

Cisco Device Memory



- Cisco routers and switches have 4 built-in memory locations:
 - ROM – Read Only Memory
 - Flash – newer devices use removable CompactFlash
 - NVRAM – Non-Volatile RAM
 - RAM – Random Access Memory

- An external USB device can also be used

ROM Read Only Memory



- When the device is powered on, it will first load from ROM
- Two main functions are performed:
 - 1) Power On Self Test (POST)
 - 2) Load bootstrap
- The bootstrap will look in Flash for an IOS software image to load

ROM Read Only Memory



- If an IOS image cannot be found the device will show the ROMMON prompt at the command line
- The ROM Monitor can be used to recover a missing or corrupted software image
- In this case you can boot from USB or an external TFTP (Trivial File Transfer Protocol) server
- Search for 'Cisco ROMMON Recovery' for your device model

Flash Memory



- The system will load the first IOS image found in Flash by default
- You can override this with the `boot system` command
- You can copy additional IOS system images to Flash via TFTP or USB

NVRAM Non-Volatile RAM Memory

- When the system has finished loading the IOS system image from Flash, it will load the startup-config configuration file from NVRAM
- The saved startup-config becomes the current running-config in RAM
- If no startup-config file is found, the device will load the Setup Wizard

NVRAM Non-Volatile RAM Memory

- Whenever you enter a command in IOS it takes effect immediately and goes into the running-config
- To make your changes permanent across a reboot:

```
copy running-config startup-config
```

RAM Random Access Memory



- The IOS system image and startup-config are loaded from Flash and NVRAM into RAM during bootup
- RAM is used as the normal working memory of the device
- ROM, Flash and NVRAM are permanent memory, their contents are not lost when the device is powered off or rebooted
- RAM is volatile memory, its contents are lost when the device is powered off

The VLAN Database



- On a switch, the VLAN database (vlan.dat) is saved in either Flash or NVRAM, depending on the model of switch

Booting from TFTP



- The system can also load a system image and/or startup-config from an external TFTP server instead of Flash/NVRAM
- This is not recommended because the device will not be able to boot if it loses connectivity to the server. It is usually only used where the device does not have enough capacity in Flash to save the system image

Lab Example

