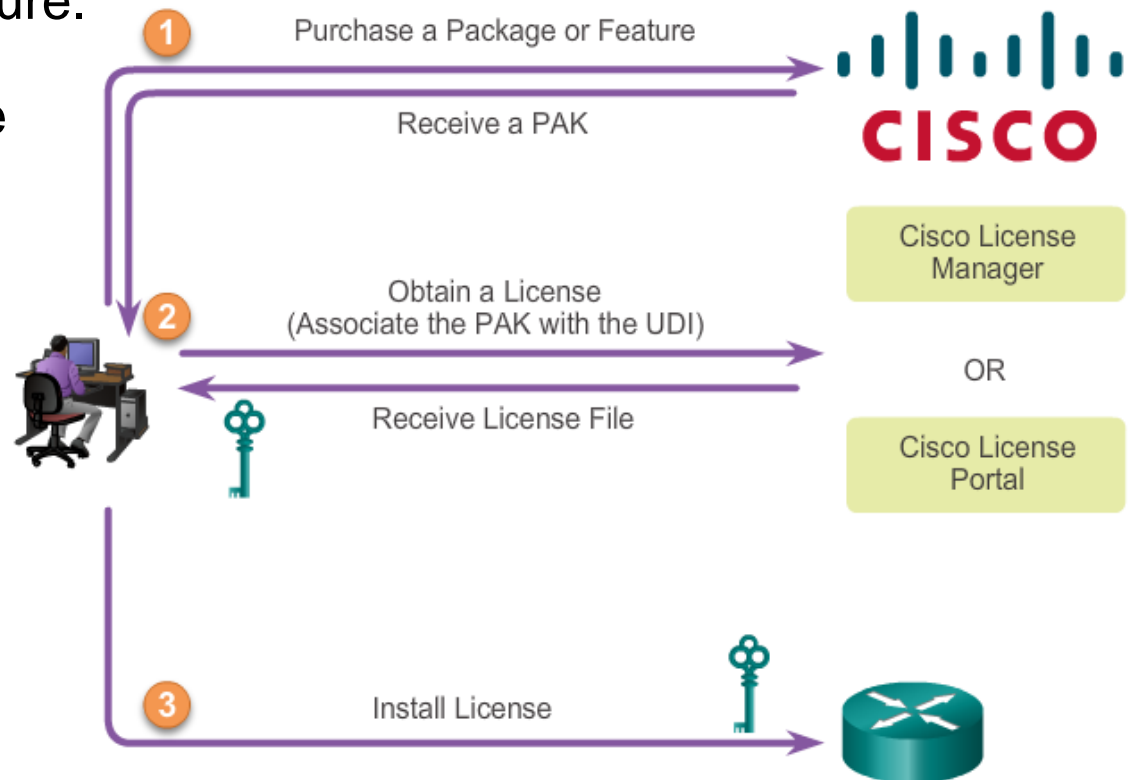
Licensing Process (cont.)

There are three steps to permanently activate a new software package or feature on a router.

Step 1. Purchase a
package or feature.

Step 2. Obtain a license

Step 3. Install license
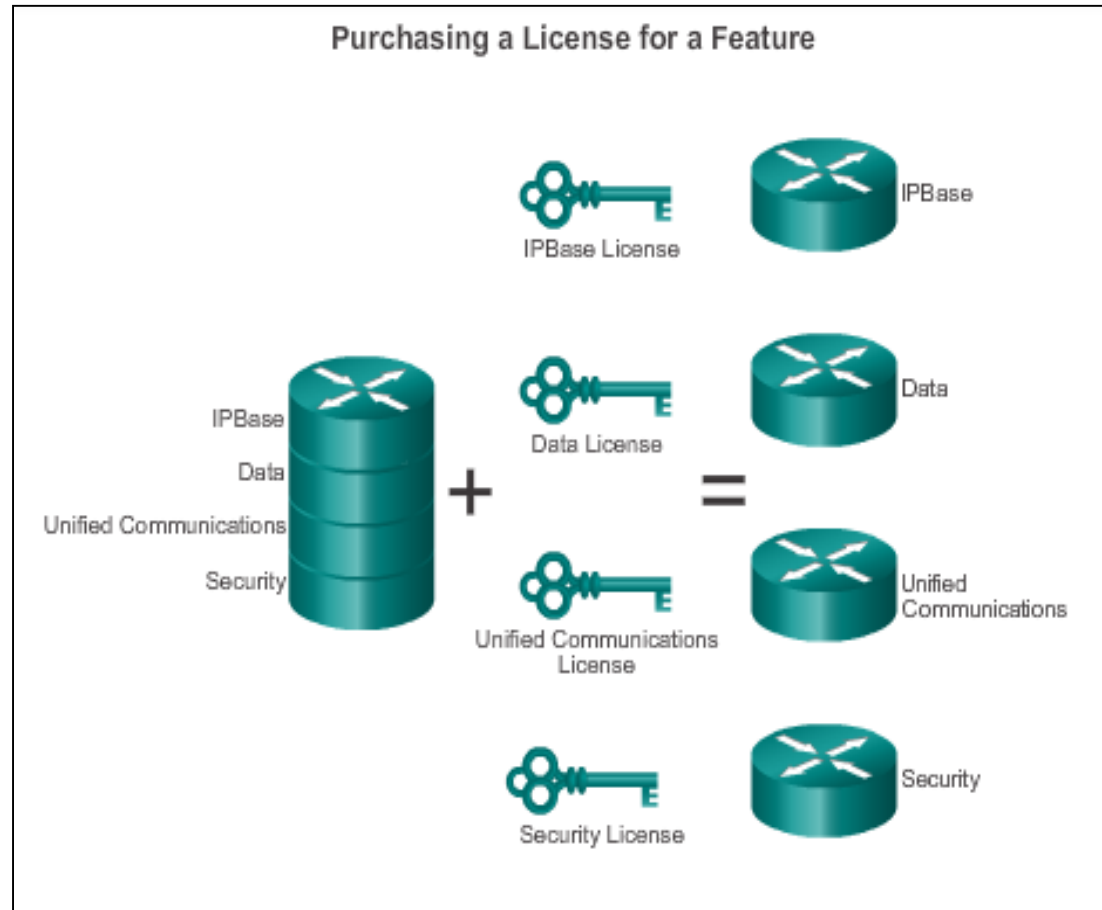
Step 1: Purchase the Software Package

- The first step is to purchase the software package or feature needed.

- Software Claim Certificates are used for licenses that require software activation. They provide Product Activation Key (PAK) and important information regarding the Cisco End User License Agreement (EULA).

Purchasing a License for a Feature

Step 2: Obtain a License

The second step is to obtain a license or license file using one of the following options:

- Cisco License Manager (CLM) is a free software application available at http://www.cisco.com/go/clm.

  The Cisco License Manager can discover network devices, view their license information, and acquire and deploy licenses from Cisco.

- Cisco License Registration Portal is the web-based portal for obtaining and registering individual software licenses, available at http://www.cisco.com/go/license.

- Both options require a PAK number and a unique device identifier (UDI).

```
R1#   show license udi
Device#   PID            SN            UDI
---------------------------------------------------------
*0        CISCO1941/K9   FTX1636848Z   CISCO1941/K9:FTX1636848Z
```

Step 3: Install the License

After obtaining the license file (an XML text file with a .lic extension), you must install a permanent license:

Step 1: Use the **license install** *stored-location-url* privileged EXEC mode command to install a license file.

Step 2: Reload the router using the **reload** privileged EXEC mode command. A reload is not required if an evaluation license is active.

- After a permanent license is installed on a router, it is good for that particular feature set for the life of the router, even across IOS versions.

- Cisco manufacturing preinstalls the appropriate permanent license on the ordered device for the purchased feature set; therefore, it's not necessary to enable that license on new hardware.

Note: Unified Communications is not supported on 1941 routers.

License Verification

Permanent License Verification – **show version** command

```
R1# show version
<output omitted>
License Info:
License UDI:
--------------------------------------------------------
Device#     PID                        SN
--------------------------------------------------------
*0        CISCO1941/K9         FTX1636848Z
Technology Package License Information for Module:'c1900'
----------------------------------------------------------

Technology      Technology-package            Technology-package
                  Current      Type          Next reboot
----------------------------------------------------------

ipbase         ipbasek9      Permanent      ipbasek9
security       seck9         Permanent      seck9
uc             None          None           None
data           None          None           None
```

License Verification

License Verification – **show license** command

```
R1# show license
Index 1 Feature: ipbasek9
        Period left: Life time
        License Type: Permanent
        License State: Active, In Use
        License Count: Non-Counted
        License Priority: Medium
Index 2 Feature: securityk9
        Period left: Life time
        License Type: Permanent
        License State: Active, In Use
        License Count: Non-Counted
        License Priority: Medium
Index 3 Feature: datak9
        Period left: Not Activated
        Period Used: 0  minute  0  second
        License Type: EvalRightToUse
        License State: Not in Use, EULA not accepted
        License Count: Non-Counted
        License Priority: None
<output omitted>
```

Activate an Evaluation Right-to-Use License

- An Evaluation License is good for a 60 day evaluation period. After the 60 days, this license automatically transitions into an Right-to-Use (RTU) license.


Evaluation License Installation

```
R1(config)# license accept end user agreement
R1(config)# license boot module c1900 technology-package
datak9
% use 'write' command to make license boot config take effect
on next boot
R1(config)#
*Apr 25 23:15:01.874: %IOS_LICENSE_IMAGE_APPLICATION-6-
LICENSE_LEVEL: Module name - c1900 Next reboot level - datak9
and License - datak9
*Apr 25 23:15:02.502: %LICENSE-6-EULA_ACCEPTED: EULA for
feature datak9 1.0 has been accepted.
UDI=CISCO1941/K9:FTX1636848Z; StoreIndex=1:Built-In License
Storage
```

- Use the **show license** command to verify that the license has been installed.
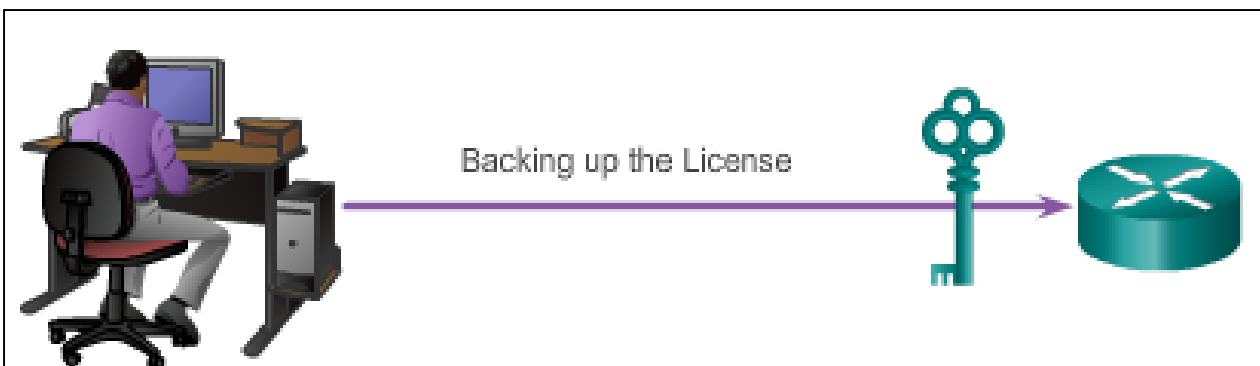
Backing Up the License

 28

Uninstalling the License

Uninstalling the License

Step 1. Disable the Technology Package

```
R1(config)# license boot module c1900 technology-package
              seck9 disable
R1(config)# exit
R1# reload
```

Step 2. Clear the License

```
R1# license clear seck9
R1# configure terminal
R1(config)# no license boot module c1900 technology-package
              seck9 disable
R1(config)# exit
R1# reload
```

Chapter 9: Summary

This chapter described and outlined the following concepts:

- Examples of Cisco IOS software releases include 12.3, 12.4, 15.0, and 15.1

- Cisco IOS software 12.4 incorporates new software features and hardware support (introduced in the Cisco IOS Software 12.3T train and additional software fixes).

- Prior to and including 12.4, the mainline "M" train received bug fixes only. The technology "T" train include fixes, new features, and platforms.

- The Cisco IOS 15.0 release family incorporates M and T releases in the same train.

- Select the proper IOS image with the correct feature set and version.

- The Cisco IOS image file uses a specific naming convention consisting of multiple parts each with a specific meaning.

Chapter 9: Summary (cont.)

- Commands are available for upgrading and verification of flash; for example, **show flash**, **boot system**.

- Network TFTP server allows image and configuration uploads and downloads over the network.

- With Cisco IOS Software release 15.0, Cisco modified the process to enable new technologies within the IOS feature sets. Each device ships with a universal image.

- Technology packages, such as IP Base, DATA, UC, and SEC are enabled in the universal image via Cisco software activation licensing keys.

- Licensing keys are unique to a particular device and are obtained from Cisco by providing the product ID and serial number of the router and a Product Activation Key (PAK).

Chapter 9: Summary (cont.)

- A permanent license is a license that never expires, even if the router is upgraded to a new IOS release.

- Use the `show license udi` command to install a license a PAK, a Cisco username/password, serial number, and PID of the.

- Use the `show version` command to verify that license has been installed.

- Use the `show license` command to display information about Cisco IOS licenses.