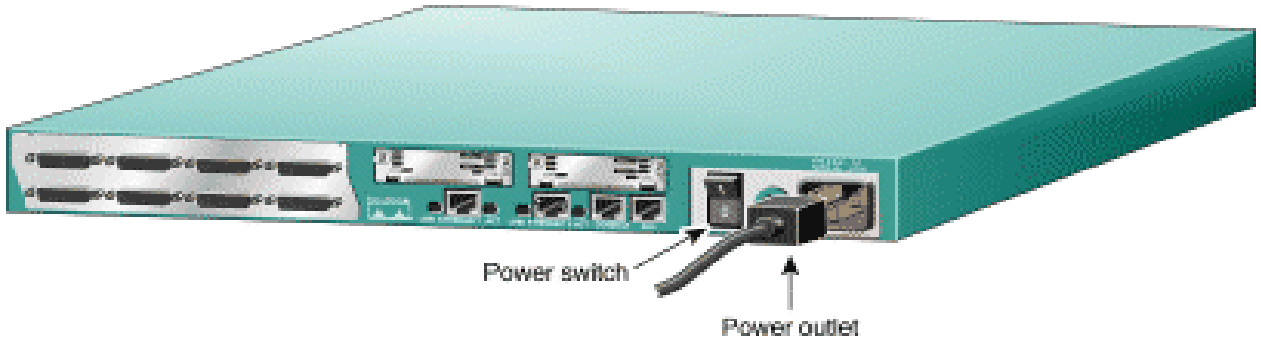
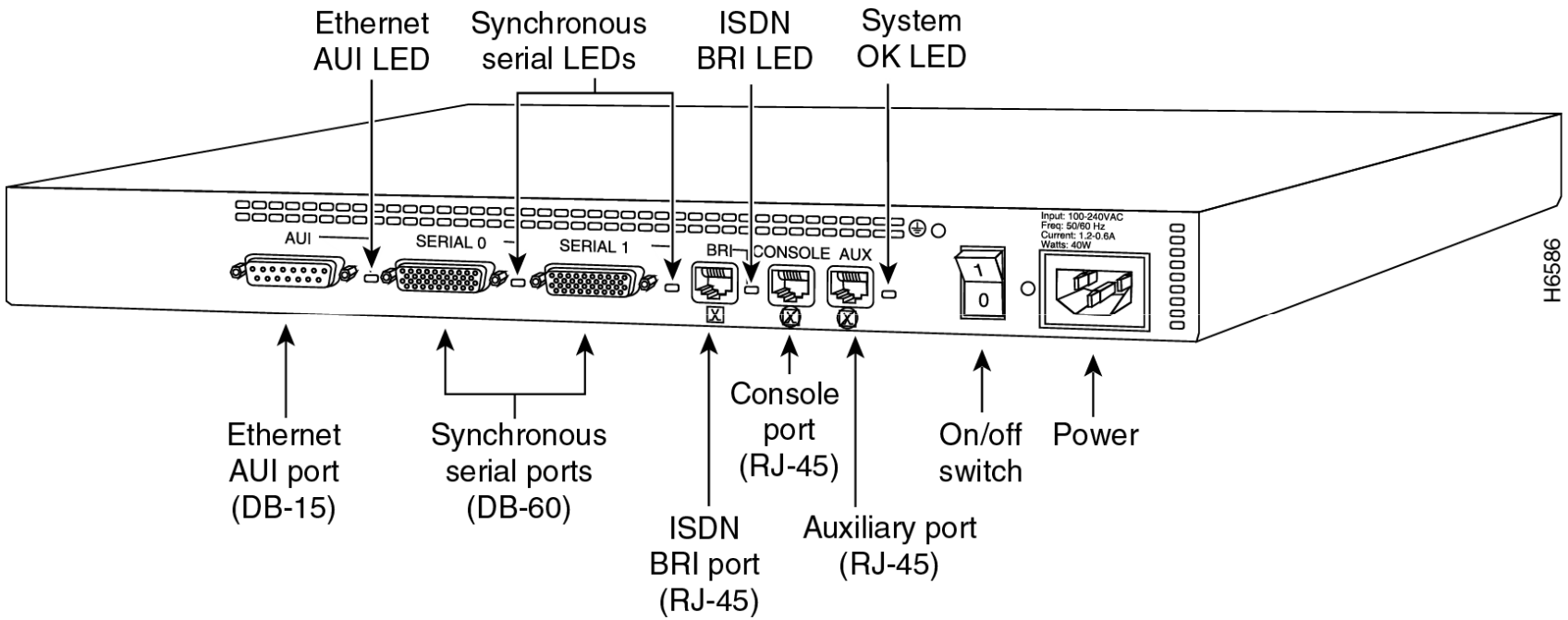
Module 02 :
Cisco Device and IOS Basic

Cisco Router의 초기 시동



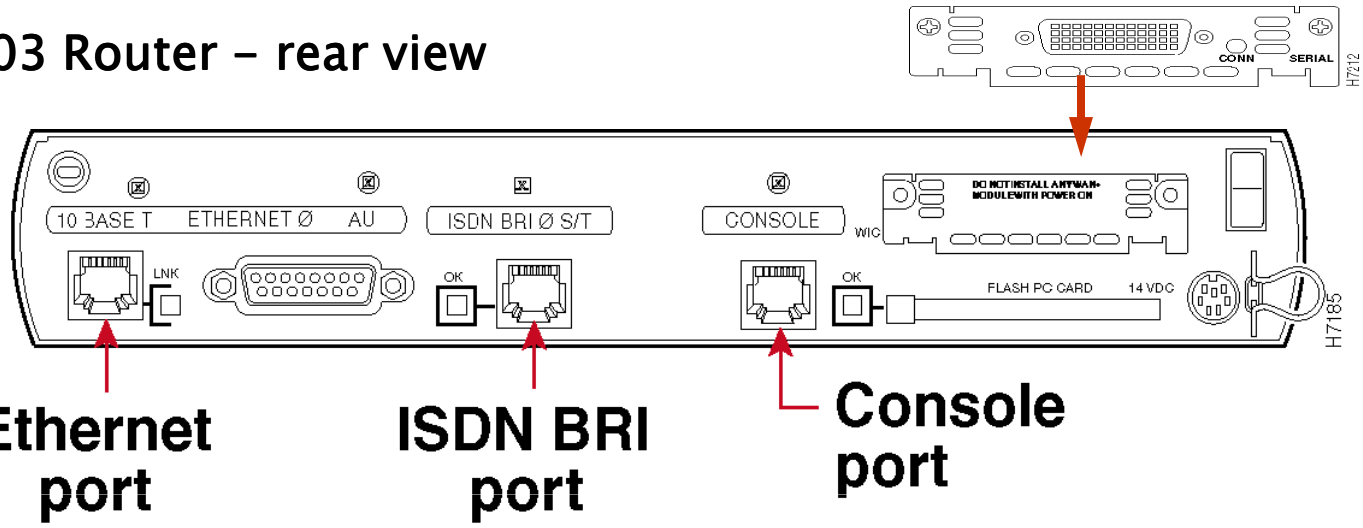
- **Power** 케이블과 **Console** 케이블의 연결 상태를 확인 한다.
- **Router**의 **Power switch**를 켜고 전원 공급 상태를 확인 한다.
- **Router**의 부팅 단계를 **Console**에 나타나는 메시지를 통해 확인한다.

Cisco 2500 Serise Router Interface Type



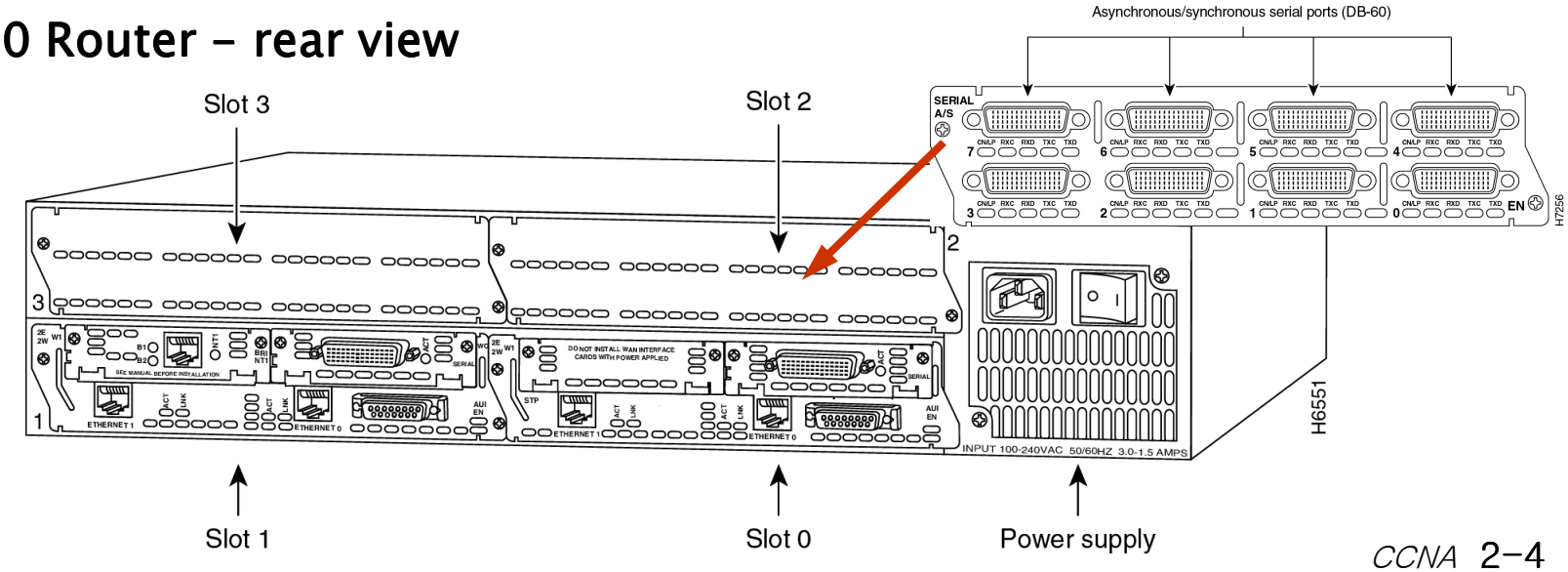
Modular Interface

1603 Router – rear view



WAN Interface Card

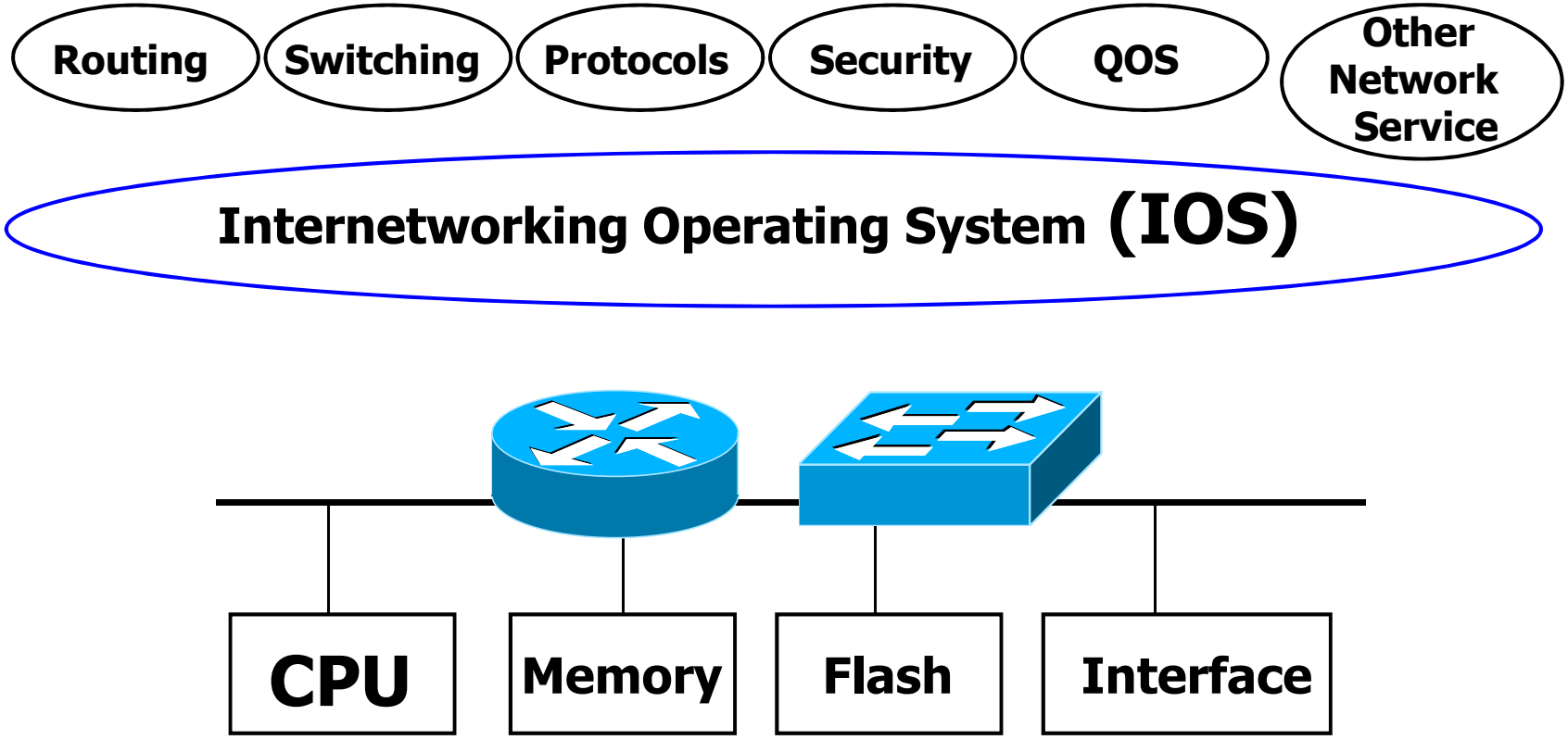
3640 Router – rear view



Cisco IOS Software 개요

- **Cisco IOS Software** 특징
- **IOS Device** 구성
- **IOS Device** 구성을 위한 외부 접근 방식
- **IOS Command Line Interface**의 기능
- **IOS**의 기본 실행**(EXEC)** 모드

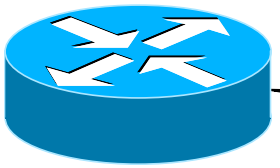
Cisco IOS Software 특징



IOS Device의 구성 작업들

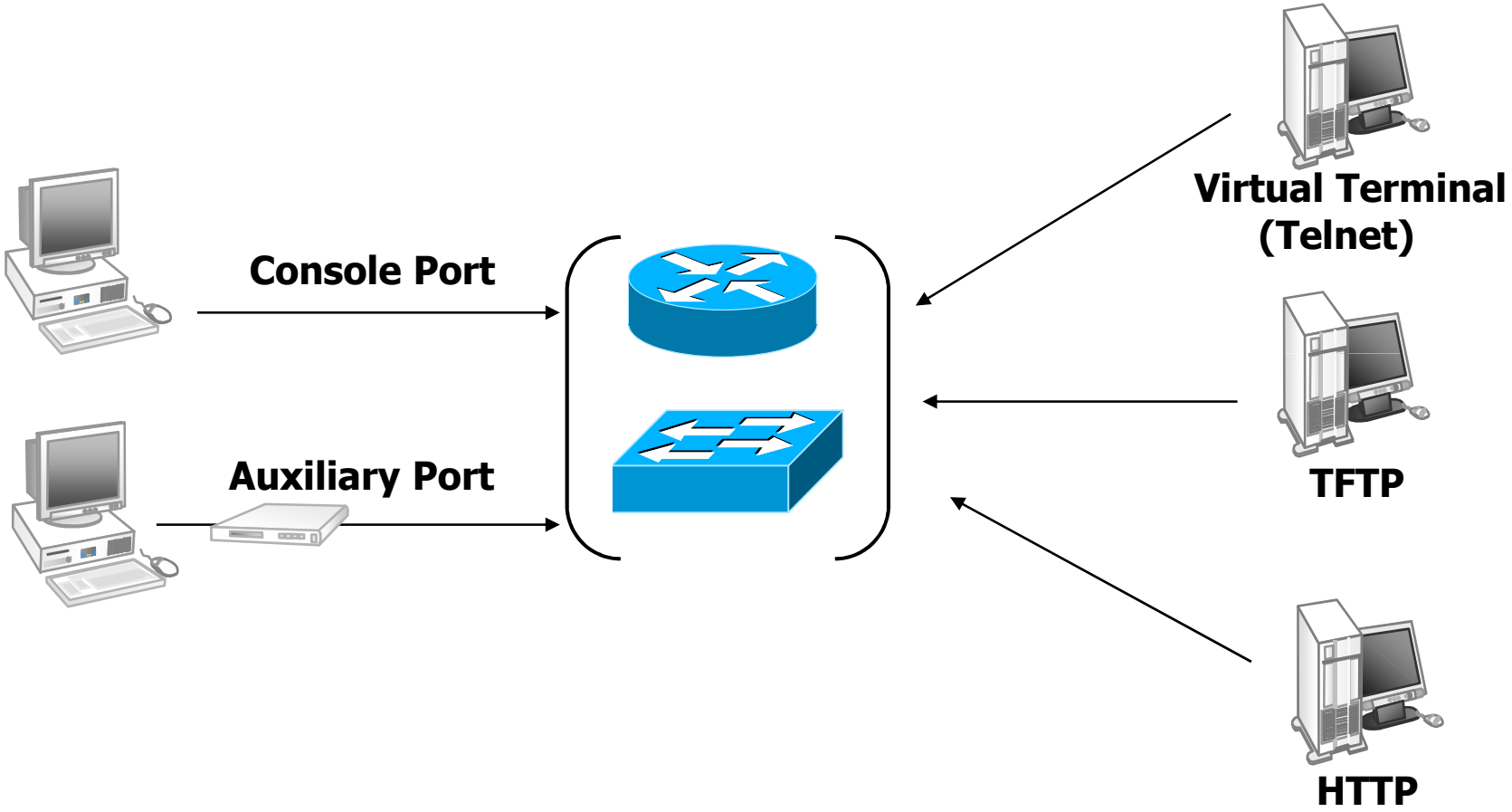
- **Network**에서 요구되는 다양한 정책 설정
- **Protocol Address**와 관련 **Option** 설정
- **IOS Device** 관리를 위한 관리 **Option**

Switch는 초기 구성 정보를 메모리에 저장하고 있다.



Router는 초기 구성 정보를 사용자가 지정해야 한다.

IOS Device 구성을 위한 외부 접근 방식



IOS Command Line Interface의 기능

- **IOS**가 제공하는 가장 기본적인 사용자 **Interface**이다.
- **CLI**는 사용자가 명령어를 직접 입력하는 방식이다.
- **IOS Device**의 종류에 따라 다양한 명령어가 제공 된다.
- **Console**안에서 명령어의 직접/간접 입력이 가능하다.
- 실행 모드는 크게 **User Mode**와 **Privileged Mode**가 있다.
- 명령어 모드에 따라 다양한 **Prompt**를 제공한다.

Cisco Router의 초기 시동

```
System Bootstrap, Version 12.2(4r)XT2, RELEASE SOFTWARE (fc1)
TAC Support:http://www.cisco.com/tac
Copyright (c) 2001 by cisco Systems, Inc.
c2691 processor with 131072 Kbytes of main memory

Main memory is configured to 64 bit mode with parity disabled
Readonly ROMMON initialized
rommon 1 > b
program load complete, entry point:0x80008000, size:0x6284dc
Self decompressing the image
:#####################################.....
 #####################################.....
 .....
 ###################### [OK]

Smart Init is enabled
Smart init is sizing iomem
    ID            MEMORY_REQ       TYPE
000259          0005F3C00     c2691 2NM Mainboard
0001AA          0X0025178C 1A DS3
                0X0010AE00 public buffer pools
                0X00211000 public particle pools
TOTAL: 0X00B6118C

If any of the above Memory Requirements are
"UNKNOWN", you may be using an unsupported
configuration or there is a software problem and
system operation may be compromised.
Rounded IOMEM up to:12Mb.
Using 9 percent iomem. [12Mb/128Mb]
.....
```

IOS Image Loading

Cisco Router의 초기 시동

Cisco Internetwork Operating System Software
IOS (tm) 2600 Software (C2691-I-M), Version 12.2(4)XT, MAINTENANCE INTERIM SOFTWARE
Copyright (c) 1986-2001 by cisco Systems, Inc.
Compiled Thu 23-Aug-01 00:28 by uma
Image text-base:0x60008960, data-base:0x60AE4000

cisco 2691 (R7000) processor (revision 0.6) with 118784K/12288K bytes of memory.
Processor board ID 12345678901
R7000 CPU at 240Mhz, Implementation 39, Rev 3.3, 256KB L2 Cache
Bridging software.
X.25 software, Version 3.0.0.
2 FastEthernet/IEEE 802.3 interface(s)
DRAM configuration is 64 bits wide with parity disabled.
55K bytes of non-volatile configuration memory.
15680K bytes of ATA System CompactFlash (Read/Write)
31360K bytes of ATA Slot0 CompactFlash (Read/Write)

IOS Software Version

Hardware 정보

Cisco Router의 초기 시동

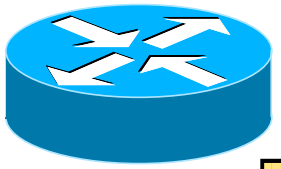
Setup Mode

```
--- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: yes

At any point you may enter a question mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.


Basic management setup configures only enough connectivity
for management of the system, extended setup will ask you
to configure each interface on the system

Would you like to enter basic management setup? [yes/no]: no
```

User Mode

```
Router con0 is now available
Press RETURN to get started.

Router>
```

IOS의 기본 실행(EXEC) 모드



- **IOS**의 기본 실행 모드이다.
- 제한된 명령어만을 사용 할 수 있다.
- 다음과 같은 **Prompt**를 제공 한다.

Router
→ router>

Switch
→ switch>

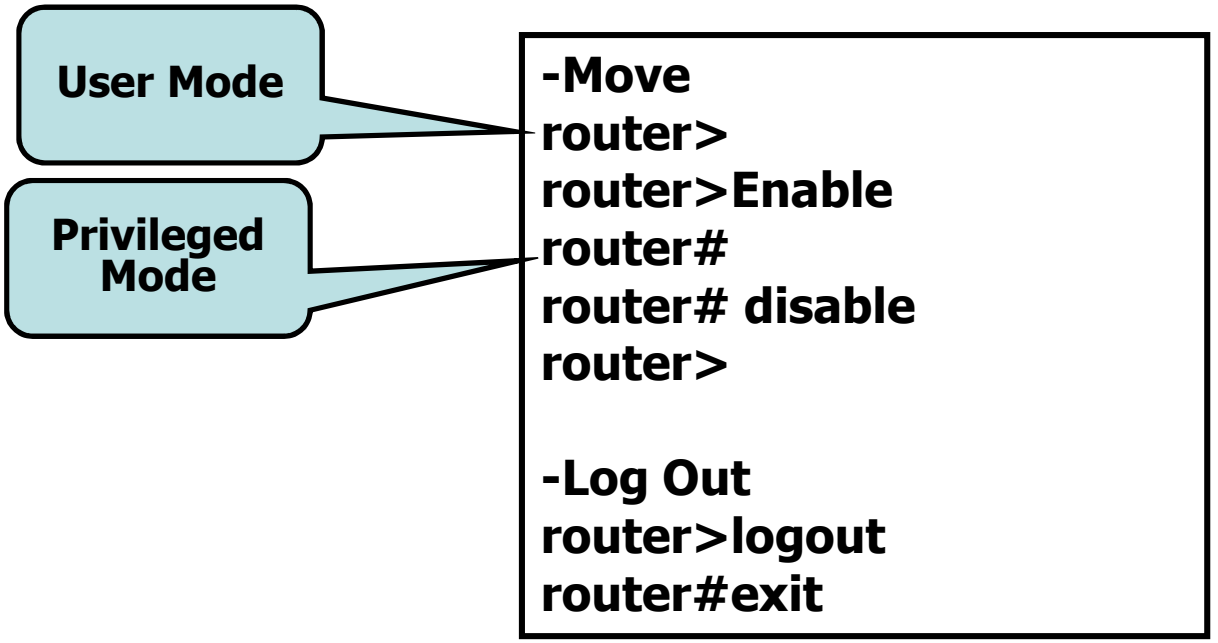
IOS의 기본 실행(EXEC) 모드

- **IOS**의 구성 작업을 진행 할 수 있는 실제 실행 모드이다.
- **IOS**의 모든 명령어를 사용 할 수 있다.
- **IOS**가 제공하는 다른 구성 모드로 진입하기 위해서는 이 실행 모드가 기본이 된다.
- 다음과 같은 **Prompt**를 제공 한다.

Router
→ **router#**

Switch
→ **switch#**

Router에 Logging하기



Router의 CLI Help 기능

Context-Sensitive Help	Console Error Messages
Provides a list of commands and the arguments associated with a specific command	Identifies problems with router commands that are incorrectly entered so you can alter or correct them

Command History Buffer
Allows recall of long or complex commands or entries for reentry, review, or correction

Router의 User Mode Command List

```
wg_ro_c>?
Exec commands:
  access-enable     Create a temporary Access-List entry
  atmsig            Execute Atm Signalling Commands
  cd                Change current device
  clear             Reset functions
  connect           Open a terminal connection
  dir               List files on given device
  disable           Turn off privileged commands
  disconnect        Disconnect an existing network connection
  enable            Turn on privileged commands
  exit              Exit from the EXEC
  help              Description of the interactive help system
  lat               Open a lat connection
  lock              Lock the terminal
  login             Log in as a particular user
  logout            Exit from the EXEC
-- More --
```

Router의 Privileged Mode Command List

```
wg_ro_c#?
Exec commands:
  access-enable          Create a temporary Access-List entry
  access-profile         Apply user-profile to interface
  access-template        Create a temporary Access-List entry
  bfe                    For manual emergency modes setting
  cd                     Change current directory
  clear                  Reset functions
  clock                  Manage the system clock
  configure              Enter configuration mode
  connect                Open a terminal connection
  copy                   Copy from one file to another
  debug                  Debugging functions (see also 'undebug')
  delete                 Delete a file
  dir                    List files on a filesystem
  disable                Turn off privileged commands
  disconnect             Disconnect an existing network connection
  enable                 Turn on privileged commands
  erase                  Erase a filesystem
  exit                   Exit from the EXEC
  help                   Description of the interactive help system
-- More --
```

Router의 CLI Editing 기능

```
Router>$ value for customers, employees, and partners.
```

	(Automatic scrolling of long lines.)
Ctrl+A	Move to the beginning of the command line.
Ctrl+E	Move to the end of the command line.
Esc-B	Move back one word.
Esc-F	Move forward one word.
Ctrl+B	Move back one character.
Ctrl+F	Move forward one character.
Ctrl+D	Delete a single character.

Router의 Command History

Ctrl-P or Up Arrow	Recalls last (previous) commands
Ctrl-N or Down Arrow	Recalls more recent commands
`show history`	Shows command buffer contents
`history size` *`line`*	Sets the buffer size permanently
`terminal history size` *`lines`*	Sets session command buffer size

Console Error Messages

>> 일반적인 **Error Message**

> 불완전한 명령어 입력시

```
Router#con
% Ambiguous command:  "con"
```

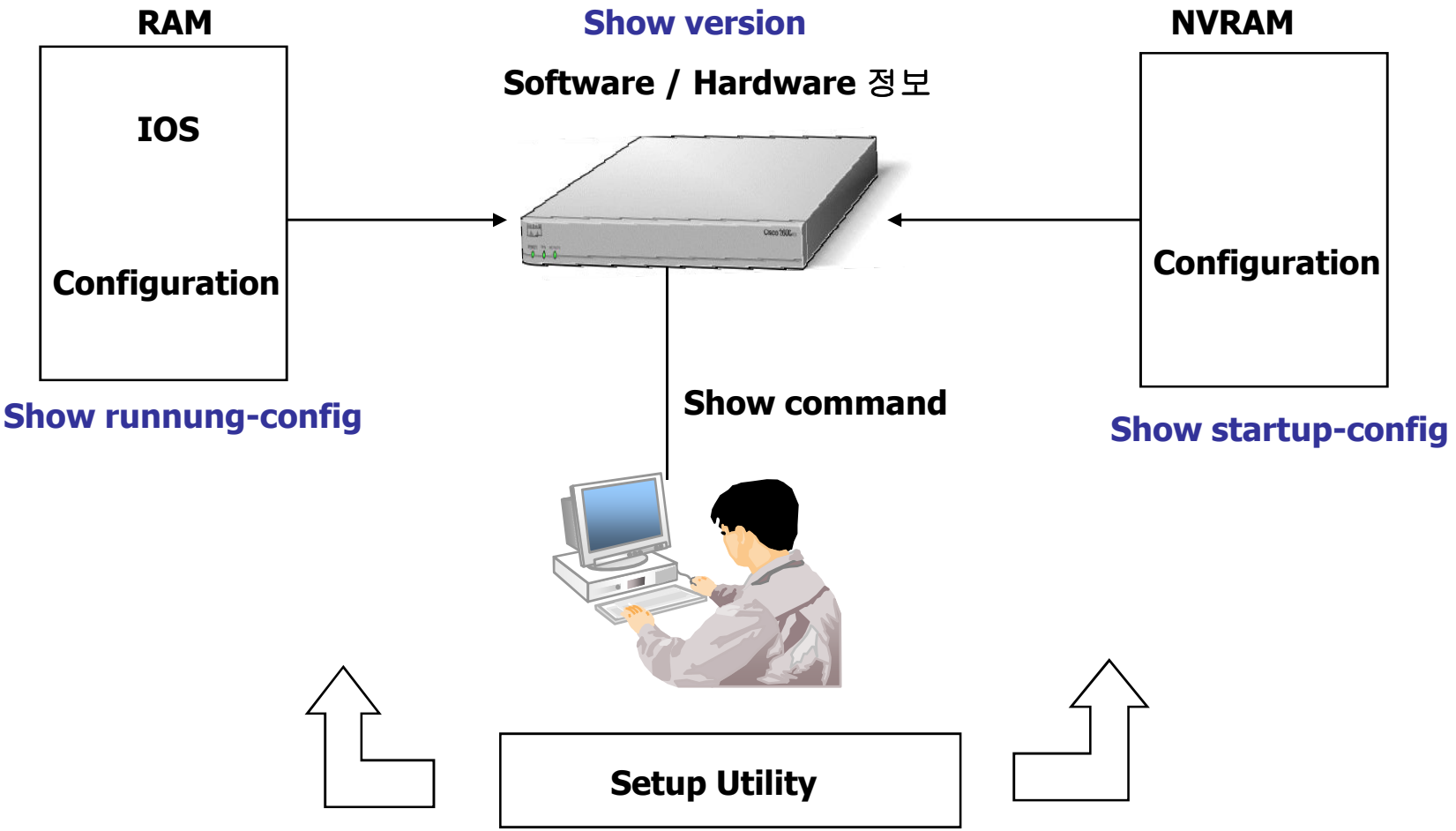
> 오타로 인한 명령어 잘못 입력시 오류

```
Router#conf v
                  ^
% Invalid input detected at '^' marker.
```

> 현재 모드에 존재하지 않는 명령입력 오류

```
Router(config)#conf
% Incomplete command.
```

Router의 초기 상태 정보 검증



Router의 초기 상태 정보 검증

In RAM

```
wg_ro_c#show running-config
Building configuration...

Current configuration:
!
version 12.0
!
     -- More --
```

- 현재 **DRAM**에 저장된 정보를 표시한다. 사용자가 수정한 정보는 **running-config** 파일에 저장된다. **Active Config** 파일이므로 여기 설정된 내용은 **System**에 적용되어 있다.

In NVRAM

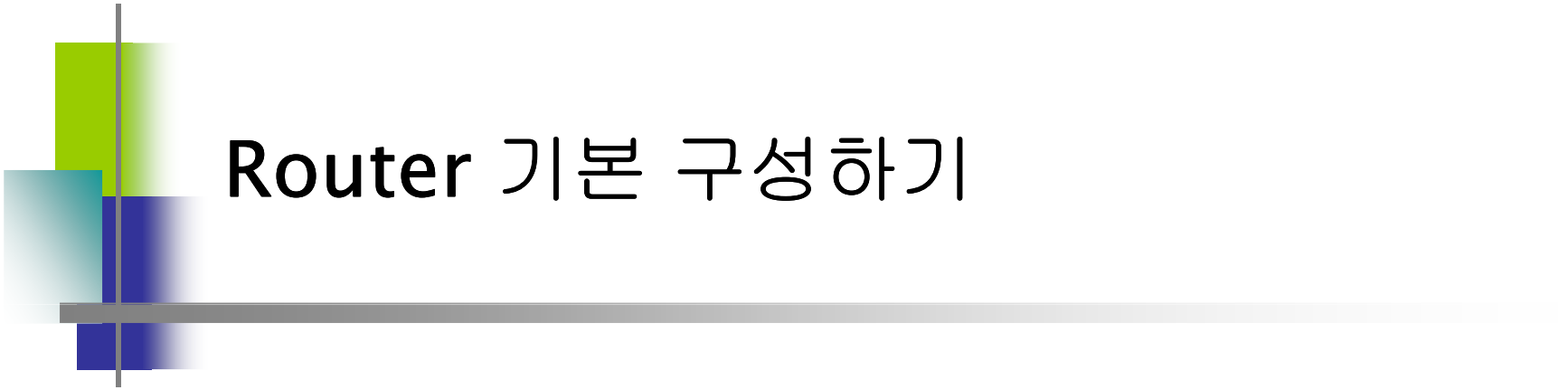
```
wg_ro_c#show startup-config
Using 1359 out of 32762 bytes
!
version 12.0
!
     -- More --
```

- **NVRAM**에 저장된 정보를 표시한다. **"#copy running-config startup-config"** 를 통해 저장한 정보가 **NVRAM**에 저장되어 있다. 이 정보는 **Router Reload**시에 **Router** 초기 구성을 한다.

Router의 초기 상태 정보 검증

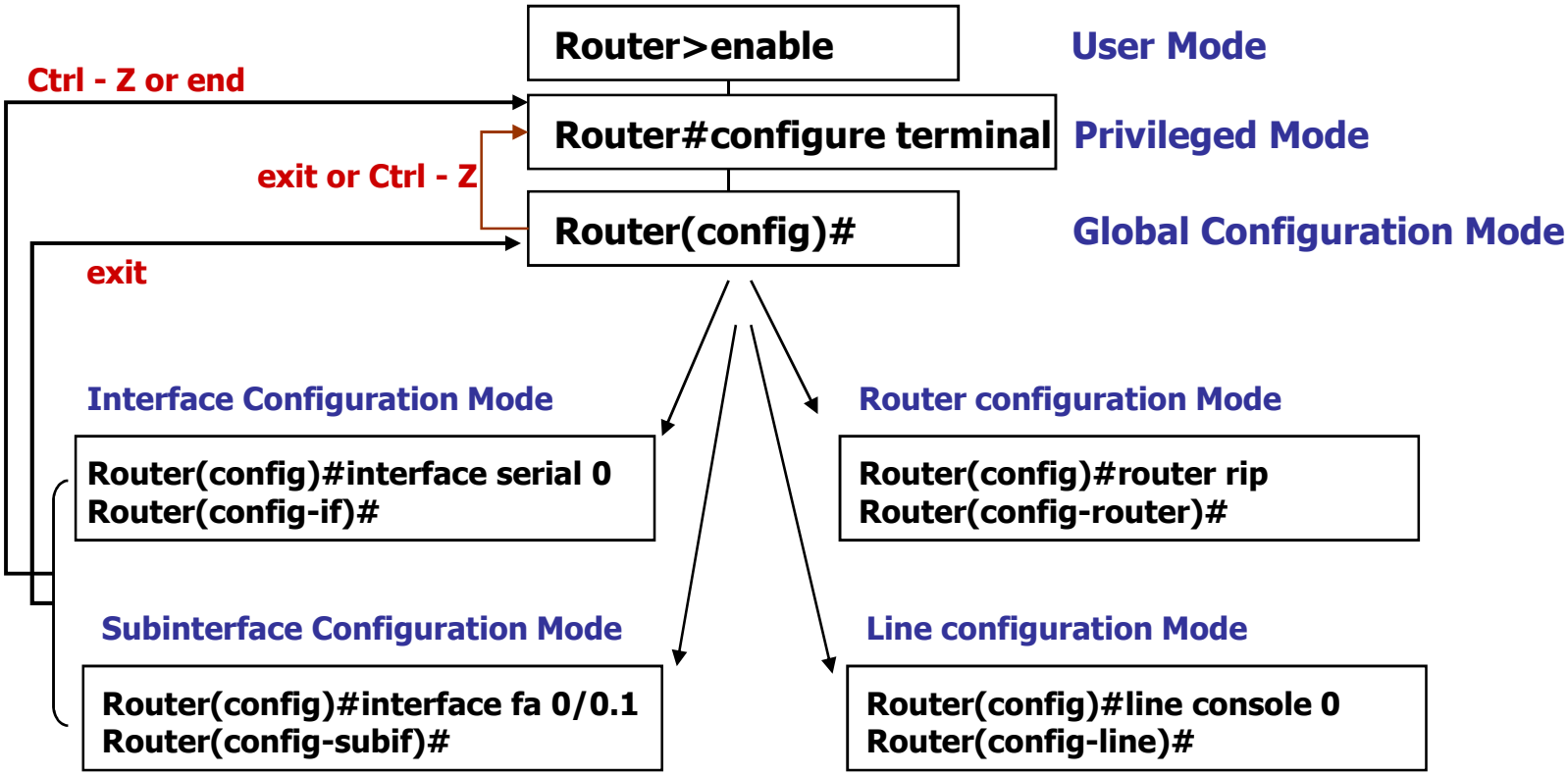
Show version

```
wg_ro_a#show version
Cisco Internetwork Operating System Software
IOS (tm) 2500 Software (C2500-JS-L), Version 12.0(3), RELEASE SOFTWARE (fc1)
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Mon 08-Feb-99 18:18 by phanguye
Image text-base: 0x03050C84, data-base: 0x00001000

ROM: System Bootstrap, Version 11.0(10c), SOFTWARE
BOOTFLASH: 3000 Bootstrap Software (IGS-BOOT-R), Version 11.0(10c), RELEASE
SOFTWARE(fc1)

wg_ro_a uptime is 20 minutes
System restarted by reload
System image file is "flash:c2500-js-l_120-3.bin"
(output omitted)
--More--

Configuration register is 0x2102
```



Router 기본 구성하기

Router 구성 모드


Router>enable
User Mode
Ctrl - Z or end
Router#configure terminal
Privileged Mode
exit or Ctrl - Z
Router(config)#
Global Configuration Mode
exit
Interface Configuration Mode
Router(config)#interface serial 0
Router(config-if)#
Router configuration Mode
Router(config)#router rip
Router(config-router)#
Subinterface Configuration Mode
Router(config)#interface fa 0/0.1
Router(config-subif)#
Line configuration Mode
Router(config)#line console 0
Router(config-line)#

CLI에서 Router 설정

Router 이름 지정

```
router(config)#hostname R11
R11(config)#
```

Banner MOTD 설정 **(Message-Of-The-Day Banner)**

```
R11(config)#banner motd  #
  외부 접근 사용자에게 보여질 문구 지정 #
```

Interface Description (interface 식별을 위한 구문**)**

```
R11(config)#interface serial 0
R11(config-if)#description *** To Busan Line ***
```

CLI에서 Router 설정

Router Password 설정

Console Password

```
Router(config)#line console 0
Router(config-line)#login
Router(config-line)#password cisco
```

Virtual Terminal Password

```
Router(config)#line vty 0 4
Router(config-line)#login
Router(config-line)#password cisco
```

Enable Password

```
Router(config)#enable password cisco
```

Secret Password

```
Router(config)#enable secret cisco
```

User Mode 에서
Privileged Mode로 이동

CLI에서 Router 설정

Console 관련 Option 설정

Console Session Time 설정

```
Router(config)# line console 0
Router(config-line)# exec-timeout 0 0
```

Console Input Message 동기화 설정

```
Router(config)# line console 0
Router(config-line)# logging synchronous
```

Console 인증 설정

```
Router(config)# Username student password korea
Router(config)# line console 0
Router(config-line)# login  local
```

Router의 Interface 설정

Interface Configuration Mode 진입을 위한 interface type 이해

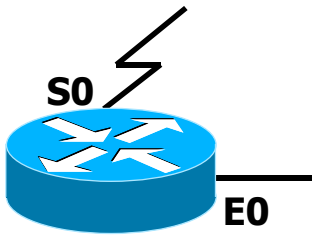
```
Router(config)#interface type number
Router(config-if)#

Type     =  serial, fastethernet, loopback, bri, tunnel, atm, fddi, null, dialer,
            token ring, async, hssi .....
Number =  interface를 구별하기 위한 번호
```

Fixed Interface Router

```
router(config)#interface type number
Ex)
router(config)#interface serial 0
Router(config-if)#
```

Fixed Interface Router

```
router(config)#interface type  slot/port
Ex)
router(config)#interface serial 1/0
Router(config-if)#
```



Router의 Interface 설정

Interface Configuration의 기본 단계 - 예제

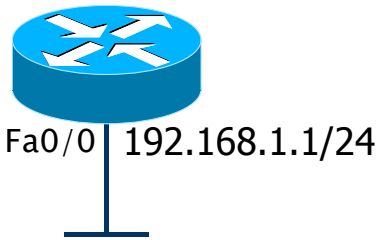
Address 설정 하기

```
Router(config)#interface fastethernet 0/0
Router(config-lf)ip address 192.168.1.1 255.255.255.0
```

Interface 동작시키기

```
Router(config)#interface fastethernet 0/0
Router(config-lf)no shutdown
```

Fastethernet connection

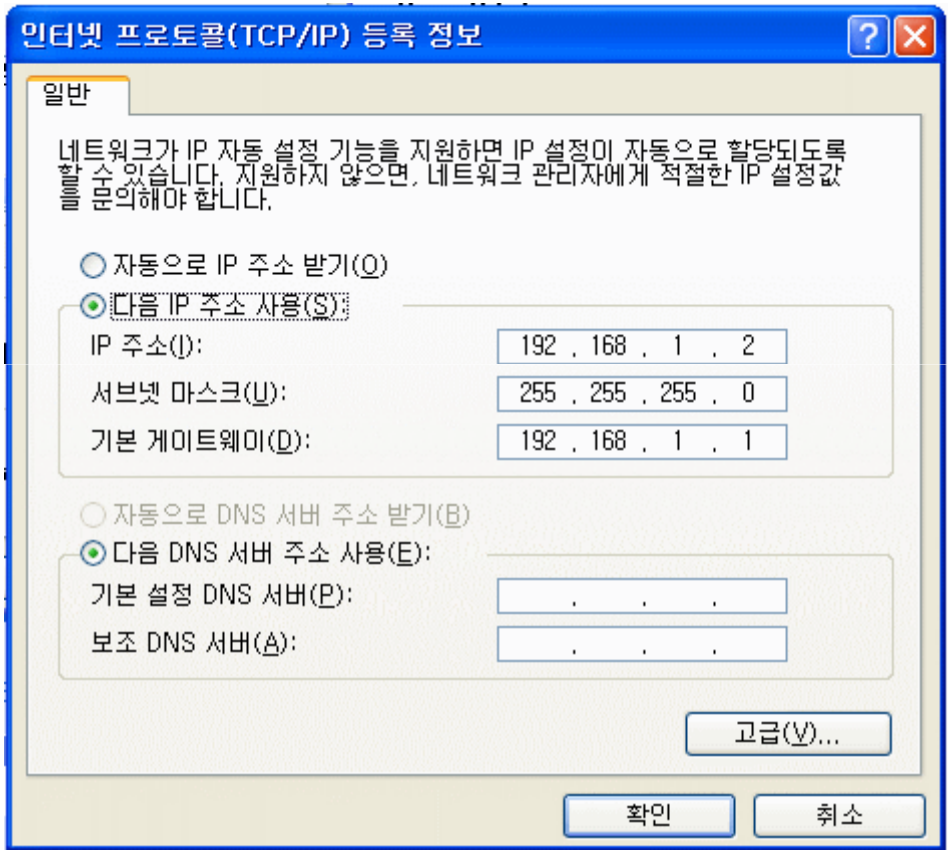


192.168.1.0/24

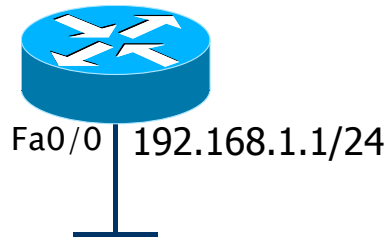
IP : 192.168.1.2
Sub : 255.255.255.0
D/G :192.168.1.1

Router의 Interface 설정

Interface Configuration의 기본 단계 - 예제



Fastethernet connection



192.168.1.0/24

IP : 192.168.1.2
Sub : 255.255.255.0
D/G :192.168.1.1

Router의 Interface 설정

Interface Configuration의 기본 단계 - 예제

Bandwidth 설정 하기

```
Router(config)#interface serial 1/0
Router(config-lf)bandwidth 64
```

Clock 설정 하기 **(DCE Interface** 설정**)**

```
Router(config)#interface serial 1/0
Router(config-lf)clock rate 64000
```

2-계층 **Protocol** 설정 하기

```
Router(config)#interface serial 1/0
Router(config-if)encapsulation ppp
```

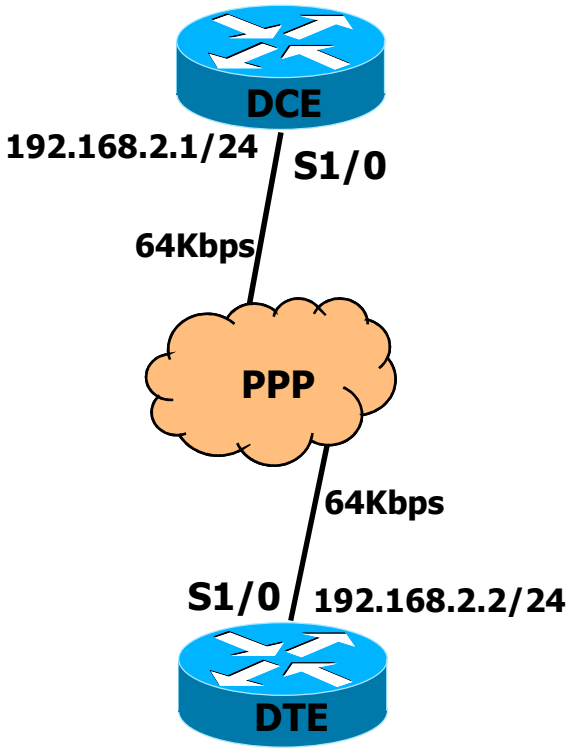
Address 설정 하기

```
Router(config)#interface serial 1/0
Router(config-lf)ip address 192.168.2.1 255.255.255.0
```

Interface 동작시키기

```
Router(config)#interface serial 1/0
Router(config-lf)no shutdown
```

Serial Back-to-Back connection



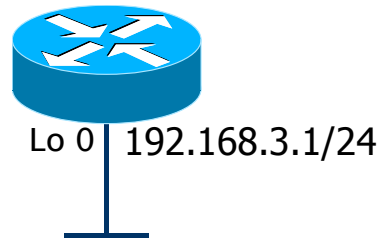
Router의 Interface 설정

Interface Configuration의 기본 단계 - 예제

Address 설정 하기

```
Router(config)# interface loopback 0
Router(config-lf) ip address 192.168.3.1 255.255.255.0
```

Loopback connection



192.168.3.0/24

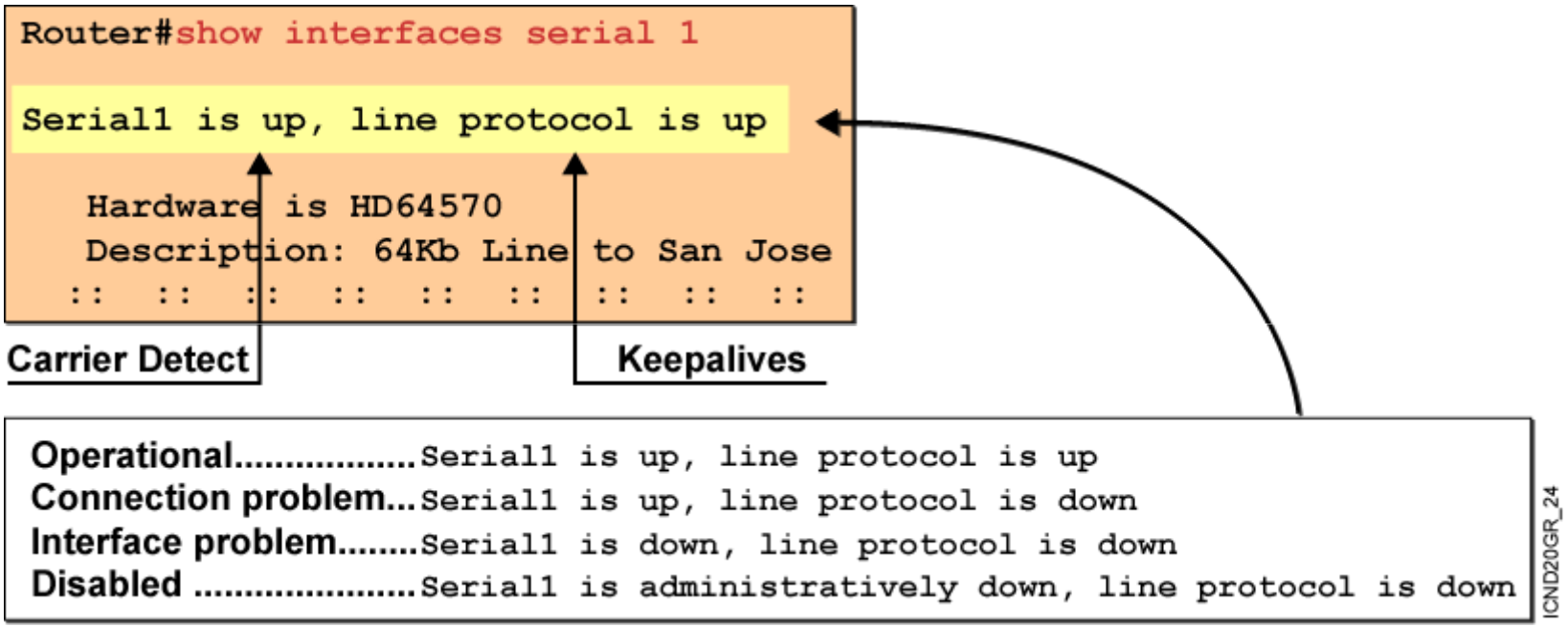
Router Interface 구성 정보 검증

Show interface Command

```
Router#show interfaces
Ethernet0 is up, line protocol is up
  Hardware is Lance, address is 00e0.1e5d.ae2f (bia 00e0.1e5d.ae2f)
  Internet address is 10.1.1.11/24
  MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:07, output 00:00:08, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     81833 packets input, 27556491 bytes, 0 no buffer
     Received 42308 broadcasts, 0 runts, 0 giants, 0 throttles
     1 input errors, 0 CRC, 0 frame, 0 overrun, 1 ignored, 0 abort
     0 input packets with dribble condition detected
     55794 packets output, 3929696 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 babbles, 0 late collision, 4 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

Router Interface 구성 정보 검증

interface 상태 정보 검증

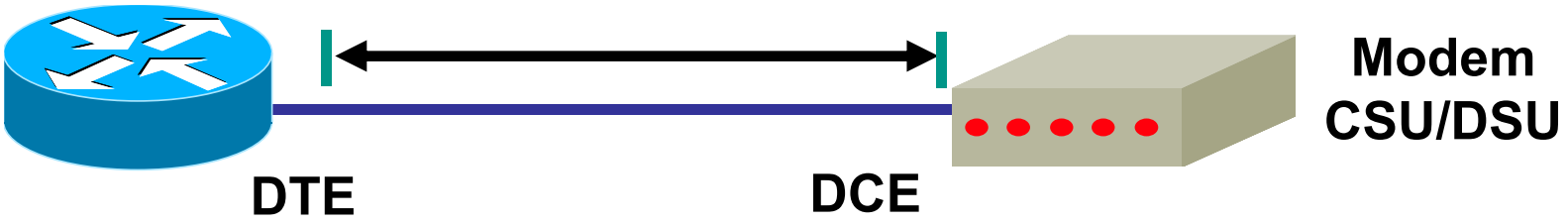


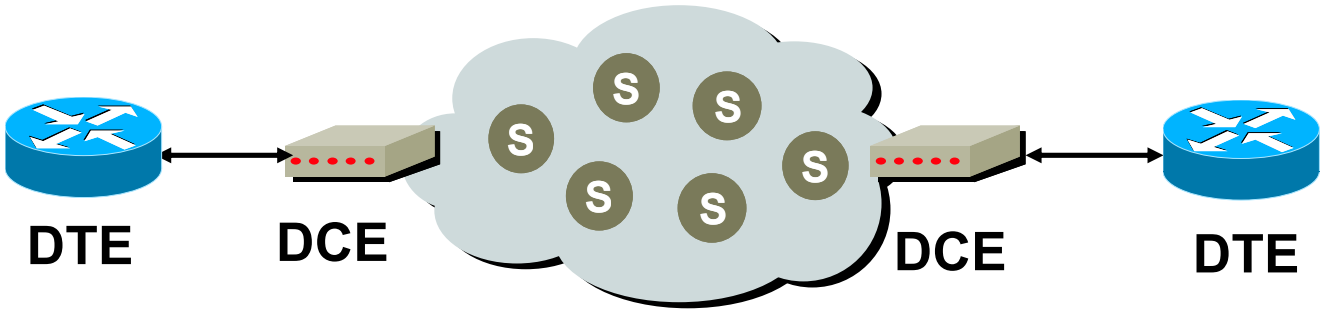
Router Interface 구성 정보 검증

Serial interface 상태 정보 검증

```
Router#show interface serial 0
Serial0 is up, line protocol is up
  Hardware is HD64570
  Internet address is 10.140.4.2/24
  MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input 00:00:09, output 00:00:04, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/1/256 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
(output omitted)
```

DTE/DCE 연결





참고 : Modem Signaling

Flow Control Group (RTS/CTS Flow Control)

RTS (Request to Send) Signal은 DTE가 DCE에 데이터 송신요구 표시

CTS (Clear to Send) Signal은 DCE가 DTE에 데이터 송신 가능을 표시

Modem Control Group

DTR (Data Terminal Ready) Signal은 DTE가 연결이 설정되어 있고, data 수신이 가능함을 DTE가 DCE에 알릴때 사용된다.

CD (Carrier Detect) Signal은 DCE가 Remote DCE와 연결되어 있고, Carrier Signal이 들어오고 있을 때 DCE가 DTE에 알린다.

- 두 DCE가 성공적으로 연결되었음을 알림

- 송신 Modem이 Carrier를 보내면 수신측 Modem은 이 신호를 받으면 접속이 이루어 지고, 송신측으로 다시 Carrier를 받았다는 신호를 보낸다. 이신호가 Carrier Detect signal이다.→ DCD

DSR (Data Set Redy) Signal은 DCE Ready를 의미하며 DCE가 DTE로 보낸다. Modem이 켜지면 바로 Active 된다.

Router Interface 구성 정보 검증

Serial interface의 Serial Cable Type 정보 확인

```
Router#show controller serial 0
HD unit 0, idb = 0x121C04, driver structure at
0x127078
buffer size 1524  HD unit 0, V.35 DTE cable
                          .
                          .
                          .
```

Router Basic Configuration LAB

개관

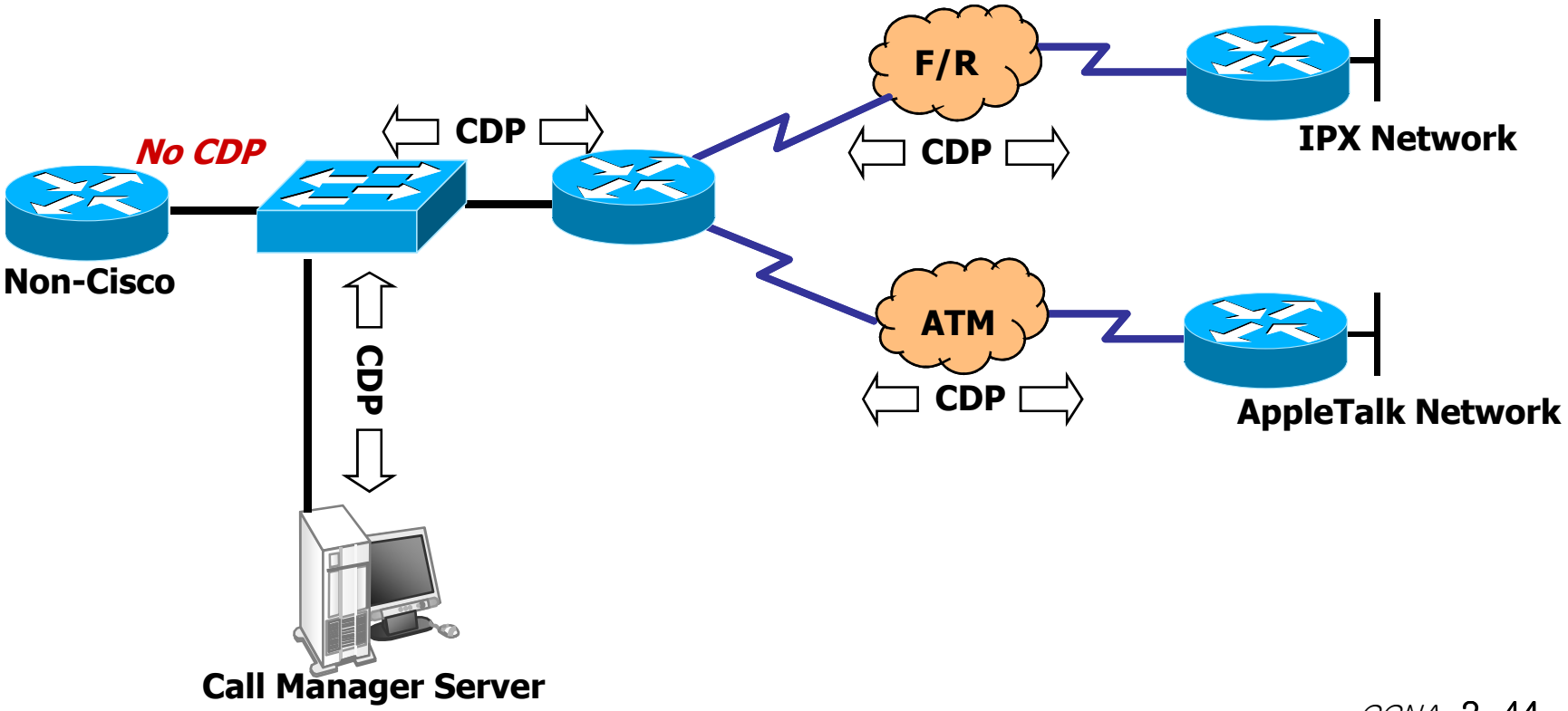
- **Neighbor Device** 관리 기초
- **Remote Device** 관리 기초
- **Router**의 시동 및 구성 정보 관리
- **IOS Device** 관리 기초

Neighbor Device 관리

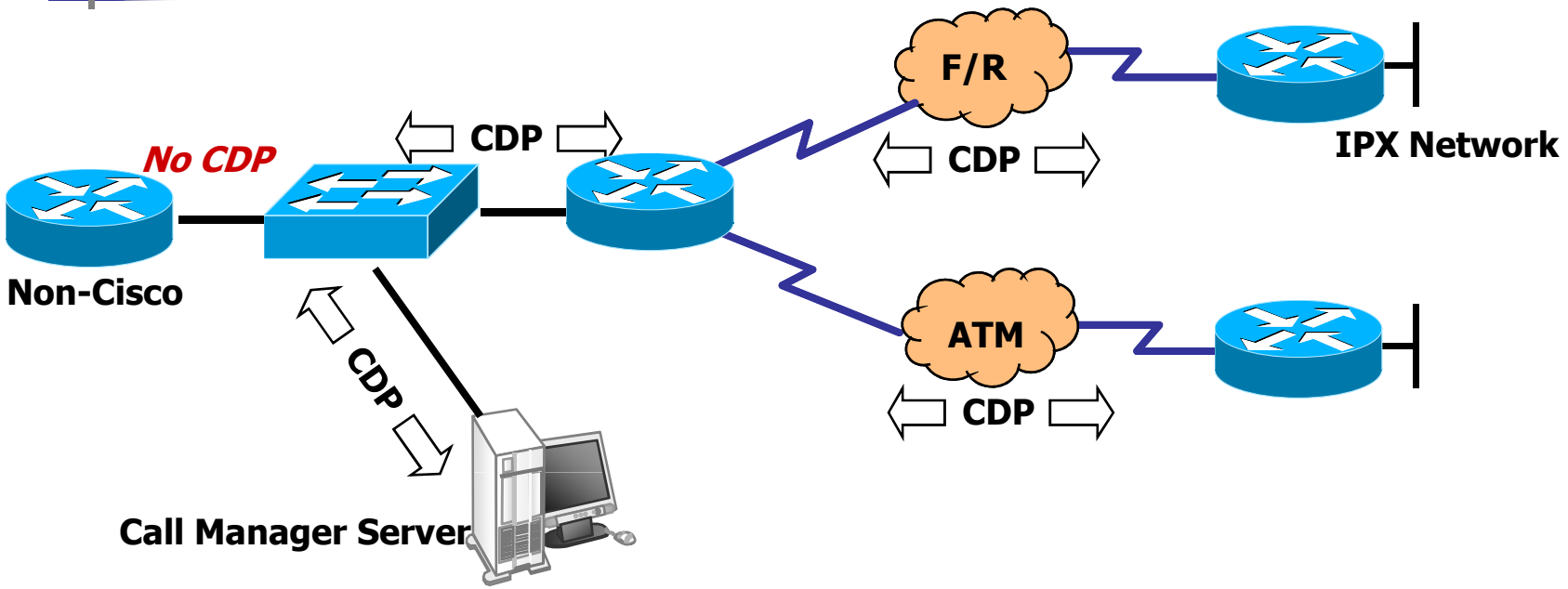
- **CDP (Cisco Discovery Protocol)** 개요
- **CDP**를 이용한 정보 수집
- **CDP** 설정 하기
- **CDP** 상태 정보 검증
- **CDP**를 이용한 **Network** 구조 검증

CDP (Cisco Discovery Protocol) 개요

3-계층 프로토콜	TCP/IP, Novell IPX, Apple Talk, Others
Cisco Proprietary Data-link Protocol	CDP는 Cisco Device에서만 동작하며 Cisco Device의 정보만을 주고 받는다.
2-계층 프로토콜	LANs, Frame-relay, ATM, Others



CDP를 이용한 정보 수집



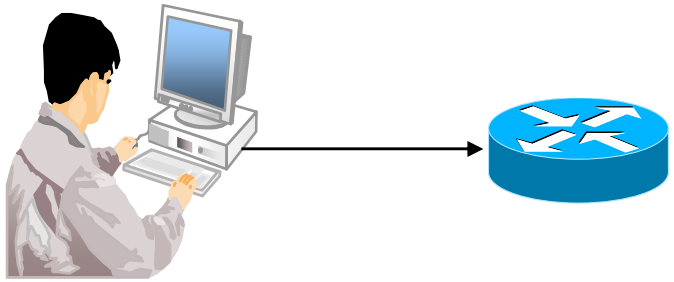
CDP에 포함된 정보

- **Neighbor Device**의 ***Hostname***
- **Neighbor Device**의 ***Address*** *정보*
- **Neighbor Device**의 ***Port*** *정보*
- **Neighbor Device**의 *장비 성격*
- **Neighbor Device**의 *기종*

CDP 설정하기

CDP Options

Router#show cdp ?



Global Configuration Mode

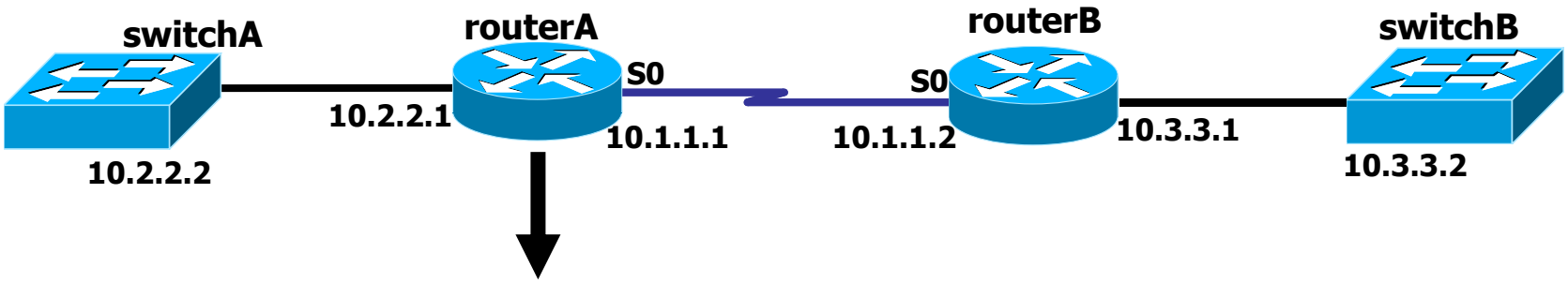
```
Router#config t
Router(config)#cdp run          → CDP Enable
Router(config)#no cdp run       → CDP Disable
```

Interface Configuration Mode

```
Router#config t
Router(config)#interface serial 0
Router(config-if)#cdp enable      → CDP Enable
Router(config-if)#no cdp enable   → CDP Disable
```

CDP 상태 정보 검증

Show cdp neighbor command




```
routerA#show cdp neighbor
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater

Device ID        Local Intrfce     Holdtme    Capability  Platform  Port ID
routerB          Ser 0             148          R          2522     Ser 1
switchA          Eth 0             167          T S        1900     2
```

CDP는 **routerA**에 물리적으로 직접 연결된 인접한 **Device**의 정보만을 보여 준다. 따라서 물리적으로 직접 연결되지 않은 **switchB**는 **CDP**를 이용한 정보 수집이 불가능 하다.

CDP 상태 정보 검증

Show cdp entry command

```
routerA#show cdp entry *  (or  show cdp neighbor detail )
Device ID: RouterB
Entry address(es):
  IP address: 10.1.1.2
Platform: cisco 2522,  Capabilities: Router
Interface: Serial0,  Port ID (outgoing port): Serial1
Holdtime : 168 sec

Version :
Cisco Internetwork Operating System Software
IOS (tm) 2500 Software (C2500-JS-L), Version 12.0(3), RELEASE
SOFTWARE (fci)
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Mon 08-Feb-99 18:18 by phanguye
.
```

CDP 상태 정보 검증

Show cdp entry command

```
routerA#show cdp traffic
CDP counters :
        Packets output: 56, Input: 38
        Hdr syntax: 0, Chksum error: 0, Encaps failed: 3
        No memory: 0, Invalid packet: 0, Fragmented: 0



RouterA#show cdp interface
BRI0 is administratively down, line protocol is down
  Encapsulation HDLC
  Sending CDP packets every 60 seconds
  Holdtime is 180 seconds
```

Remote Device 관리

- **Router Telnet** 설정하기
- **Telnet**을 이용한 **Remote Device** 연결하기
- **Telnet Session** 관리

Router telnet 설정하기

Virtual Terminal Configuration

```
routerA#config t
routerA(config)#line vty 0 4
routerA(config-line)#password cisco
routerA(config-line)#login
```

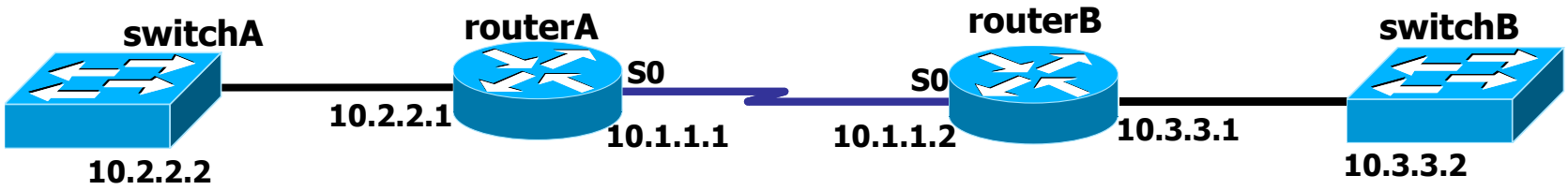
Local UserDB를 이용한 접속 설정

```
routerA#config t
routerA(config)#line vty 0 4
routerA(config)#username admin password cisco
routerA(config-line)#login local
```

암호 입력 없이 **UserEXEC mode**까지 접속허용하기

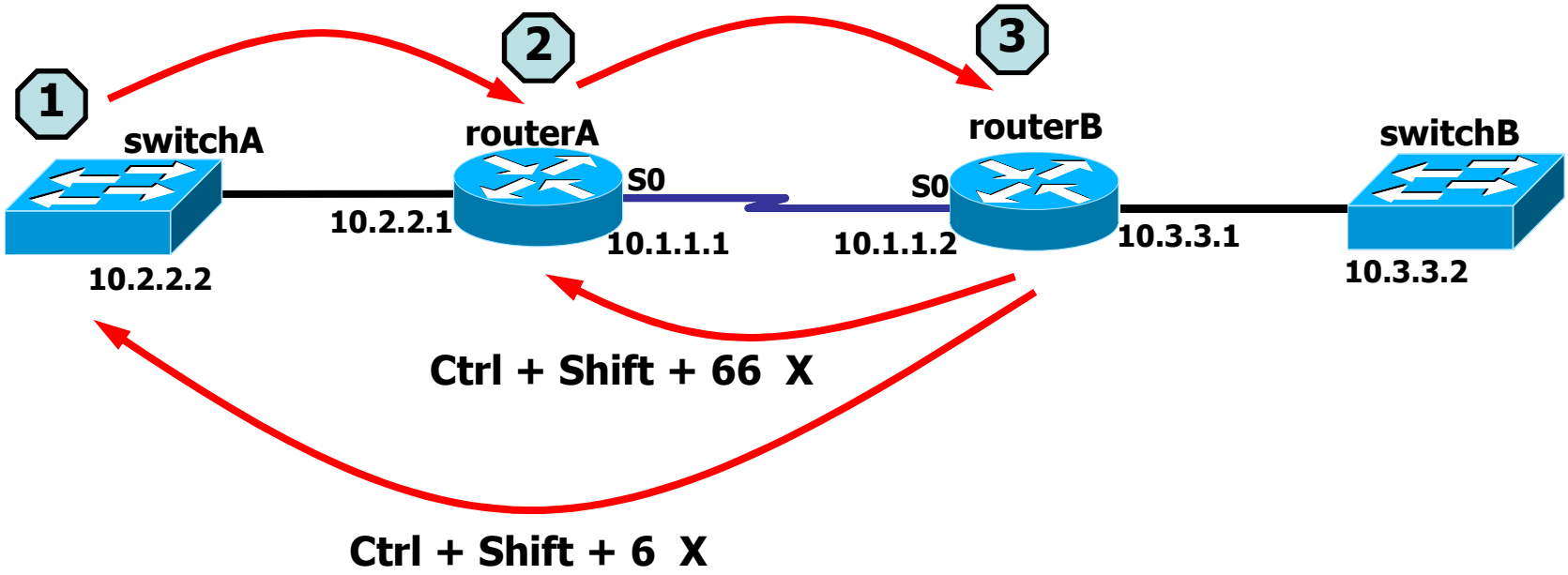
```
routerA#config t
routerA(config)#line vty 0 4
routerA(config-line)#no password
routerA(config-line)#no login
```

Telnet을 이용한 remote Device 연결




```
RouterA#telnet 10.2.2.2
Trying 10.2.2.2 ... Open
------------------------------------------------
Catalyst 1900 Management Console
Copyright (c) Cisco Systems, Inc.  1993-1998
All rights reserved.
Enterprise Edition Software
Ethernet Address:      00-90-86-73-33-40
PCA Number:           73-2239-06
PCA Serial Number:     FAA02359H8K
Model Number:         WS-C1924-EN
System Serial Number:  FAA0237X0FQ
.
.
SwitchB>
```

Telnet Session 관리하기



1. **Ctrl + Shift + 6 X**를 입력하면 **telnet** 접속되어 있는 현재 위치에서 처음 있던 위치로 이동한다.
2. **Enter**를 **2**번 누르면 이전 위치로 이동한다.
3. **Ctrl + Shift + 66 x** 키를 누르면 **2**번째 위치로 이동한다. 엔터를 **2**번 연속 누르면 이전 위치로 이동하게 된다.

Router의 시동 및 구성 정보 관리

- **Router**의 부팅 과정 소개
- **Router**의 내부 구성 요소
- **IOS**와 **Configuration**의 참조 동작
- **Configuration register**

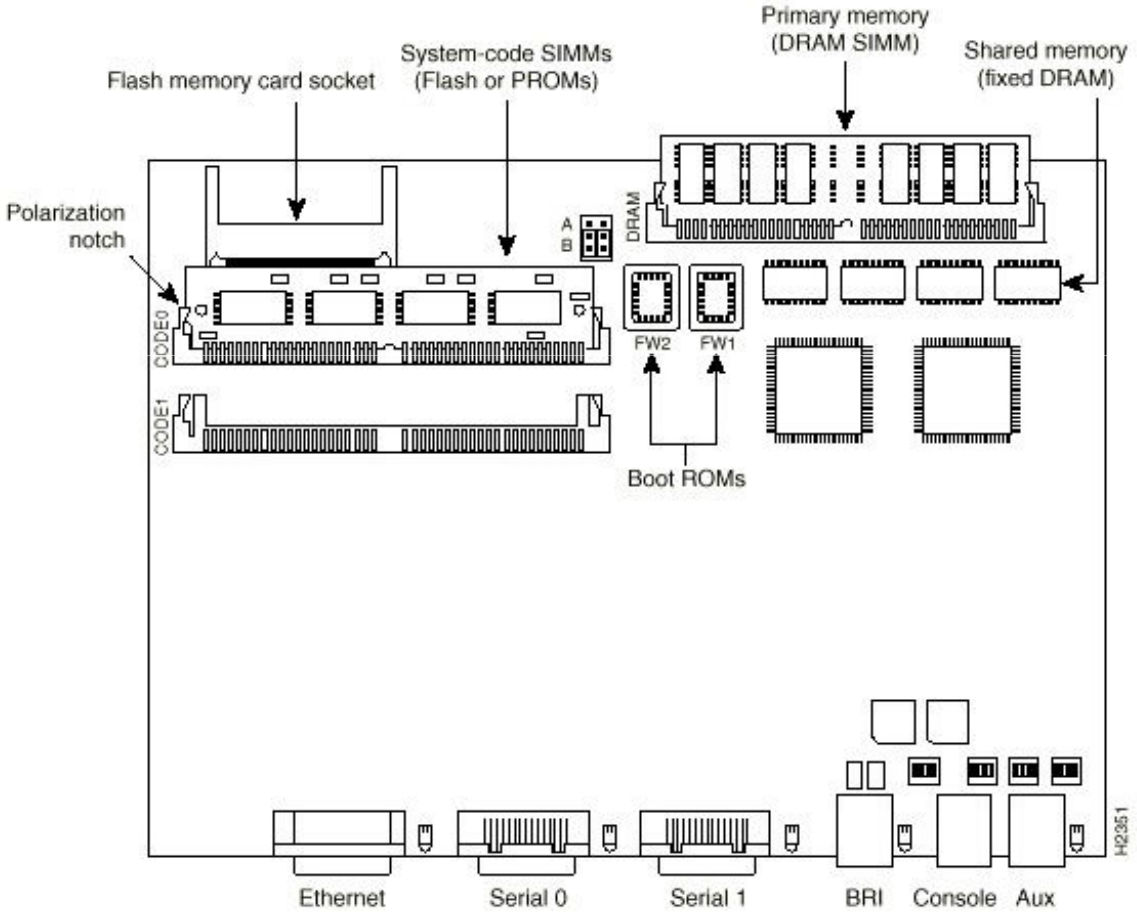
Router의 부팅 과정 소개

Router의 부팅 순서

1. **POST (Power On Self Test)**
2. **Bootstrap code**의 **Loading**과 실행
3. **IOS Software**의 참조 위치 판단
4. **IOS Software**의 **loading**
5. **Configuration** 정보의 참조 위치 판단
6. **Configuration** 정보의 **Loading**및 적용
7. **Cisco IOS Software**의 실행

Router 내부 구성 요소

System Card Layout—Model 2501, 2502, 2503, and 2504 Routers



Configuration Register

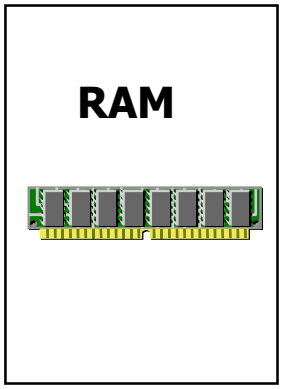
```
wg_ro_a#show version
Cisco Internetwork Operating System Software
IOS (tm) 2500 Software (C2500-JS-L), Version 12.0(3), RELEASE SOFTWARE (fc1)
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Mon 08-Feb-99 18:18 by phanguye
Image text-base: 0x03050C84, data-base: 0x00001000

ROM: System Bootstrap, Version 11.0(10c), SOFTWARE
BOOTFLASH: 3000 Bootstrap Software (IGS-BOOT-R), Version 11.0(10c), RELEASE
SOFTWARE (fc1)

wg_ro_a uptime is 20 minutes
System restarted by reload
System image file is "flash:c2500-js-l_120-3.bin"

--More--

Configuration register is 0x2102
```

Show version command에서 확인한 **configuration register** 값

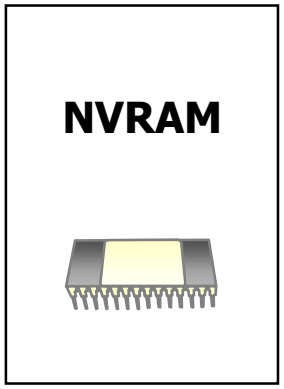
IOS Device의 기본 관리

- **IOS File System**과 **Device**
- **IOS Image** 관리
- **Device Configuration** 정보 관리
- **IOS Copy Command**
- **IOS Device**에서 **Debug** 사용

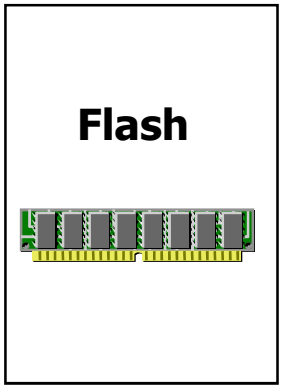
IOS File System과 Device



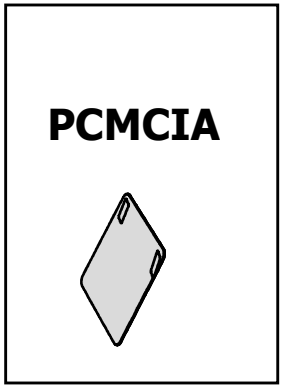
System:



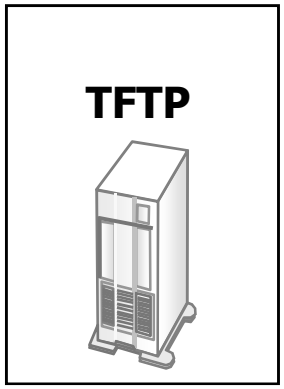
Nvram:



Flash:



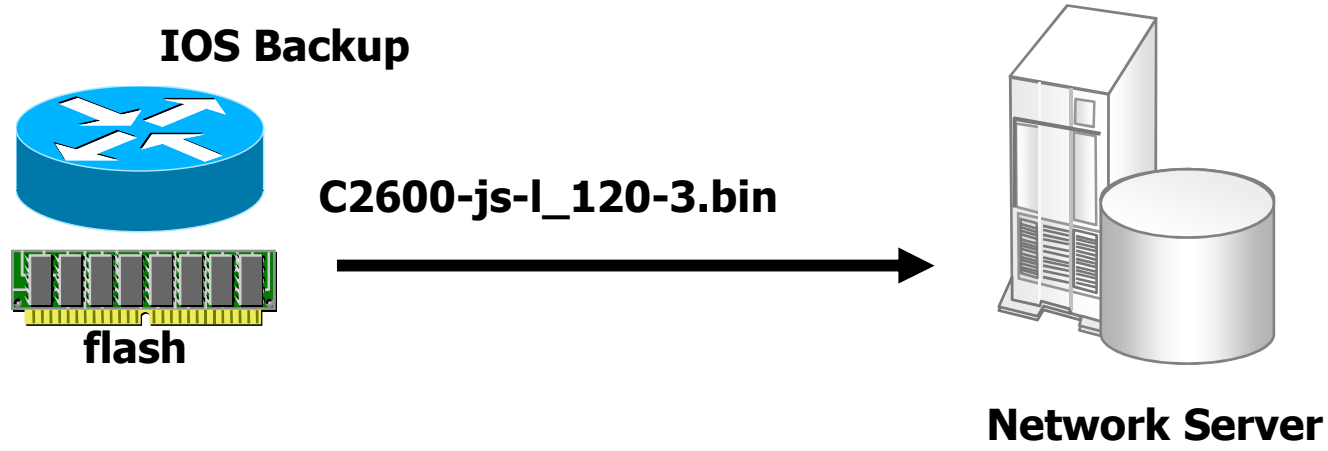
Slot:



Tftp:

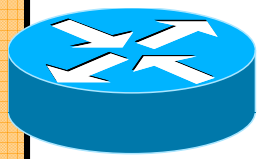
IOS Image 관리

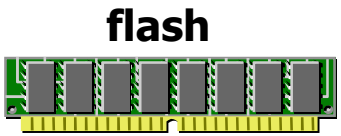
IOS Backup & Restore



IOS Image 관리

```
Router#show flash
System flash directory:
File  Length   Name/status
  1   10084696  c2500-js-l_120-3.bin

[10084760 bytes used, 6692456 available, 16777216 total]
16384K bytes of processor board System flash (Read ONLY)
```





IOS Image File Format Example

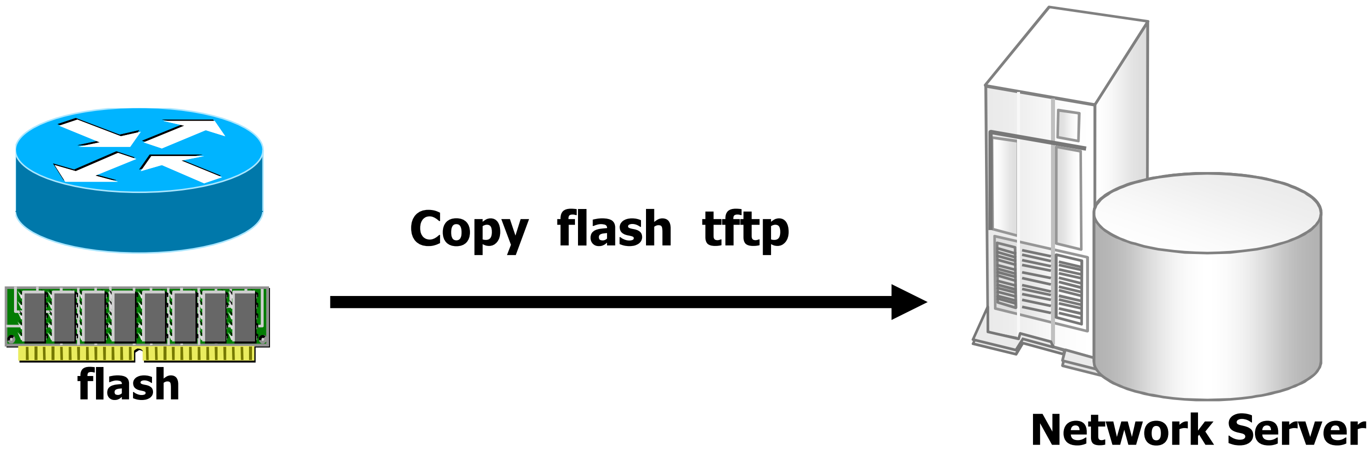
PPPP – FFFF - MM

PPPP = Platform
FFFF = Feature
MM = Run-time Memory & Compress format

C7200 – js40 – mz.bin

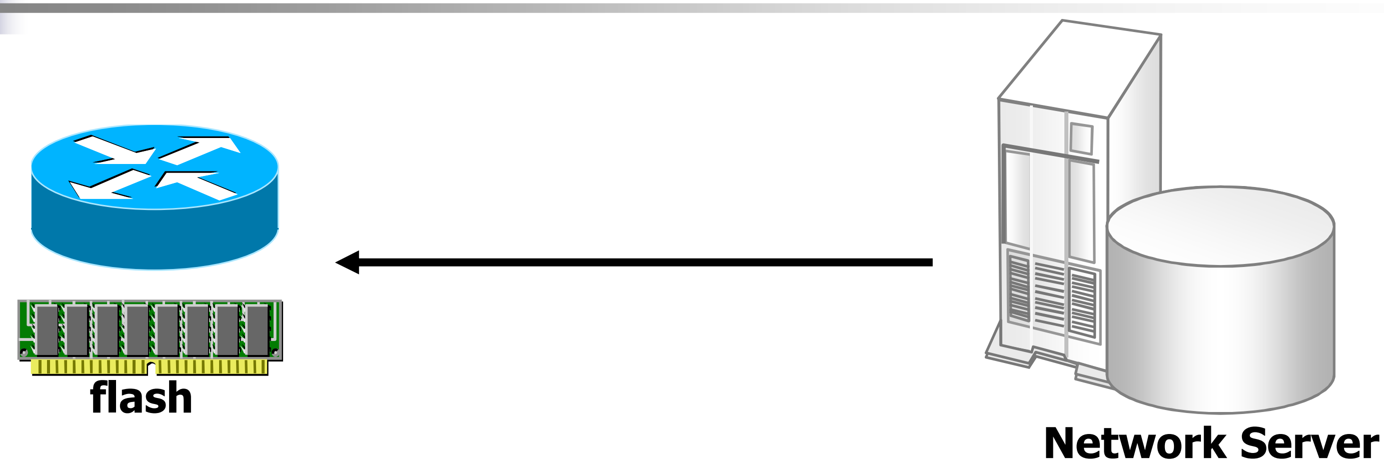
- **7200 router**
- **Enterprise**
- **NAT,ISL,VPDN/L2F**
- **40bit encryption**
- **Binary format**
- **Zipped file**
- **RAM에서 실행되는 Image**

IOS Image 관리 – IOS Backup



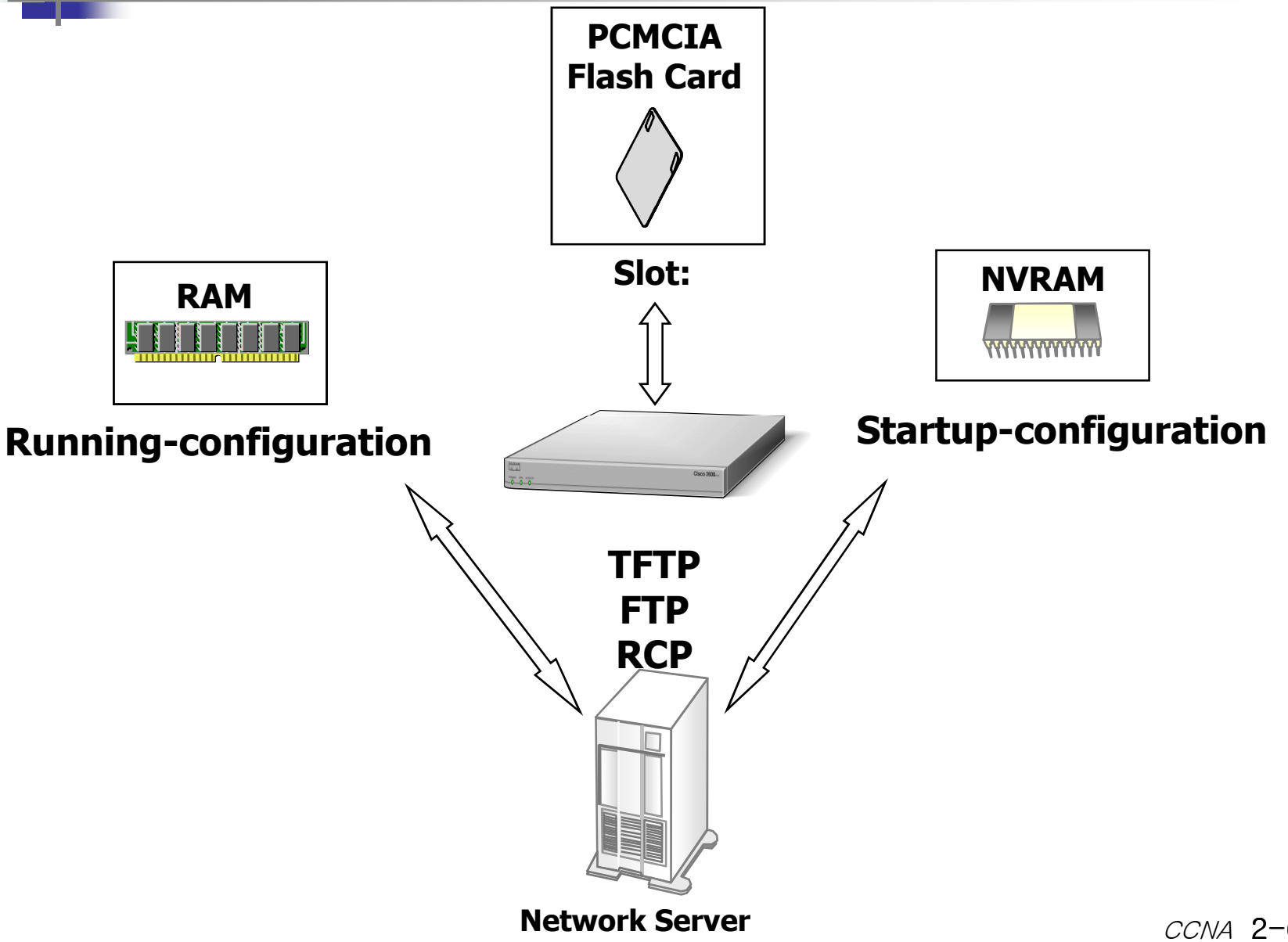

```
wg_ro_a#copy flash tftp
Source filename []? c2500-js-l_120-3.bin
Address or name of remote host []? 10.1.1.1
Destination filename [c2500-js-l_120-3.bin]?
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
<output omitted>
10084696 bytes copied in 709.228 secs (14223 bytes/sec)
wg_ro_a#
```

IOS Image 관리 – Restore or Upgrade

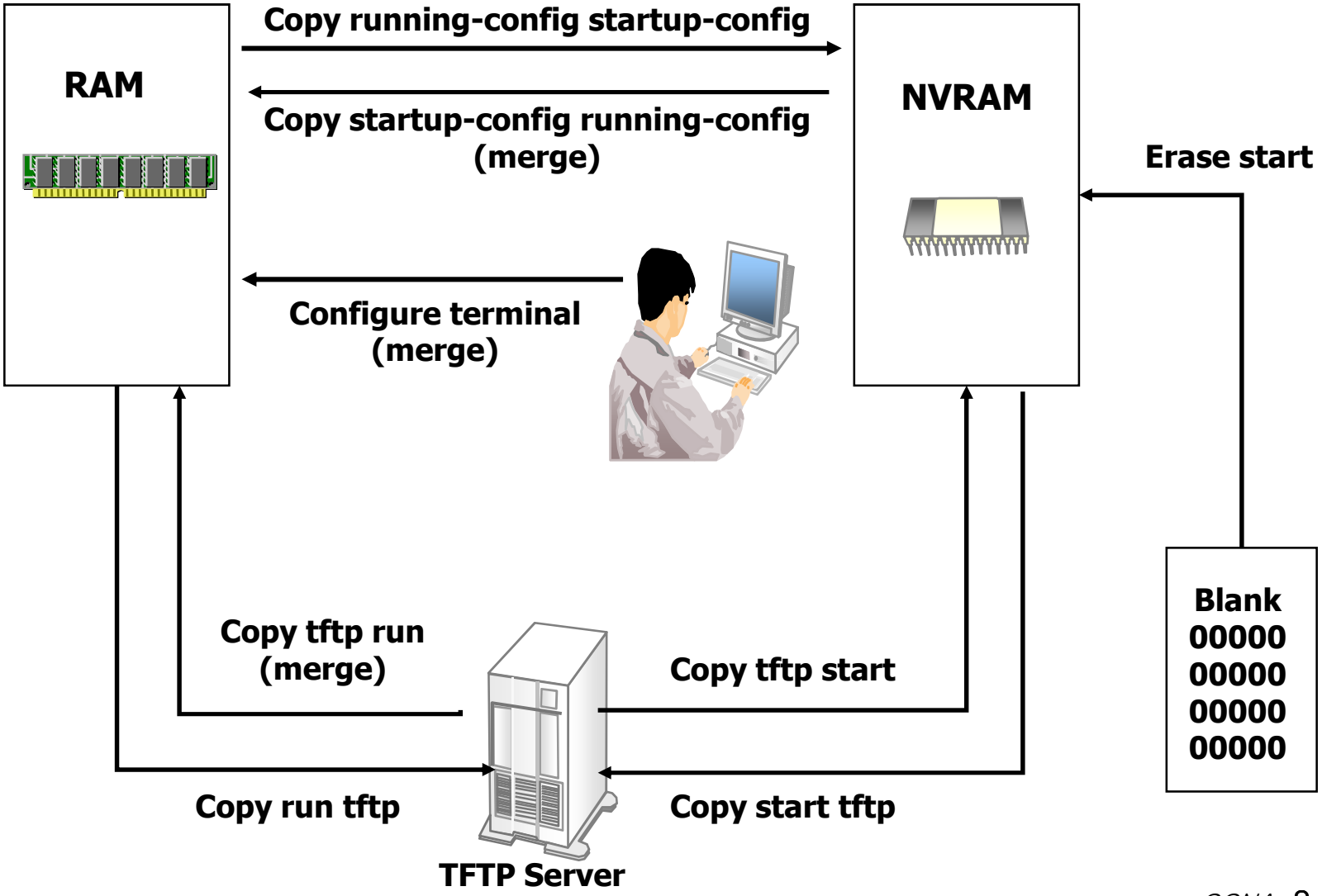



```
wg_ro_a#copy tftp flash
Address or name of remote host [10.1.1.1]?
Source filename []? c2500-js-l_120-3.bin
Destination filename [c2500-js-l_120-3.bin]?
Accessing tftp://10.1.1.1/c2500-js-l_120-3.bin...
Erase flash: before copying? [confirm]
Erasing the flash filesystem will remove all files! Continue? [confirm]
Erasing device... eeeee (output omitted) ...erased
Erase of flash: complete
Loading c2500-js-l_120-3.bin from 10.1.1.1 (via Ethernet0): !!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! (output omitted)
[OK - 10084696/20168704 bytes]
Verifying checksum... OK (0x9AA0)
10084696 bytes copied in 309.108 secs (32636 bytes/sec)
wg_ro_a#
```

IOS Device Configuration 관리



IOS Copy Command



IOS Copy Command

Router의 running-config

```
Interface serial 0
 ip address 10.1.1.1 255.255.255.0
!
Interface ethernet 0
 ip address 10.2.2.2 255.255.255.0
!
Interface ethernet 1
 no ip address
```

TFTP Server의 test.cfg

```
Interface ethernet 0
 ip address 172.16.1.1 255.255.255.0
!
Interface ethernet 1
 ip address 192.168.1.1 255.255.255.0
```

Copy tftp running-config (merged)

Copy 결과 =

```
Interface serial 0
 ip address 10.1.1.1 255.255.255.0
!
Interface ethernet 0
 ip address 172.16.1.1 255.255.255.0
!
Interface ethernet 1
 ip address 192.168.1.1 255.255.255.0
```

IOS Copy Command

Configuration 정보 Copy

```
Router#copy running-config tftp
Address or name of remote host  [ ] ?  10.1.1.1
Destination filename  [running-config] ?  Wgrox.cfg
.!!
1684 bytes copied in 13.300 sec  (128 bytes / sec )

Router#copy tftp running-config
Address or name of remote host  [ ] ?  10.1.1.1
Source filename [ ] ? Wgrox.cfg
Destination filename [running-config] ?
Accessing tftp://10.1.1.1/wgrox.xfg....
Loading wgrox.cfg from 10.1.1.1  ( via ethernet 0 ) : !!
[OK  -  1684/3072  bytes]

1684 bytes copied in 17.692 secs  (99 byte / sec)
```

IOS Device에서 Debug Command 사용

Show 와 **Debug Command**의 비교

구 분	**show**	**debug**
실행에 따른 구분	**Static**	**Dynamic**
실행에 따른 **Overhead**	**Low**	**High**
주된 사용 용도	상태 정보 확인	특정 동작 과정 확인

Show commands

interface, protocols, performance, media등의 부분적인 정보들을 확인 하다**.**

Debug commands

각종 **protocol**들의 **traffic**의 흐름을 분석 할 수 있으며 **configuration**의 문제점들을 확인 할 수 있다**.**

LAB