



In 60 Days - CCENT

Router Architecture

CCNA

in60days.net

# Inside the Router

Non-Volatile  
RAM

Read Only  
Memory  
ROM

Flash  
Memory

CPU

DRAM

# Inside the Router

**Boot Flash**  
**RX Boot**

**NV RAM**  
Startup  
Config/Config Reg

**ROM**  
**ROM Monitor**

**DRAM**  
Uncompressed  
IOS/Running  
Config/Buffers/Routing  
Tables

**Flash**  
IOS  
Compressed



DRAM



Flash

# Inside the Router

ROM monitor  
Startup code

RX Boot  
Host OS

Cisco IOS  
Full code

Config Register  
Start settings

Config File  
Device config

# Router OS

- **Boot ROM**

EEPROM for startup diag/Rommon and loads IOS

- **NVRAM**

Stores router startup config and config register

# Router OS

- Flash/PCMCIA

IOS and some config files

- DRAM

Stores full IOS, running config, routing tables



# Router OS

- ROM Monitor

System diagnostics and startup

- RxBoot

Mini IOS, allows for upload of full IOS

# Router OS

- Cisco IOS

Resides in flash. Router operating system

- Router Config

Stored in NVRAM and pulled on boot

# Config Register

- Sets instructions for booting

Boot and ignore startup config - 0x2142

Boot normally – 0x2102

```
Router(config)#config-register 0x2102
```

- Show version

# Router Booting

## ROM Monitor

System diagnostics, check config register, tests hardware & interfaces

Boots RX Boot image or goes into **Rommon>**

## RX Boot

Sets up interfaces and loads full IOS or goes into

**Router(boot)>**

## Cisco IOS

Allocates buffers, loads startup config, goes into

**Router>**

# Backing Up

- Copy all files to a server

```
Router#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
Router#copy start tftp:
Router#copy flash: tftp:
```

```
Router#sh version
Cisco IOS Software, 1841 Software (C1841-ADVENTERPRISEK9-M), Version 12.4(24)T3,      RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2010 by Cisco Systems, Inc.
Compiled Tue 23-Mar-10 04:50 by prod_rel_team
```

```
ROM: System Bootstrap, Version 12.4(13r)T5, RELEASE SOFTWARE (fc1)
```

```
Router uptime is 1 minute
System returned to ROM by power-on
System image file is "flash:c1841-adventerprisek9-mz.124-24.T3.bin"
```

```
This product contains cryptographic features and is subject to United
[SNIP]
```

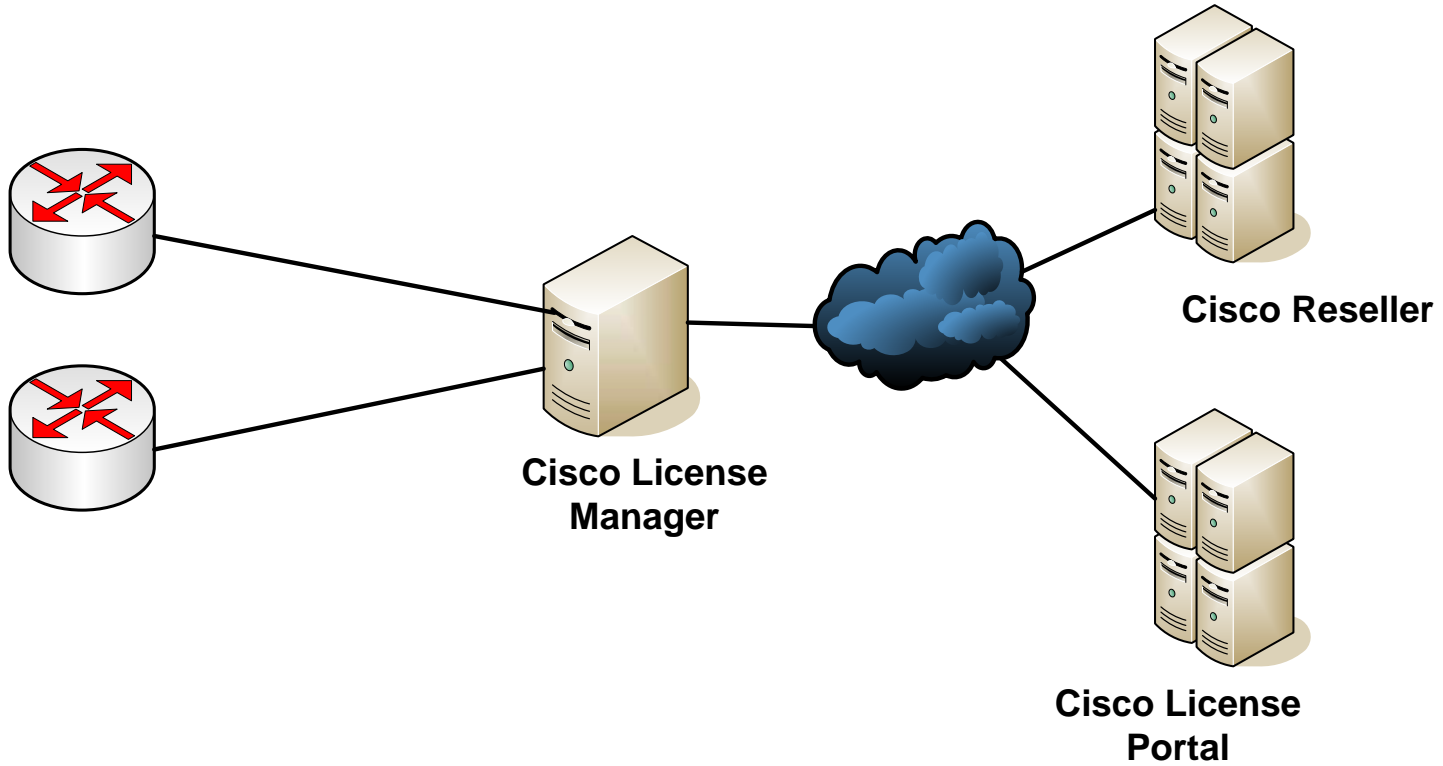
```
Cisco 1841 (revision 7.0) with 356352K/36864K bytes of memory.
Processor board ID FHK1220227J
2 FastEthernet interfaces
1 Serial(sync/async) interface
1 Virtual Private Network (VPN) Module
DRAM configuration is 64 bits wide with parity disabled.
191K bytes of NVRAM.
62720K bytes of ATA CompactFlash (Read/Write)

Configuration register is 0x2102
```

# IOS Licensing

- New model has one IOS release per model
- Feature sets unlocked as you pay

Voice	Locked
Security	Locked
Data	Locked
IP Base	Unlocked





# Process

- Each model features a UDI
- Unique Device Identifier
- UDI consists of – PID and SN

```
Router#show license ?
  all      Show license all information
  detail   Show license detail information
  feature  Show license feature information
  udi      Show license udi information
```

```
Router#show license udi
```

Device#	PID	SN	UDI
*0	CISCO1941/K9	FTX15240000	CISCO1941/K9:FTX15240000

```
Router#
```

# Product Activation Key (PAK)

- Purchasable from Cisco Systems
- Used to obtain license files for IOS
- PAKs match IOS feature sets
- PAK and UDI submitted online to Cisco



### Software License Claim Certificate

Dear Customer,

By accessing or using the Cisco products identified below, you agree that your use of such products is governed by the terms and conditions of the Cisco Software License and any applicable supplemental license agreement. To review the terms of the Software License before accessing or using the products, you can find a copy of the Cisco Software License in the Cisco Information Packet that accompanies the products below or online at:

[http://www.cisco.com/en/US/docs/general/warranty/english/EU1KEN\\_.html](http://www.cisco.com/en/US/docs/general/warranty/english/EU1KEN_.html)

To obtain the license authorization keyfile, log on to one of the websites listed below, and follow the registration instructions. The Product Authorization Key (PAK) number found below is required for the registration process. After registering, retain this document for future reference.

#### Registration Information

Use this website if you are registered user of Cisco.com:  
<http://www.cisco.com/go/license>

You should receive the license authorization keyfile and installation instructions through e-mail within one hour of registration. If you experience problems with the registration websites or if you have additional questions, for a prompt response, please use of a Service Request using the TAC Service Request Tool at <http://tools.cisco.com/ServiceRequestDesktop/ServiceRequest.do>. Please have your valid Cisco user ID and password available. As an alternative you may also call one of the following number:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)

EMEA: +32 2 704 55 55

USA: 1 800 553-2447

You can find a complete list of Cisco TAC contacts at this URL:  
<http://www.cisco.com/techsupport/contacts>

Product	Description	Entitlement Qty
ASA-CSC10-LIC	ASA 5500 Series Content Security SSM-10 Software License	1

Product Authorization Key: 1301B6C17AA



SO#: 12549653 - Lant: 21 - Ship Set: 21



Worldwide (change)

Search

Solutions Products & Services Ordering Support Training & Events Partner Central

HOME

Support

Product License Registration

## Product License Registration

1 Enter a PAK Number 2 Validate Features 3 Designate Licenses 4 Finish and Submit

### License Assistant

- 1 - Welcome
- 2 - Cisco Account
- 3 - PAKs and Devices
- 4 - Summary
- 5 - Get License
- 6 - Deploy License

## 5 - Get License

The system is in the process of getting a license from the License Portal.

License downloading  
Obtaining license (pak: \*\*\*\*81D8 ) for device: CISCO3845-MB:FOC10382R6A is done. Status: Success



100%

Help

< Back

Next >

Finish

Cancel

Image © [www.petenetlive.com](http://www.petenetlive.com)

# Final Steps

- Copy to router with USB/TFTP/FTP
- Issue 'license install' command
- Reload router

```
Router#show license ?
  all      Show license all information
  detail   Show license detail information
  feature  Show license feature information
  udi      Show license udi information
```

```
Router#show license feature
```

Feature name	Enforcement	Evaluation	Subscription	Enabled
ipbasek9	no	no	no	yes
securityk9	yes	yes	no	no
datak9	yes	no	no	no

```
Router#dir usbflash0:
```

```
Directory of usbflash0:/
QQE_25657585937363320.lic
```

```
Router#license install usbflash1:QQE_25657585937363320.lic
```

```
Router#Installing licenses from usbflash1:QQE_25657585937363320.lic
PLEASE READ THE FOLLOWING TERMS CAREFULLY.
```

```
[Licensing text snipped]
```

```
ACCEPT? [yes/no]: yes
```

```
Installing...Feature:ios-ips-update...Successful:Supported
```

```
1/1 licenses were successfully installed
```

```
0/1 licenses were existing licenses
```

```
0/1 licenses were failed to install
```

# Right-to-Use License

- Lets you unlock features to test
- No PAK required to enable features
- After 60 days expires but still works

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#license boot mod
Router(config)#license boot module ?
    c1900  license boot module for c1900
Router(config)#license boot module c1900 ?
    technology-package  product technology group
Router(config)#license boot module c1900 technology-package ?
    securityk9  security technology
Router(config)#license boot module c1900 technology-package  securityk9
PLEASE READ THE FOLLOWING TERMS CAREFULLY.  INSTALLING THE LICENSE OR
LICENSE KEY PROVIDED FOR ANY CISCO PRODUCT FEATURE OR USING SUCH
PRODUCT FEATURE CONSTITUTES YOUR FULL ACCEPTANCE OF THE FOLLOWING
TERMS.  YOU MUST NOT PROCEED FURTHER IF YOU ARE NOT WILLING TO BE BOUND
BY ALL THE TERMS SET FORTH HEREIN.
[SNIPPED]
ACCEPT? [yes/no]: y
% use 'write' command to make license boot config take effect on next boot
%IOS_LICENSE_IMAGE_APPLICATION-6-LICENSE_LEVEL: Module name = C1900 Next reboot level =
securityk9 and License = securityk9

Router(config)#
```

```
Router#show license all
License Store: Primary License Storage
StoreIndex: 0   Feature: ipbasek9                               Version: 1.0
    License Type: Permanent
    License State: Active, In Use
    License Count: Non-Counted
    License Priority: Medium

License Store: Evaluation License Storage
StoreIndex: 0   Feature: securityk9                           Version: 1.0
    License Type: Evaluation
    License State: Inactive
        Evaluation total period: 208 weeks 2 days
        Evaluation period left: 208 weeks 2 days
    License Count: Non-Counted
    License Priority: None
StoreIndex: 1   Feature: datak9                               Version: 1.0
    License Type:
    License State: Inactive
        Evaluation total period: 208 weeks 2 days
        Evaluation period left: 208 weeks 2 days
    License Count: Non-Counted
    License Priority: None
```



A close-up, slightly blurred photograph of a hand holding a pen, writing on a document. The background is out of focus, showing what appears to be a desk or workspace with some papers and a lamp.

**End**

CCNA

[in60days.net](http://in60days.net)