Installing the Software

This reference provides the essential information required to install the software.

- Overview, on page 1
- Licensing, on page 1
- Install the software for Cisco IOS XE, on page 5
- IOS XE downgrade warning, on page 9
- ROMMON images, on page 10
- File systems, on page 10
- Auto-generated file directories and files, on page 11
- Flash storage, on page 12
- LED indicators, on page 12

Overview

Installing software on the router involves installing a consolidated package (bootable image). This consists of a bundle of subpackages (modular software units), with each subpackage controlling a different set of functions.

These are the two main methods to install the software:

- Managing and Configuring a Router to Run Using Consolidated Packages —This method allows for individual upgrade of subpackages and generally has reduced boot times compared to the method below. Use this method if you want to individually upgrade a module's software.
- Managing and Configuring a Router to Run Using Individual Packages —This simple method is similar to a typical Cisco router image installation and management that is supported across Cisco routers.

It is better to upgrade software in a planned period of maintenance when an interruption in service is acceptable. The router needs to be rebooted for a software upgrade to take effect.

There are different types of licenses for the device that are discussed in the next sections.

Licensing

This reference provides the necessary details regarding software licensing, activation, and compliance for the system.

Cisco software licensing

Cisco software licensing is a system that

- consists of processes and components to activate Cisco IOS software feature sets by obtaining and validating Cisco software licenses
- enables licensed features and stores license files in the bootflash of your router, and
- pertains to consolidated packages, technology packages, or individual features.

Licensing support on ESR6300

The ESR6300 does not support the Right to Use licenses, and supports only the Specific License Reservation (SLR).

Configure consolidated packages

Configure the appropriate license level on the ESR6300 router to bring up all the subsystems that correspond to a specific license. The image-based license is enforced only at boot time.

An image-based license is used to help bring up all the subsystems that correspond to a license. This license is enforced only at boot time.

One of the following image-based licenses can be pre-installed on the ESR6300 router:

- Network-Essentials
- Network-Advantage
- HSecK9

Note All of the IOS-XE feature set may not apply to the ESR6300. Some features may not have been implemented yet, or are not appropriate for this platform.

Note Network-Essentials and Network-Advantage licenses are mutually exclusive. To configure one, remove the other using **no license boot level** <> option in the privileged exec mode. The router will need to be reloaded for the configuration to take effect.

To obtain software images for the router, go to: http://software.cisco.com/download/navigator.html

Procedure

Use the **license boot level** command to configure the license level using the appropriate license type.

Example:

```
Router# config terminal
            Router(config)# license boot level network-advantage
            Do you want to accept terms? Y
```

The image-based license is configured and will be enforced at the next boot time. The router must be reloaded for the configuration to take effect.

License installation on the ESR6300

License installation on the ESR6300 is a configuration requirement that

- requires two mandatory license parts: feature license and throughput license
- supports Network-Essentials or Network-Advantage for the feature license component, and
- provides throughput options of 50Mbps, 250Mbps, or 2Gbps.

License component details

The ESR6300 license consists of two required parts:

- Feature License
- Throughput License

The feature license is either Network-Essentials or Network-Advantage. The throughput license can be either 50Mbps, 250Mbps or 2Gbps.

Note For the 2Gbps throughput level, an additional feature license, HSECk9 is required to comply with export restriction requirements.

Network-Essentials

The **Network-Essentials** technology package includes the baseline features. It also supports security features.

Features that are available in this license are:

- Traffic segmentation (VPN, VRF, VLAN)
- Crypto Tunnels
- IPSec
- IKEv2
- SSL-VPN
- DHCP
- QoS
- ACL

- EIGRP
- IGMP
- HTTP
- IP Multicast
- Radius
- TACACS
- OSPF
- RIP
- HSRP

Table 1: Network-Essentials license PIDs and throughput levels

PID	Throughput Level
SL-6300-NE/DEF-K9	50Mbps
SL-6300-NE/PERF-K9	250Mbps
SL-6300-NE/BOOS-K9	2Gbps (boosted throughput)

The **Network-Essentials_npe** technology package (npe = No Payload Encryption) includes all the features in the Network-Essentials technology package without the payload encryption functionality. This is to fulfill export restriction requirements. The Network-Essentials_npe is available only in the Network-Essentials_npe image. The difference in features between the Network-Essentials package and the Network-Essentials_npe package is therefore the set of payload encryption features such as IPsec and Secure VPN.

Network-Advantage

The **Network-Advantage** technology package includes all crypto features. The Network-Advantage license contains all of the features of the Network-Essentials license, plus additional advanced networking capabilities.

The Network-Advantage license includes these additional features beyond Network-Essentials:

- MPLS
- BFD
- RSVP
- RSRB
- SDLC
- IP SLA
- STUN
- TCP optimization
- App-aware QoS policies and troubleshooting

Table 2: Network-Advantage license PIDs and throughput levels

PID	Throughput Level
SL-6300-NA/DEF-K9	50Mbps
SL-6300-NA/PERF-K9	250Mbps
SL-6300-NA/BOOS-K9	2Gbps (boosted)

The **Network-Advantage_npe** package (npe = No Payload Encryption) includes all the features in the **Network-Advantage** technology package without the payload-encryption functionality. This is to fulfill export restriction requirements. The **Network-Advantage_npe** package is available only in the **Network-Advantage_npe** image. The difference in features between the **Network-Advantage** package and the **Network-Advantage_npe** package is therefore the set of payload-encryption-enabling features such as IPsec and Secure VPN.

Policy: feature limitations for ESR6300 device deployment

The ESR6300 device has specific feature limitations that restrict certain capabilities.

- No support for MacSec or DLEP in the release.(MQC: modular quality of service command line).
- Layer2 COS to DSCP mapping does NOT work due to no ASIC chipset support for the feature.
- Copper FE SFPs are NOT supported on ESR6300.
- Copper GE SFPs are only supported in config terminal > service internal > service unsupported-transceiver mode.
- Cisco does NOT claim IP Mobility for Ethernet support on the ESR6300.
- Auto-negotiation for 10Mbps, 100Mbps, 1000Mbps in full-duplex mode is supported. For half duplex, support is only on 10Mbps and 100Mbps.
- Booting the golden configuration from a USB is NOT supported in 17.1.1, however it is available in 17.2.1.
- Refer to the Cisco approved vendor list [AVL] for Cisco USBs. Kingston USB 3.0 works as well. Ensure the USB has a single partition and ext2, fat16 or fat32 format only.
- There is no WebUI support for Day 0 or Day 1

  For Security: No support for TLS, TrustSec, MacSec , CWS [Cloud Web Security], IDS/IPS.

Install the software for Cisco IOS XE

Install Cisco IOS XE software to enable router functionality and configuration management through different package types and boot methods.

The device can be booted from multiple resources including bootflash, flash, nvram, usbflash0, and webui. Starting with IOS-XE Release 17.2.1, support has been added for booting from USB storage devices.

To install the software, use one of the following methods:

- Managing and Configuring a Router to Run Using a Consolidated Package
- Managing and Configuring a Router to Run Using Individual Packages
- Configuring a Router to Boot the Consolidated Package via TFTP Using the boot Command

Procedure

Step 1 Use the **boot config ?** command to identify the available boot resources.

Example:

```
Router(config)# boot config ?
bootflash:  URL of the config file
flash:      URL of the config file
nvram:      URL of the config file
usbflash0:  URL of the config file
webui:      URL of the config file
```

Step 2 Use the **boot config** *resource:filename* command to configure the boot source using the appropriate command syntax.

The syntax for the boot command is: `boot config usbflash0:`*`FILE name`*

The following is an example of booting from a config file on flash:

Example:

```
Router(config)# boot config flash0:startup-config
```

For USB boot configuration, use the `usbflash0` option:

```
Router(config)# boot config usbflash0:startup-config
Router(config)#
Router# write memory
Building configuration...
[OK]
*Feb 10 10:20:11.990: %SYS-2-PRIVCFG_ENCRYPT: Successfully encrypted private config file
```

Step 3 Use the **show boot** command to verify the boot configuration settings.

Example:

```
Router# show boot
BOOT variable =
CONFIG_FILE variable = usbflash0:startup-config
BOOTLDR variable does not exist
Configuration register is 0x1820
Standby not ready to show bootvar
```

The environment variable CONFIG_FILE confirms that the startup-config is set to boot from the specified location.

The Cisco IOS XE software is successfully installed and configured to boot from the selected resource, with the configuration verified through the **show boot** command output.

Boot from USB feature summary

The boot from USB feature provides specific behaviors and characteristics for configuration file management when using USB storage devices.

- Once the CONFIG_FILE is set to a non-default value, the **nvram:startup-config** command is aliased to this new location.
- Any change made to the config file in usbflash will be reflected in nvram:startup-config as well.
- The EXEC command **erase nvram:startup-config** erases the contents of NVRAM, and deletes the file referenced by CONFIG_FILE variable.
- If the USB is unplugged after setting the **boot config usbflash0:** <*filename*> variable, then the day 0 default configuration will take effect.
- When the configuration is saved using the **copy system:running-config nvram:startup-config** command, the device saves a complete version of the configuration file to the location specified by the CONFIG_FILE environment variable, and a distilled version to NVRAM. A distilled version is one that does not contain access list information.

Boot from ROMMON

This task enables you to configure the router to boot from a USB device when using ROMMON mode.

Follow these steps to boot from the USB:

Procedure

Step 1 Use the **set CONFIG_FILE=usbflash0:***filename* command to specify the configuration file from the ROMMON prompt.

Example:

```
rommon 2 > set CONFIG_FILE=usbflash0:my_startupcfg
           rommon 3 > sync
           rommon 4 > set
           PS1=rommon ! >
           MCU_UPGRADE=SKIP
           THRPUT=
           LICENSE_BOOT_LEVEL=
           RET_2_RTS=
           MCP_STARTUP_TRACEFLAGS=00000000:00000000
           BSI=0
           RANDOM_NUM=1275114933
           BOOT=flash:Jun5_1.SSA,12
           RET_2_RCALTS=951454376
           CONFIG_FILE=usbflash0:my_startupcfg
```

Step 2 Use the ROMMON prompt to continue booting the IOS image as usual.

Cisco IOS XE release upgrade

A Cisco IOS XE release upgrade is an automatic system process that:

- checks and upgrades the ROMMON version when the device boots with Cisco IOS XE image for the first time
- verifies and updates the MCU after ROMMON upgrade completion, and
- automatically power cycles the device after installing the new ROMMON.

Upgrade process details

When the device boots up with Cisco IOS XE image for the first time, the device checks the installed version of the ROMMON, and upgrades if the system is running an older version. During the upgrade, do not power cycle the device. The system automatically power cycles the device after the new ROMMON is installed.

Once ROMMON is upgraded, the device will check if the MCU is upgraded. Once that is complete, the device will boot up with the Cisco IOS XE image as normal.

After the installation, the system will boot up with the Cisco IOS XE image as normal.

Note When the device boots up for first time and if the device requires an upgrade, the entire boot process may take several minutes. This process will be longer than a normal boot due to the ROMMON and/or MCU upgrade.

Boot process of a consolidated package

This example illustrates the boot process of a consolidated package:

```
Router# configure terminal
 Router(config)#boot system bootflash:ESR 6300-universalk9.17.1.1.SPA.bin
Router(config)#config-register 0x2102
Router(config)#exit
Router#
*Nov  7 00:07:06.784: %SYS-5-CONFIG_I: Configured from console by console
Router#
Router#show run | inc license
license udi pid ESR 6300-K9 sn FCW2150TH0F
license boot level network-advantage
Router#
Router#reload ?
  /noverify  Don't verify file signature before reload.
  /verify    Verify file signature before reload.
  at         Reload at a specific time/date
  cancel     Cancel pending reload
  in         Reload after a time interval
  pause      Pause during reload
  reason     Reload reason
  <cr>       <cr>

Router#reload /verify

System configuration has been modified. Save? [yes/no]: yes
Building configuration...

[OK]
```

```
*Nov  7 00:08:48.101: %SYS-2-PRIVCFG_ENCRYPT: Successfully encrypted private config file
Verifying file integrity of bootflash:/ESR 6300-universalk9.16.10.01.SPA.bin...........
.................................

Embedded Hash   SHA1 : B0315BDC4F545D624BB128CE0FFAA468E6EF7587
Computed Hash   SHA1 : B0315BDC4F545D624BB128CE0FFAA468E6EF7587
Starting image verification
Hash Computation:    100%Done!
Computed Hash   SHA2: 03febcc07fbeadeed664f2f5ef87f6c3
                      5b343e6f7aecdd70e50e5203909aec8f
                      3d276529d2a6af6859d4c77237f812d5
                      0da93678edc942c8874edca2d5224101

Embedded Hash   SHA2: 03febcc07fbeadeed664f2f5ef87f6c3
                      5b343e6f7aecdd70e50e5203909aec8f
                      3d276529d2a6af6859d4c77237f812d5
                      0da93678edc942c8874edca2d5224101

Digital signature successfully verified in file bootflash:/ESR
6300-universalk9.16.10.01.SPA.bin
Signature Verified

Proceed with reload? [confirm]

*Jul  9 06:43:37.910: %SYS-5-RELOAD: Reload requested by console. Reload Reason: Reload
Command. Jul  9 14:43:59.134: %PMAN-5-EXITACTION: R0/0: pvp: Process manager is exiting:
process exit with reload chassis code

watchdog watchdog0: watchdog did not stop!
reboot: Restarting system


Press RETURN to get started!
```

IOS XE downgrade warning

An IOS XE downgrade warning is a system feature that

- presents a warning when issuing a **boot system flash** command followed by a file name of an image which has a version number lower than the one of the running image
- allows the downgrade operation by ignoring the warning message presented to the user
- permits booting an image with the same or higher version of the running image without warning, and
- applies only to images already loaded on the bootflash of the router using the **boot system flash**<*file_name*> CLI (excluding other sources/devices like ftp, mop, rpc, tftp, rom).

Version comparison examples

The system compares versions using these rules:

When comparing two version numbers as follows:

- 17.7.1
- 17.7.1c

The version with the letter (17.7.1c) will be considered the most updated one.

When comparing two version numbers as follows:

- 17.7.3a
- 17.7.3f

The comparison will be made taking into consideration the alphabetical order. In the case above 17.7.3f will be considered the most updated one.

ROMMON images

A ROMMON image is a software package that:

- is used by ROM Monitor (ROMMON) software on a router
- is separate from the consolidated package normally used to boot the router, and
- can be independently released and used to upgrade the router with new ROMMON software.

ROMMON image release cycle

An independent ROMMON image (software package) may occasionally be released and the router can be upgraded with the new ROMMON software. For detailed instructions, see the documentation that accompanies the ROMMON image.

Note A new version of the ROMMON image is not necessarily released at the same time as a consolidated package for a router.

File systems

This table provides a list of file systems that can be seen on the Cisco ESR6300 router.

Table 3: Router file systems

File System	Description
bootflash:	Boot flash memory file system.
flash:	Alias to the boot flash memory file system above.
cns:	Cisco Networking Services file directory.
nvram:	Router NVRAM. You can copy the startup configuration to NVRAM or from NVRAM.
obfl:	File system for Onboard Failure Logging (OBFL) files.
system:	System memory file system, which includes the running configuration.

File System	Description
tar:	Archive file system.
tmpsys:	Temporary system files file system.
usbflash0:	The Universal Serial Bus (USB) flash drive file systems. **Note** The USB flash drive file system is visible only if a USB drive is installed in the USB port.

Use the **?** help option if you find a file system that is not listed in the table above.

Auto-generated file directories and files

This section discusses the auto-generated files and directories that can be created, and how the files in these directories can be managed.

Table 4: Auto-generated files

File or Directory	Description
crashinfo files	Crashinfo files may appear in the bootflash: file system. These files provide descriptive information of a crash and may be useful for tuning or troubleshooting purposes. However, the files are not part of router operations, and can be erased without impacting the functioning of the router.
core directory	The storage area for .core files. If this directory is erased, it will automatically regenerate itself at bootup. The .core files in this directory can be erased without impacting any router functionality, but the directory itself should not be erased.
tracelogs directory	The storage area for trace files. Trace files are useful for troubleshooting. If the Cisco IOS process fails, for instance, users or troubleshooting personnel can access trace files using diagnostic mode to gather information related to the Cisco IOS failure. Trace files, however, are not a part of router operations, and can be erased without impacting the router's performance.

Important notes about auto-generated directories

Important information about auto-generated directories include:

- auto-generated files on the bootflash: directory should not be deleted, renamed, moved, or altered in any way unless directed by Cisco customer support.

Note Altering auto-generating files on the bootflash: may have unpredictable consequences for system performance.

- Crashinfo files and files in the core and tracelogs directory can be deleted.

Flash storage

Flash storage is a local media storage that enables subpackage installation and router operation.

Flash storage operation

To list file names in flash storage, use the **dir bootflash:** command.

Note Flash storage is required for successful operation of a router.

LED indicators

For LED information on the router, see the LED section of the ESR6300 Hardware Technical Manual.