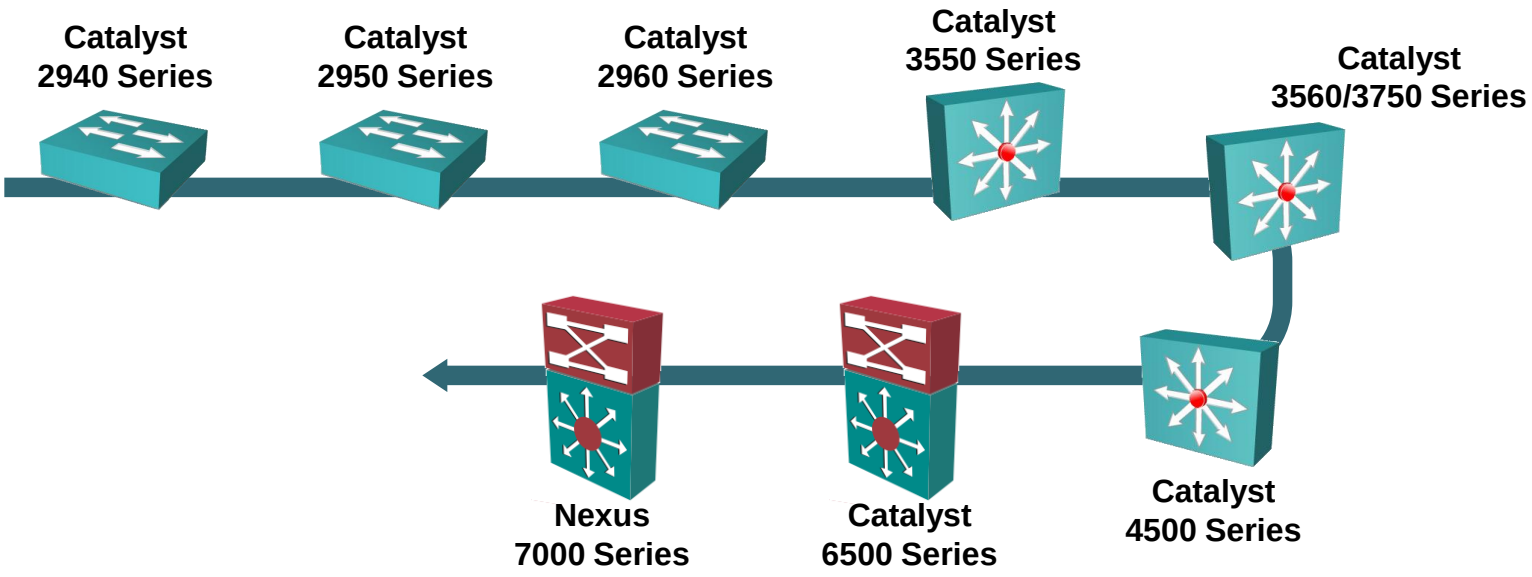
Module 2

Cisco Device and IOS Basic

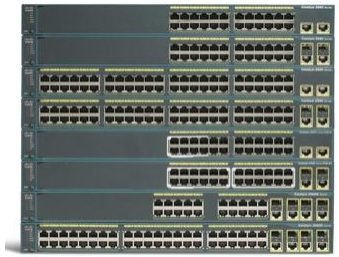
Cisco Switch

- **선택 기준**
  - **매체 속도 : 10Mbps, 100Mbps, 1000Mbps**
  - **스위치간 통신(trunking) 필요성**
  - **Workgroup segmentation (VLANs)**
  - **Port밀도 요구사항**



Catalyst Switch Type

Catalyst
2940 Series



Catalyst
2960 Series

Catalyst
6500 Series

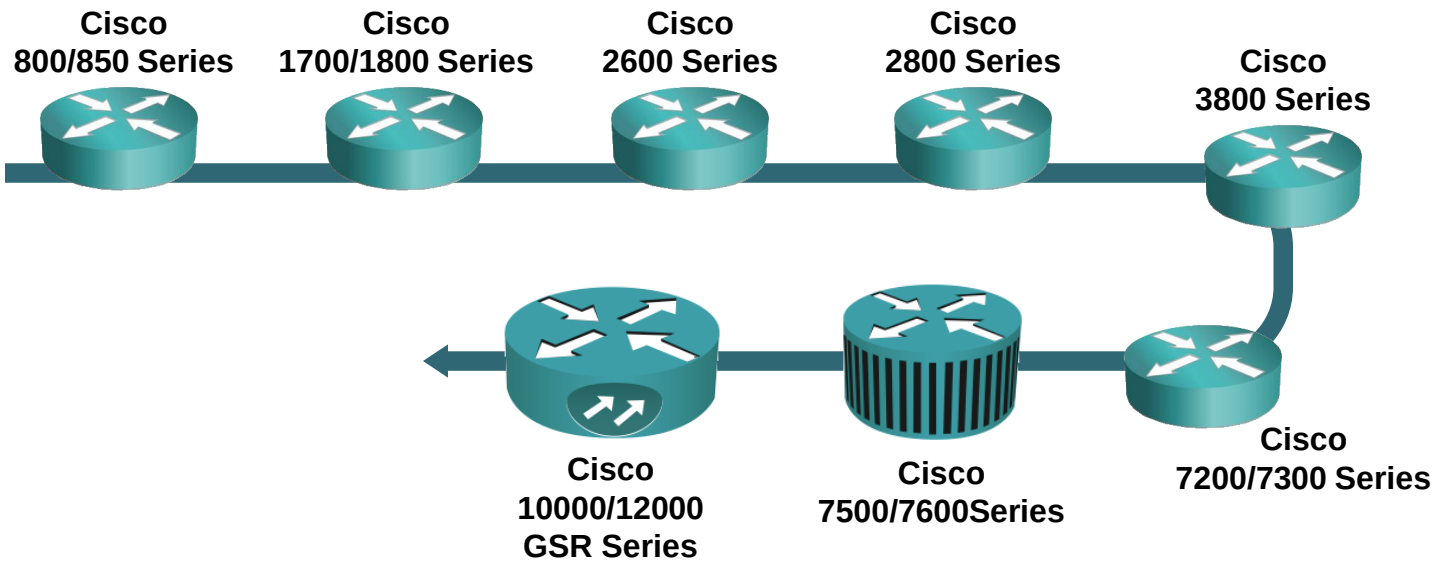
Catalyst
3560 Series

Catalyst
4500 Series

Nexus
7000 Series

Cisco Router

- **선택 기준**
  - 라우팅 특성 및 확장에 대한 필요성
  - 포트 밀도 및 다양성 요구사항
  - 일반적인 사용자 인터페이스
  - 용량 및 성능



Cisco Router Type

Cisco
800/850 Series

Cisco
1700/1800 Series

Cisco
2600 Series

Cisco
2800 Series

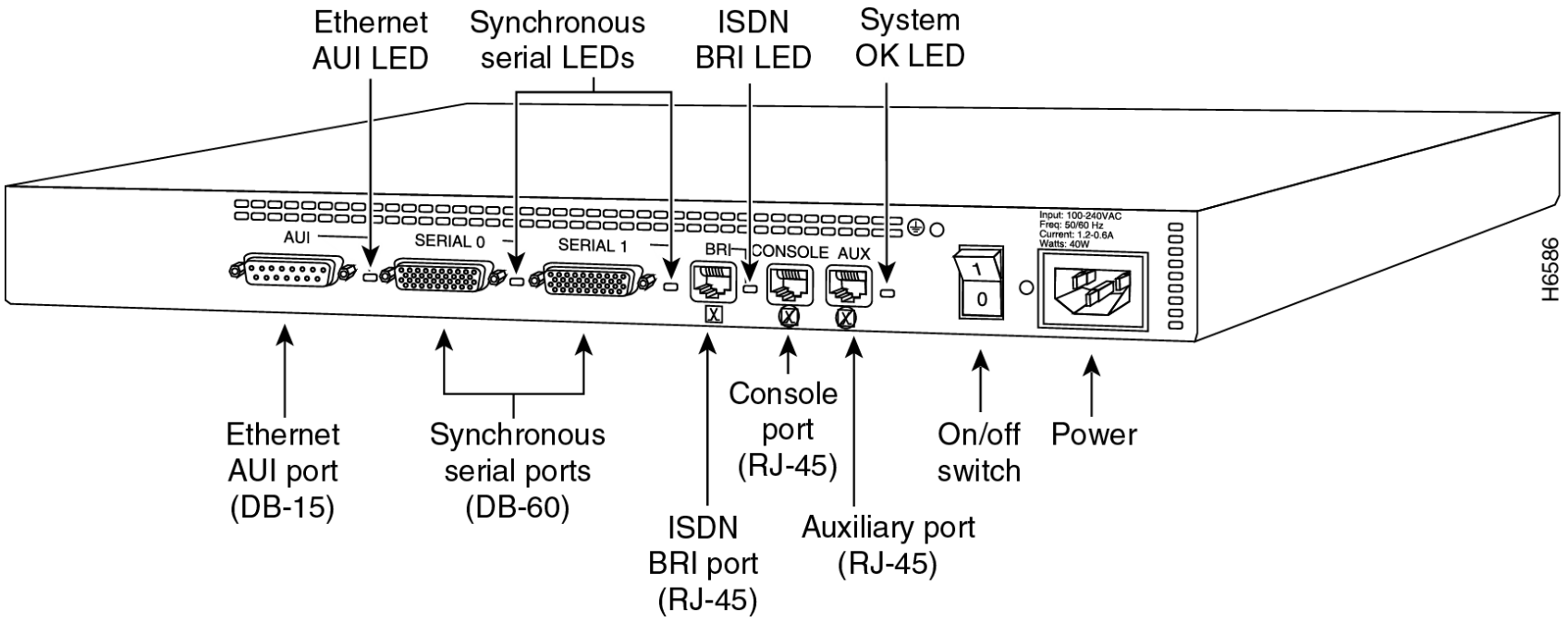
Cisco
3800 Series

Cisco
7200/7300 Series

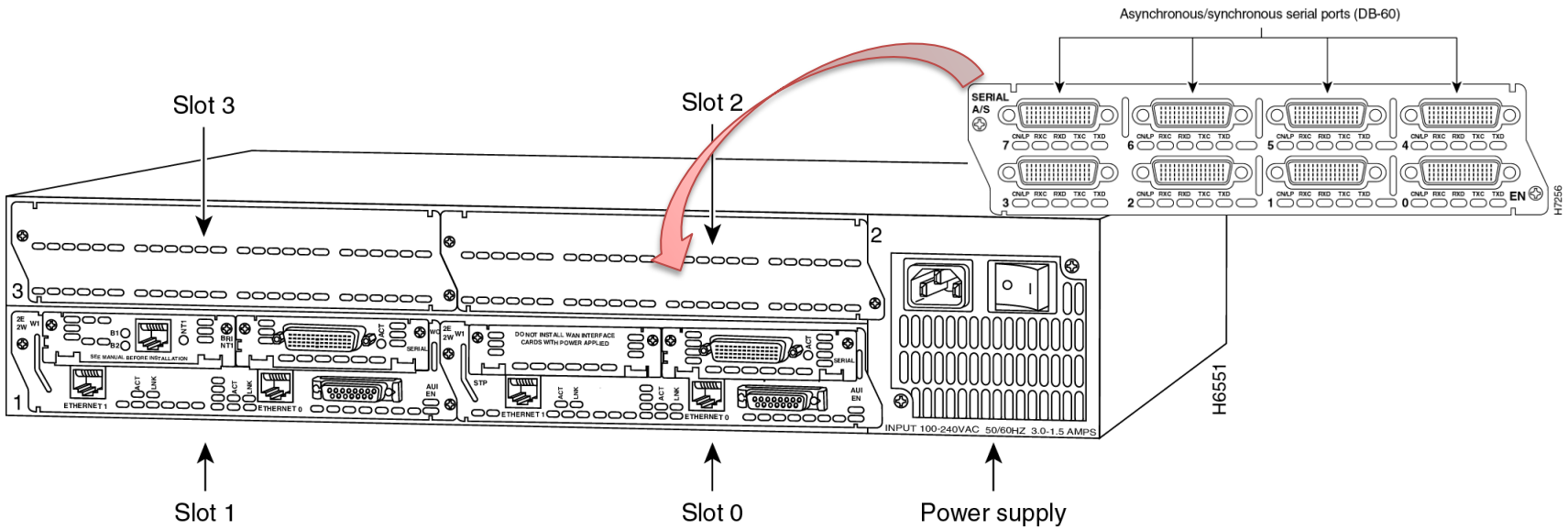
Cisco
7500/7600Series

Cisco
10000/12000
GSR Series

Cisco 2500 Series Router Interface Type



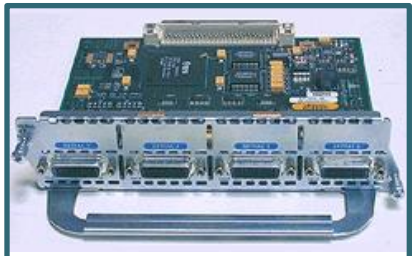
Modular Interface (Cisco 3725)



NM-1E

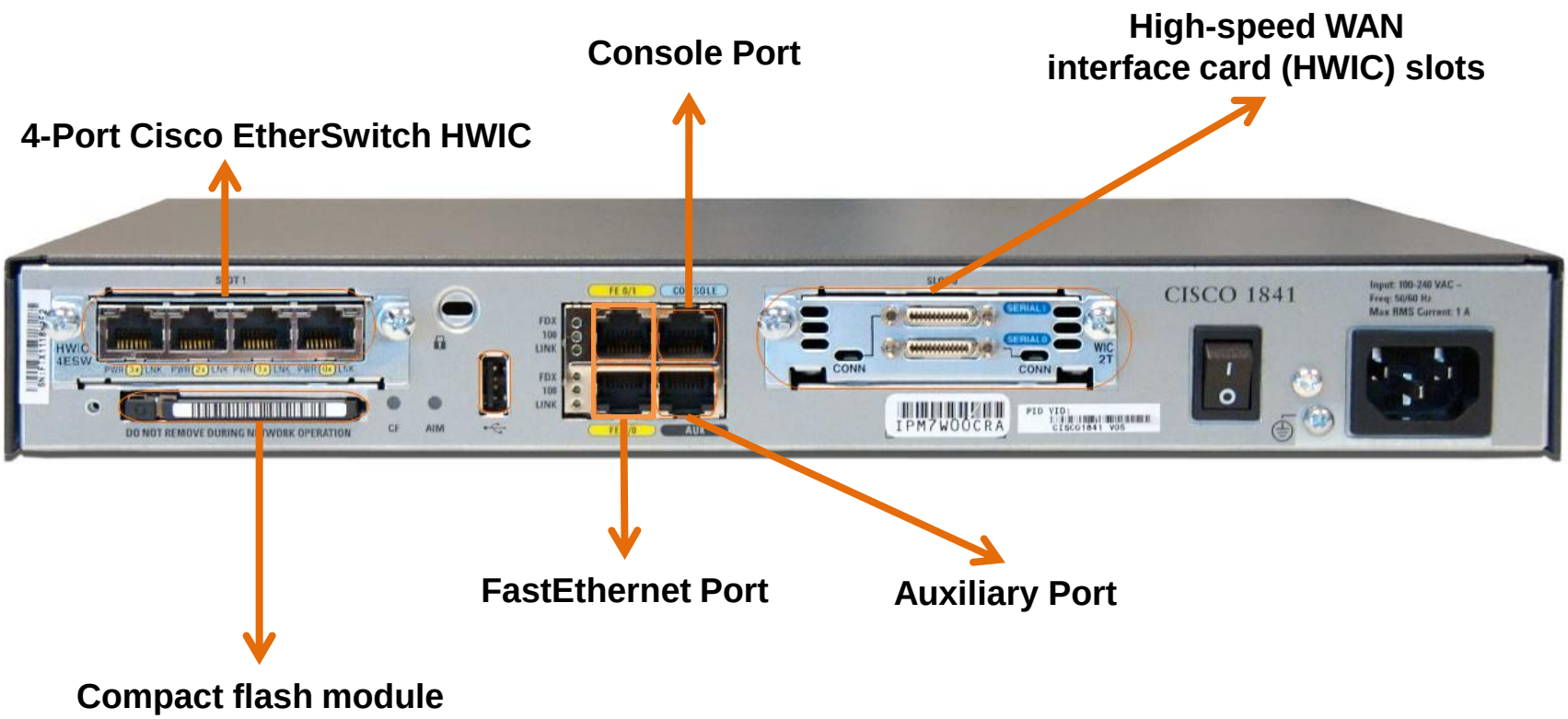
NM-4E

WIC-2T



NM-4T

Cisco 1841 Router Interface



Cisco Router Cable

B-To-B(WIC 1T ↔ WIC 2T)

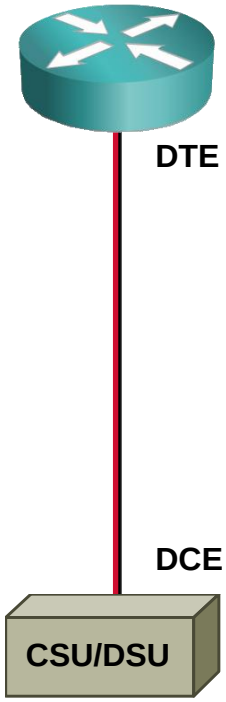
B-To-B(WIC 1T ↔ WIC 1T)

CSU/DSU & V.35 Cable

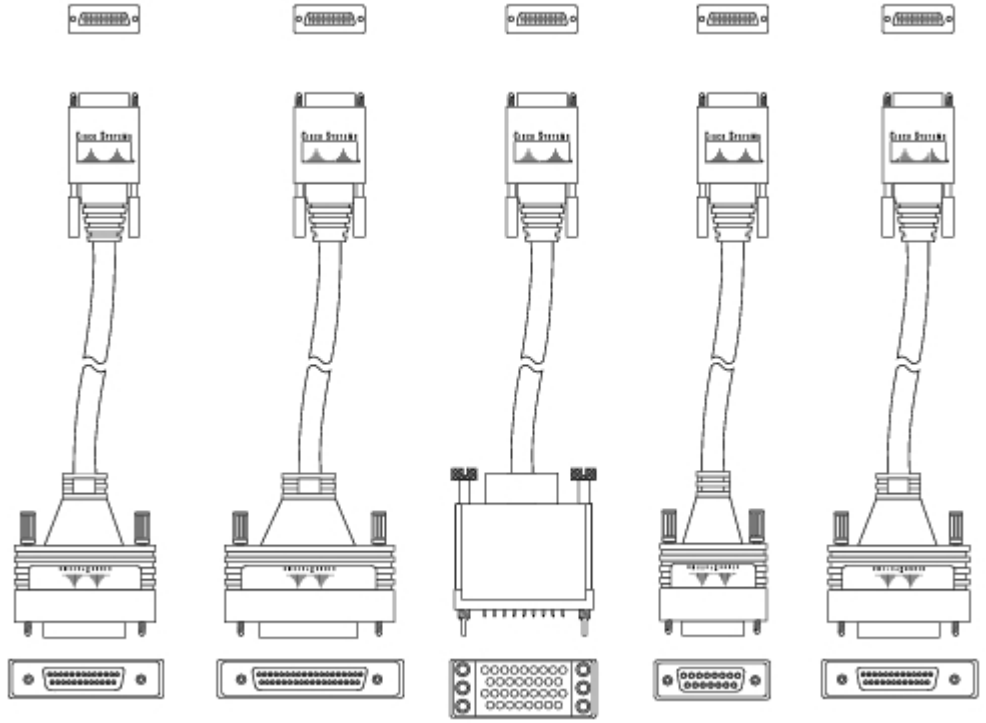
1751 CSU

V.35 Cable

WAN Serial Connection Option



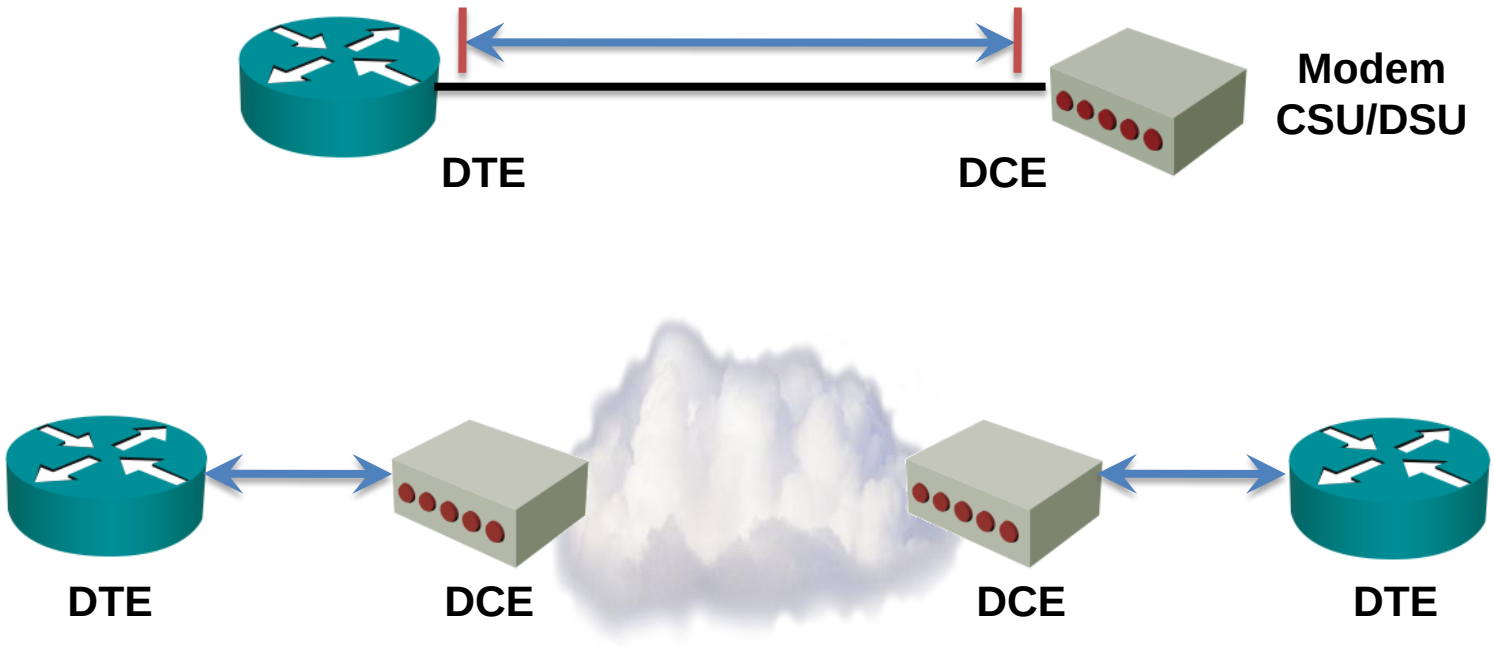
Router Connections



Network Connections at the CSU/DSU

Router to CSU Connection

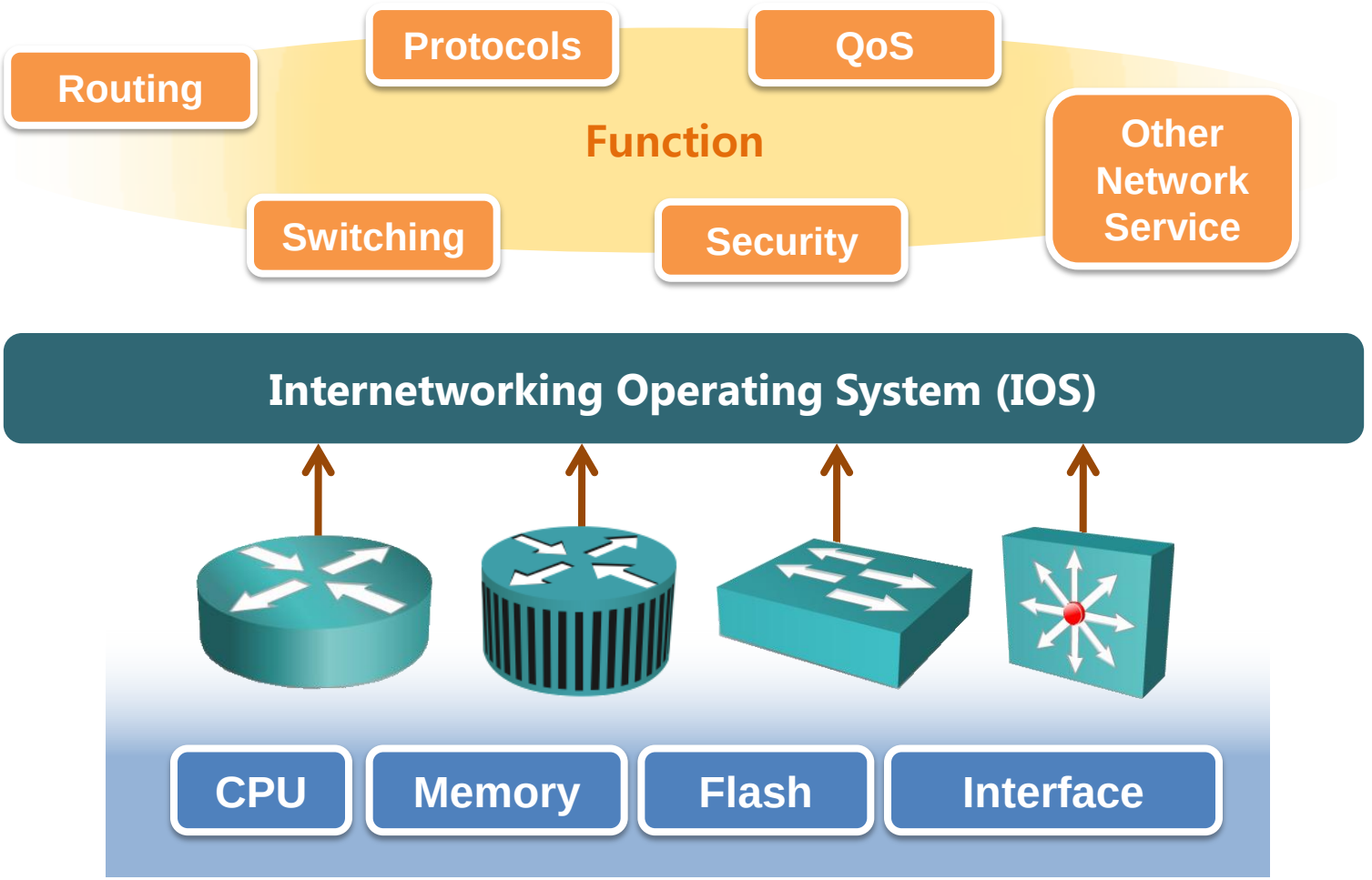
DTE/DCE 연결



Cisco IOS Software 개요

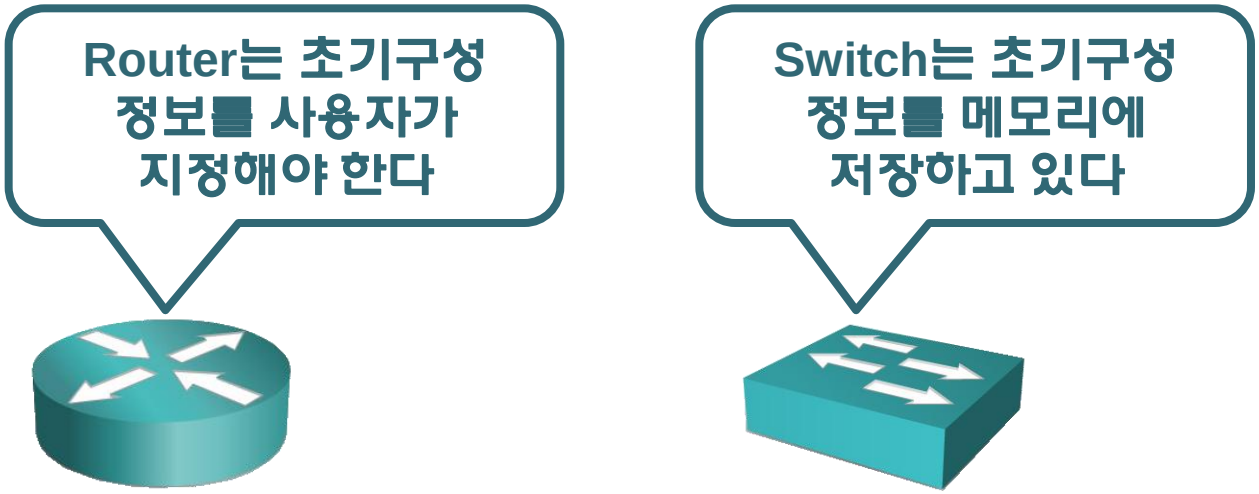
- Cisco IOS Software 특징
- IOS Device 구성
- IOS Device 구성을 위한 외부 접근 방식
- IOS Command Line Interface의 기능
- IOS의 기본 실행(EXEC) 모드

Cisco IOS Software 특징

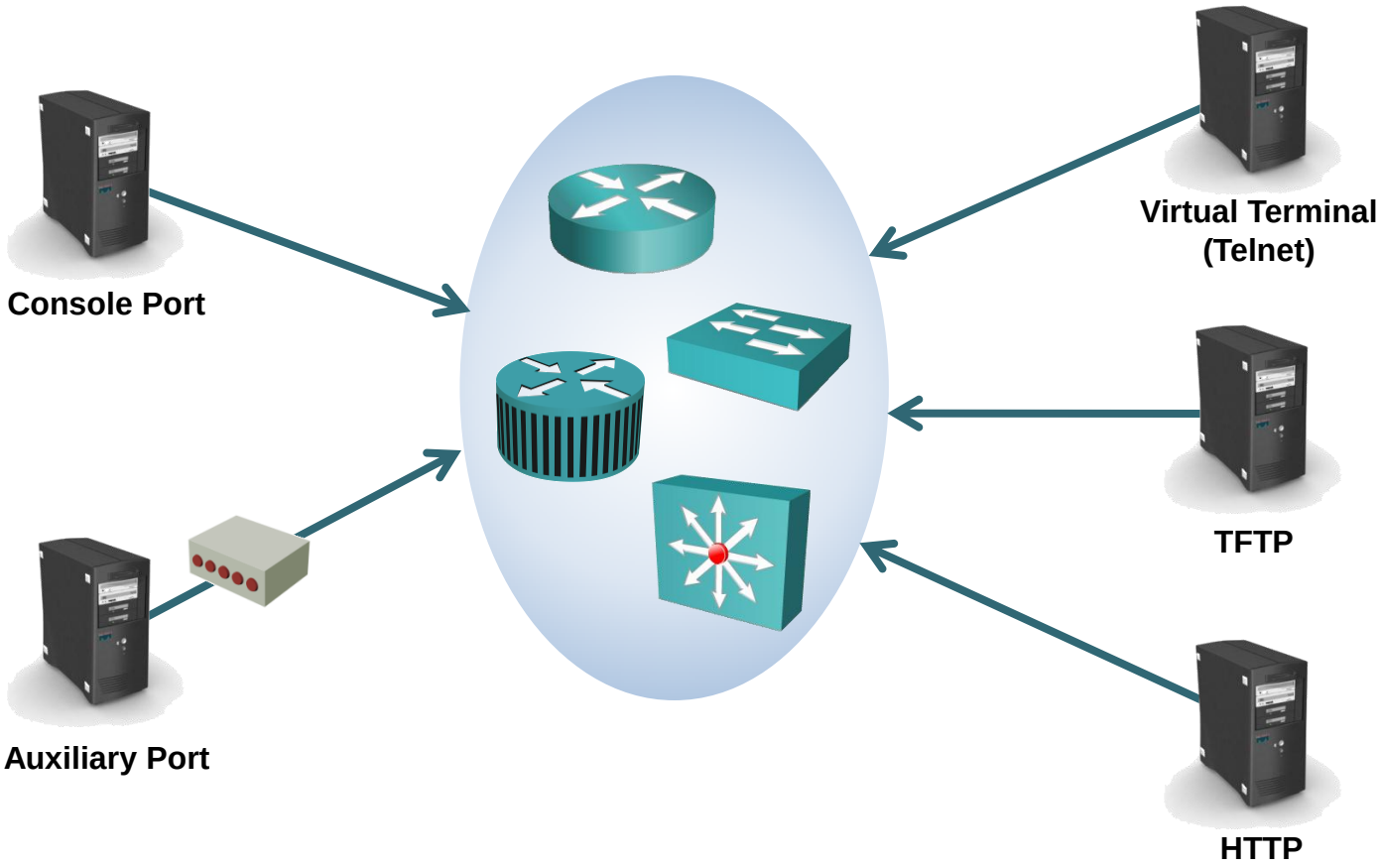


IOS Device의 구성 작업들

- Network에서 요구되는 다양한 정책 설정
- Protocol Address와 관련 Option 설정
- IOS Device 관리를 위한 관리 Option



IOS Device 구성을 위한 외부 접근 방식



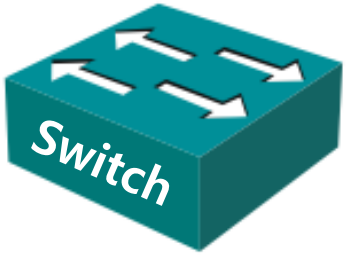
IOS Command Line Interface의 기능

- IOS가 제공하는 가장 기본적인 사용자 Interface이다
- CLI는 사용자가 명령어를 직접 입력하는 방식이다
- IOS Device의 종류에 따라 다양한 명령어가 제공된다
- Console안에서 명령어의 직접/간접 입력이 가능하다
- 실행모드는 크게 User Mode와 Privileged Mode가 있다
- 명령어 모드에 따라 다양한 Prompt를 제공한다

IOS의 기본 실행(EXEC) 모드 – User Mode

- IOS의 기본 실행 모드이다
- 제한된 명령어 만을 사용할 수 있다
- 다음과 같은 Prompt를 제공한다


```
Router>
Router>
Router>
```

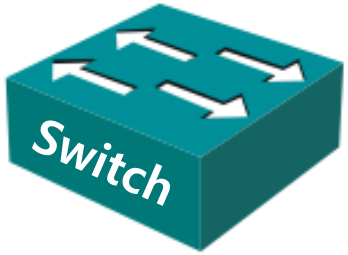



```
Switch>
Switch>
Switch>
```

IOS의 기본 실행(EXEC) 모드 – Privileged Mode

- IOS의 구성작업을 진행할 수 있는 실제 실행모드이다
- IOS의 모든 명령어를 사용할 수 있다
- IOS가 제공하는 다른 구성모드로 진입하기 위해서는 이 실행모드가 기본이 된다
- 다음과 같은 Prompt를 제공한다


```
Router#
Router#
Router#
```




```
Switch#
Switch#
Switch#
```

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
…….
```

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 Information

Cisco Router의 초기 시동

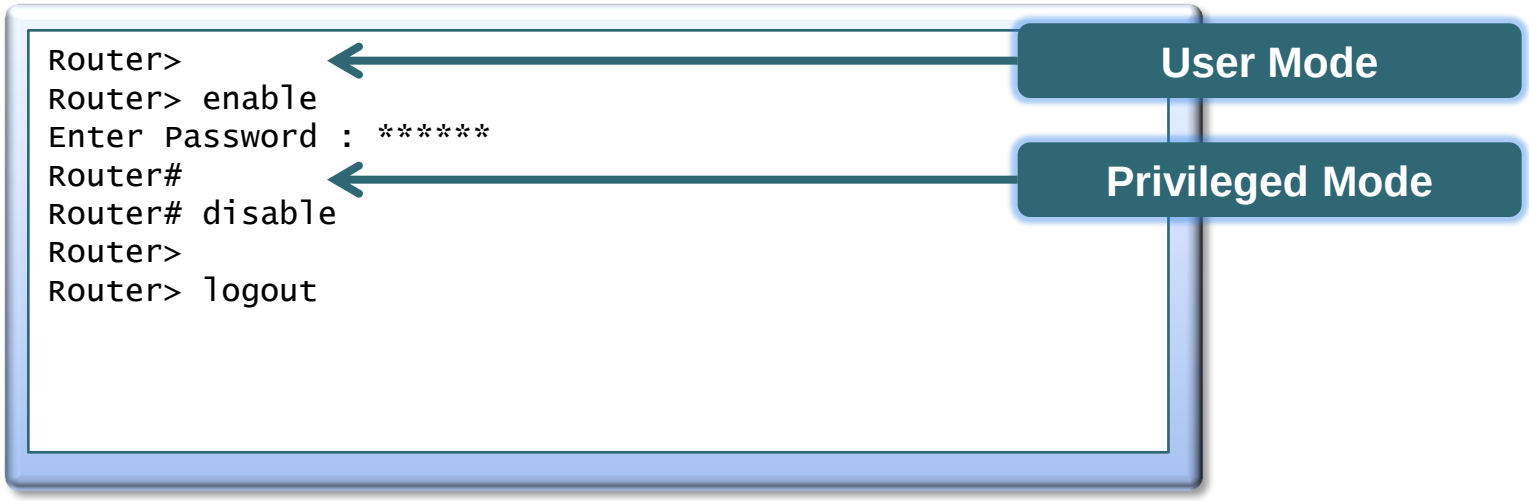
- **Setup Mode**

```
--- 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>
```

Router에 Login하기



Router의 User Mode Command List

```
Router>?
Exec commands:
  access-enable    Create a temporary Access-List entry
  access-profile   Apply user-profile to interface
  clear            Reset functions
  connect          Open a terminal connection
  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
  login            Log in as a particular user
  logout           Exit from the EXEC
  modemui          Start a modem-like user interface
  mrinfo           Request neighbor and version information from a multicast
                   router
  mstat            Show statistics after multiple multicast traceroutes
  mtrace           Trace reverse multicast path from destination to source
  name-connection  Name an existing network connection
  pad              Open a X.29 PAD connection
  ping             Send echo messages
  ppp              Start IETF Point-to-Point Protocol (PPP)
 --More--
```

Router의 Privileged Mode Command List

```
Router#?
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
  archive          manage archive files
  auto             Exec level Automation
  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
 --More--
```

Router의 CLI Help Function

- **Context-Sensitive Help**
  - Command List를 제공
  - 명령어 조합 및 각 단계마다 수행할 수 있는 명령만 표시
- **Console Error Message**
  - 라우터에서 발생할 수 있는 문제를 정의
  - 문제를 수정할 수 있도록 도와준다
- **Command History Buffer**
  - 사용한 명령을 버퍼에 저장 (재사용)
  - 버퍼의 크기 조절 가능

Console Error Message

- **일반적인 Error Message**

• 불완전한 명령어 입력 시

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

• 오타로 인한 명령어 잘못 입력 시 오류

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

• 현재 모드에 존재하지 않는 명령 입력 오류

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

Router의 CLI Editing 기능

```
Router(config-if)#ip address 192.168.50.51 255.255.255.0
Router(config-if)#
```

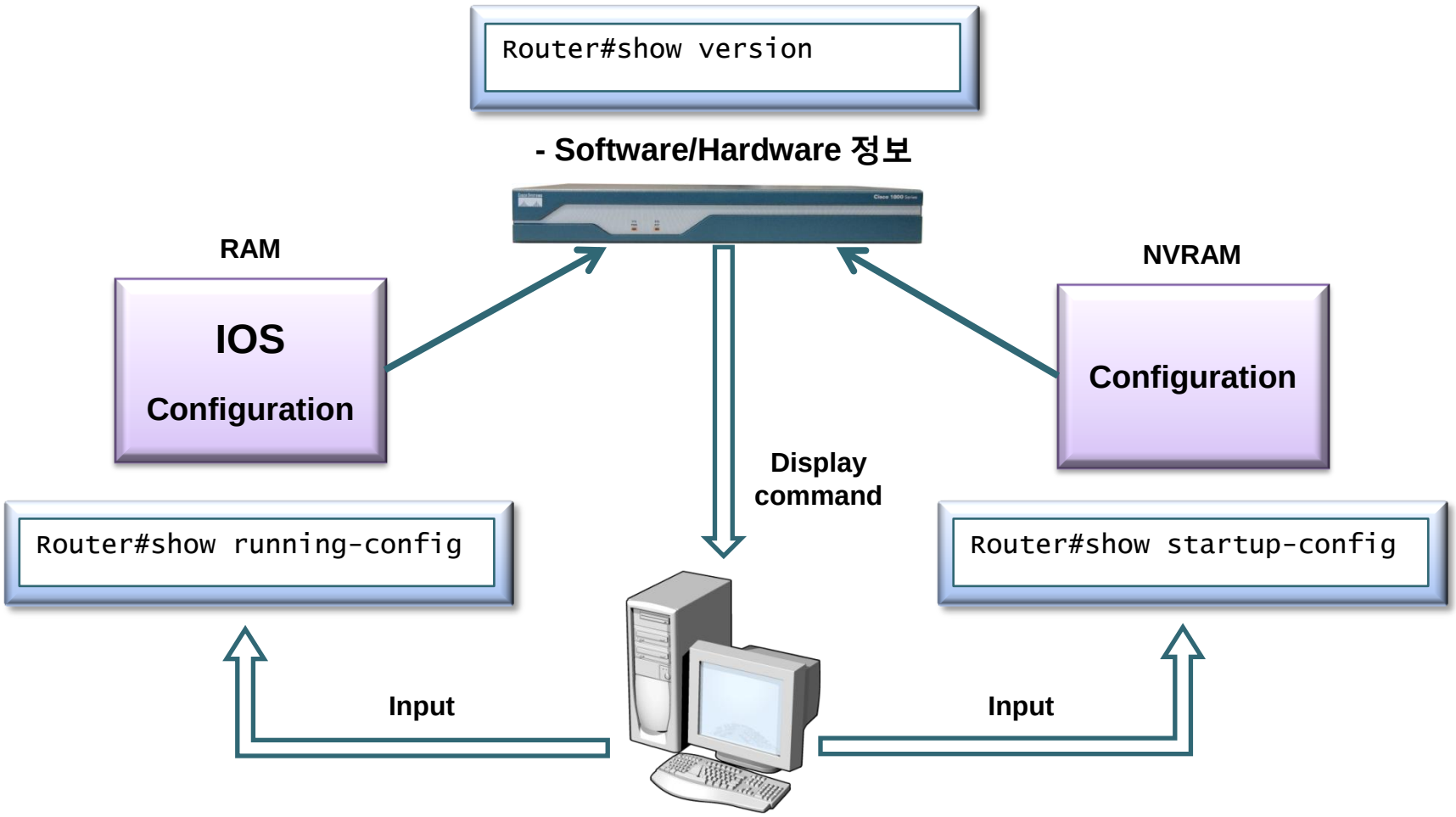
	(Automatic scrolling of long lines)
Ctrl + A	Move to the beginning of the command line
Ctrl + E	Mode to the end of the Command line
Esc – B	Move back one word
Esc – F	Mode forward one word
Ctrl + B	Move back one character
Ctrl + F	Move forward one character
Ctrl + D	Delete a single character

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

```
Router#show history
  en
  conf t
  sh ip int brief
  show history
  end
  conf t
  show history
Router#
```

Router의 초기 상태 정보 검증



Router의 초기 상태 정보 검증

```
R11#show version
Cisco Internetwork Operating System Software
IOS (tm) 3700 Software (C3725-I-M), Version 12.3(1a), RELEASE SOFTWARE (fc1)
Copyright (c) 1986-2003 by cisco Systems, Inc.
Compiled Fri 06-Jun-03 12:20 by dchih
Image text-base: 0x60008954, data-base: 0x60D52000

ROM: ROMMON Emulation Microcode
ROM: 3700 Software (C3725-I-M), Version 12.3(1a), RELEASE SOFTWARE (fc1)

R11 uptime is 1 hour, 7 minutes
System returned to ROM by unknown reload cause - suspect boot_data[BOOT_COUNT] 0x0, BOOT_COUNT 0,
      BOOTDATA 19
System image file is "tftp://255.255.255.255/unknown"

cisco 3725 (R7000) processor (revision 0.1) with 120832K/10240K bytes of memory.
Processor board ID XXXXXXXXXXX
R7000 CPU at 80Mhz, Implementation 39, Rev 2.1, 256KB L2, 512KB L3 Cache
Bridging software.
X.25 software, Version 3.0.0.
2 FastEthernet/IEEE 802.3 interface(s)
4 Serial network interface(s)
DRAM configuration is 64 bits wide with parity enabled.
55K bytes of non-volatile configuration memory.
16384K bytes of ATA System CompactFlash (Read/Write)

Configuration register is 0x2102
```

Router의 초기 상태 정보 검증

In RAM

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

Current configuration : 1117 bytes
!
version 12.3
service timestamps debug datetime
msec
...............
```

- 현재 DRAM에 저장된 정보를 표시
- 사용자가 수정한 정보는 running-config 파일에 저장
- Active Config 파일이므로 설정된 내용은 System에 적용되어 있음

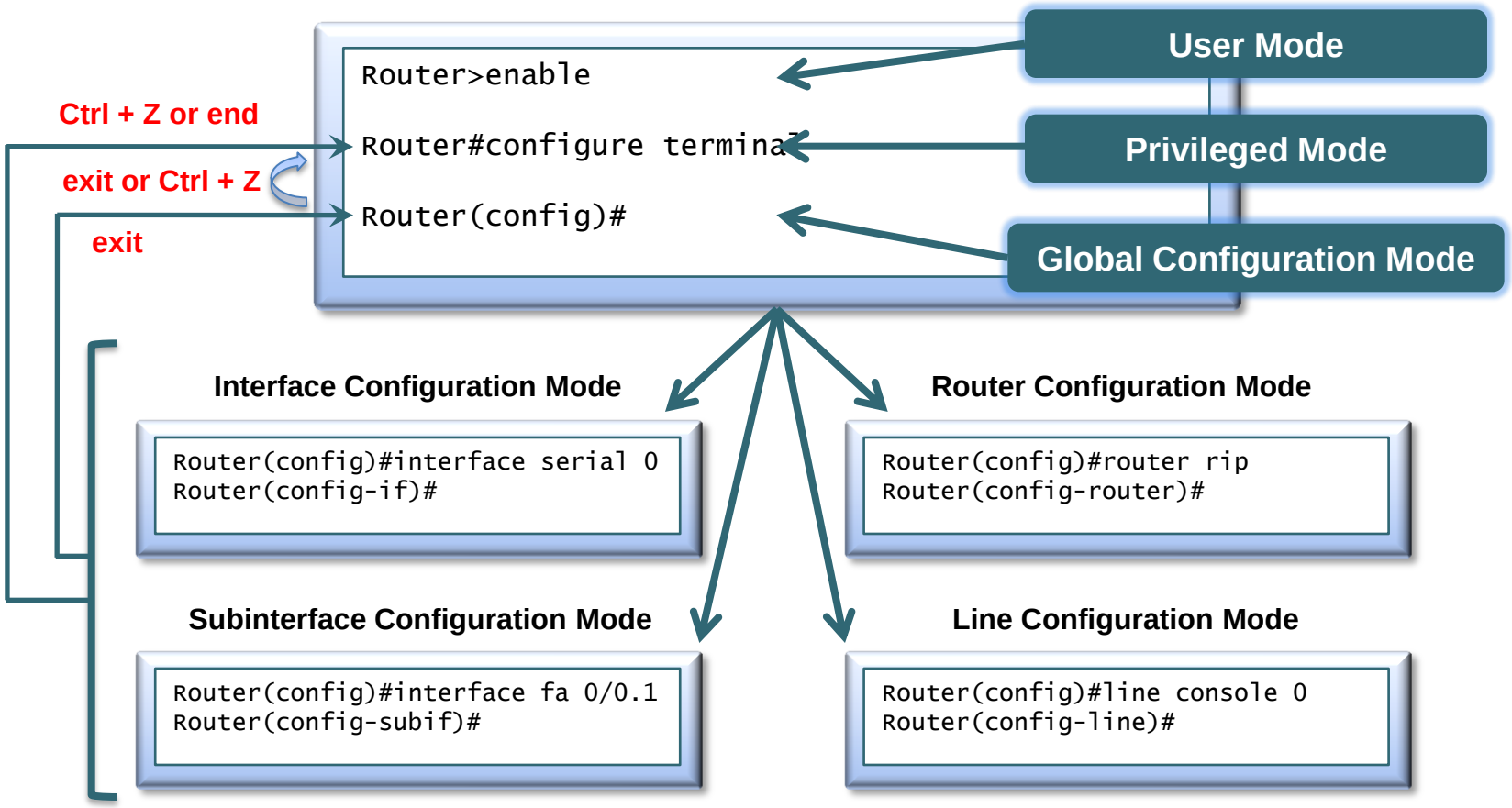
In NVRAM

```
Router#show startup-config
Using 1027 out of 57336 bytes
!
version 12.3
service timestamps debug datetime
msec
service timestamps log datetime msec
no service password-encryption
...............
```

- NVRAM에 저장된 정보를 표시
- “copy running-config startup-config”명령을 사용하여 NVRAM에 저장
- 이 정보는 Router Reload시에 Router를 초기 구성에 사용

Router 기본 구성하기

Router 구성 모드


User Mode
Privileged Mode
Global Configuration Mode
Router>enable
Router#configure termina
Router(config)#
Ctrl + Z or end
exit or Ctrl + Z
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 DayBanner)**

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

- **Interface Description (interface 식별을 위한 구분)**

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

CLI에서 Router Password 설정

- **Console Password**

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

- **Virtual Terminal Password**

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

- **Enable Password**

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

- **Secret Password**

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

User Mode에서 Privileged Mode로 변경

CLI에서 Router 설정 – Console Option

- **Console Session Time 설정**

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

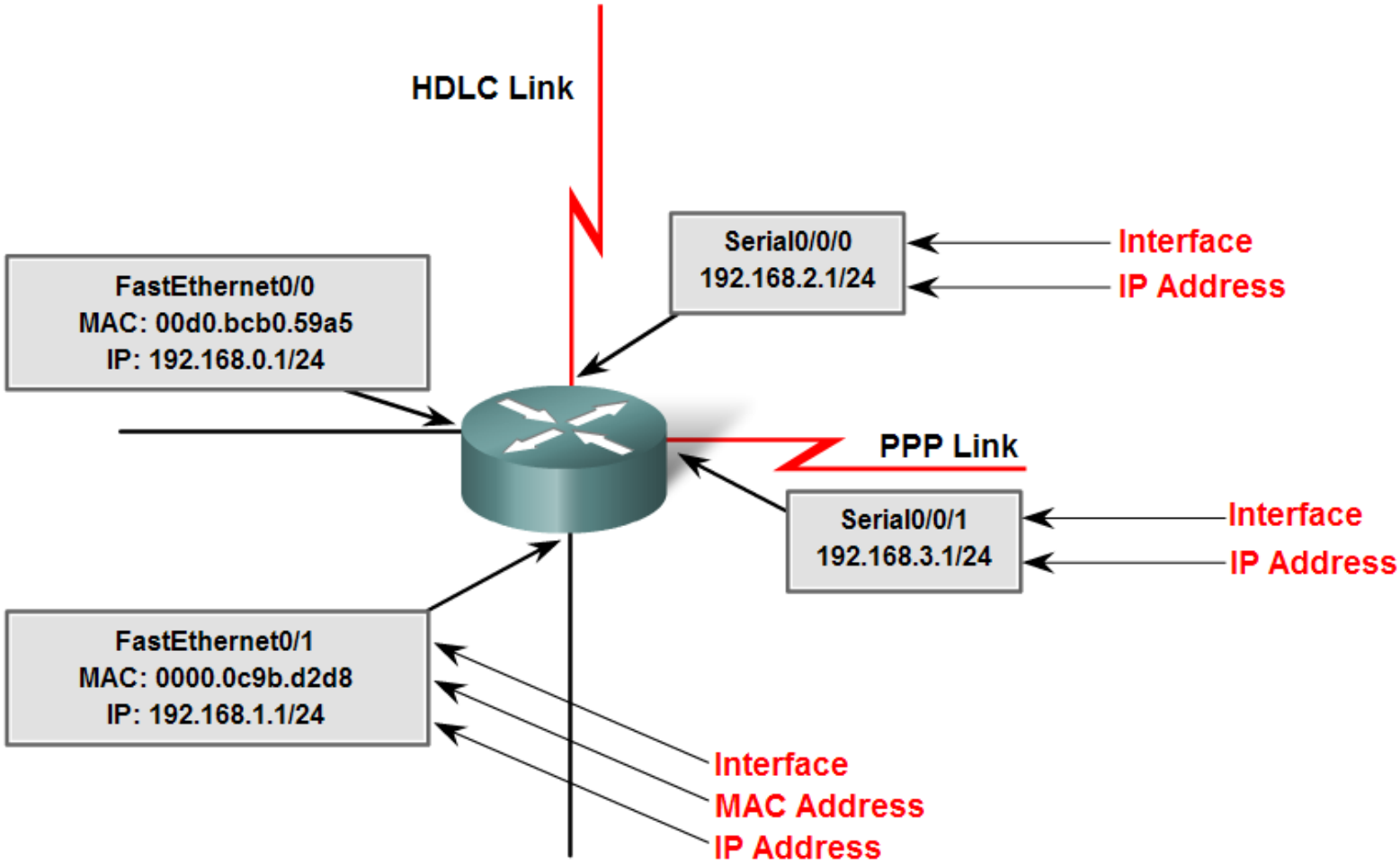
- **Console Input Message 동기화 설정**

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

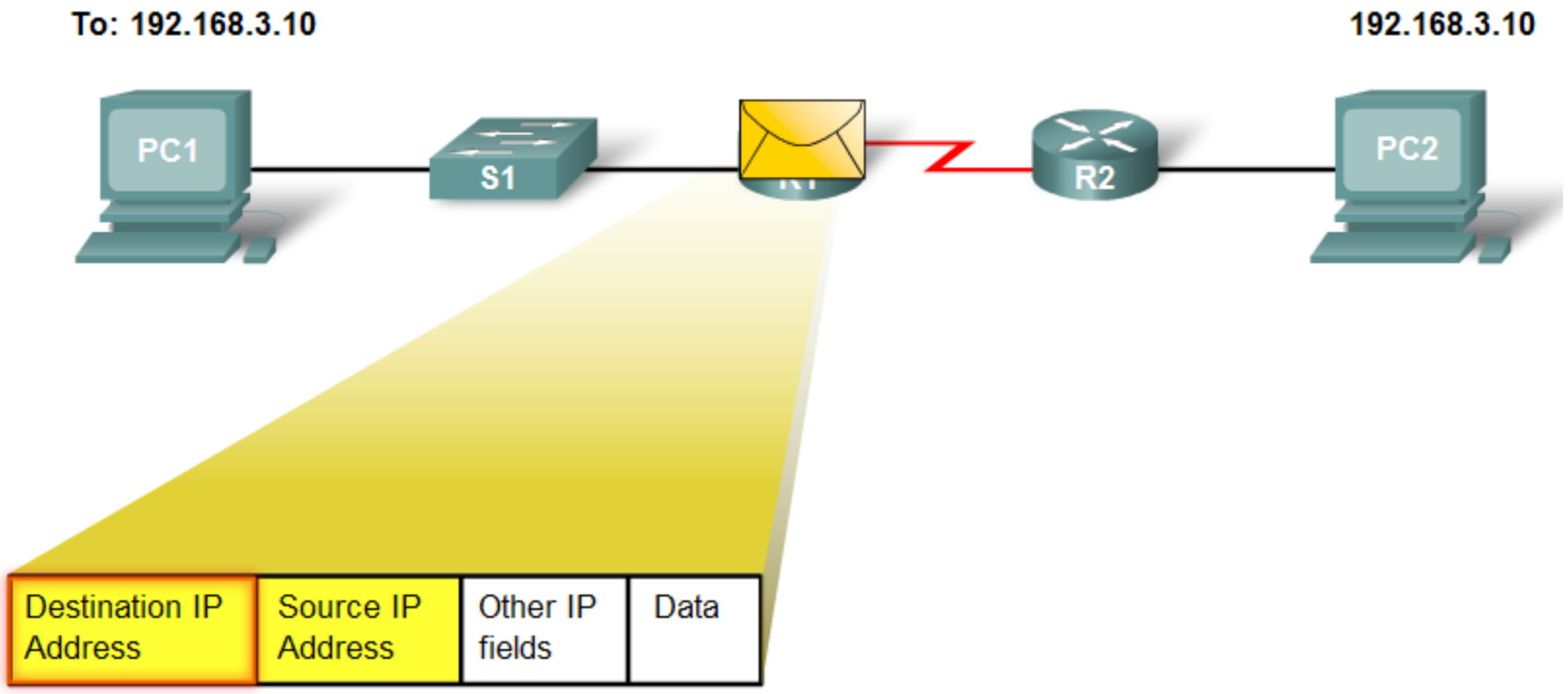
- **Console 인증 설정**

```
Router(conf)#Username student password Korea
Router(conf)#line console 0
Router(conf-line)#login local
```

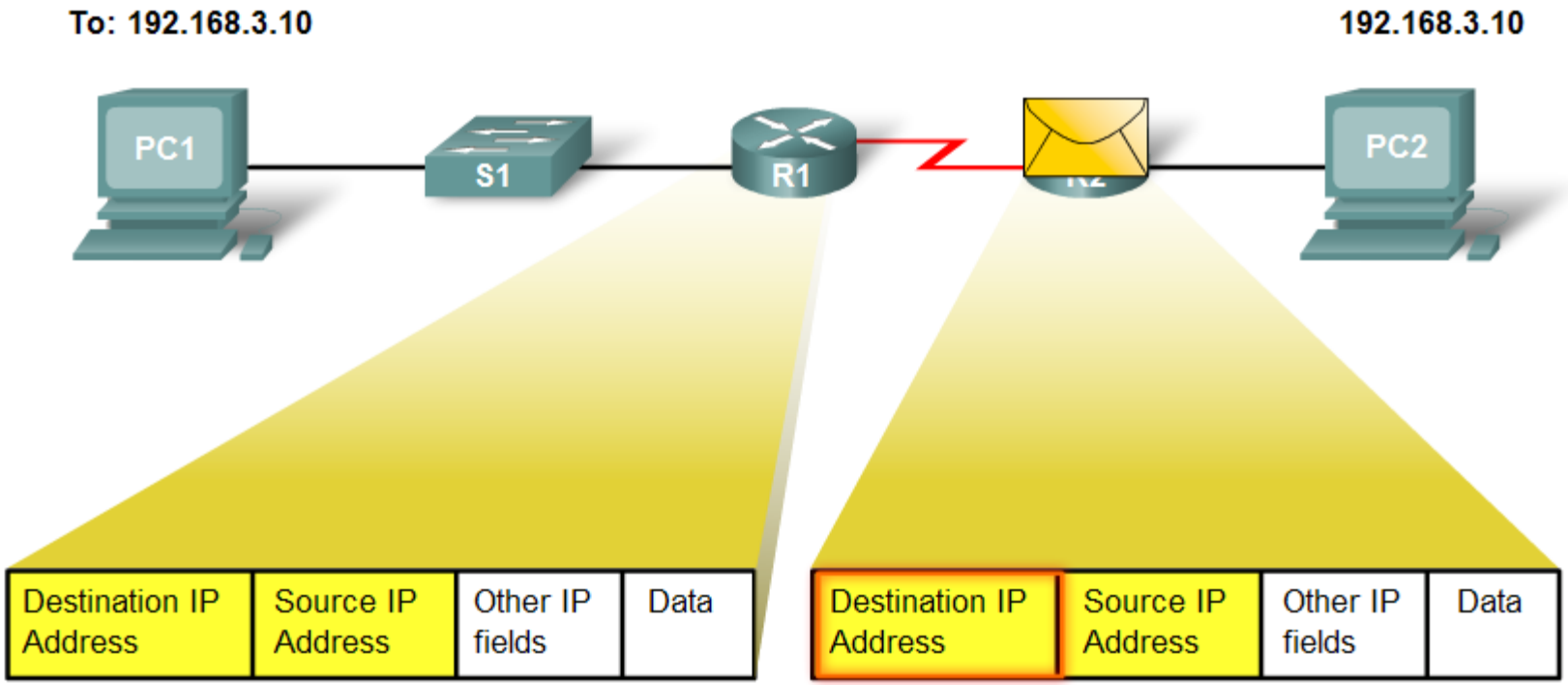
Router Interface – Logical Representation



Router Packet Forwarding



Router Packet Forwarding



Router의 Interface 설정

- **Interface Configuration Mode 진입을 위한 Interface Type 이해**

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

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

- **Fixed Interface Router**

```
Router(conf)#interface type number
EX)
Router(conf)#interface serial 0
Router(conf-if)#
```

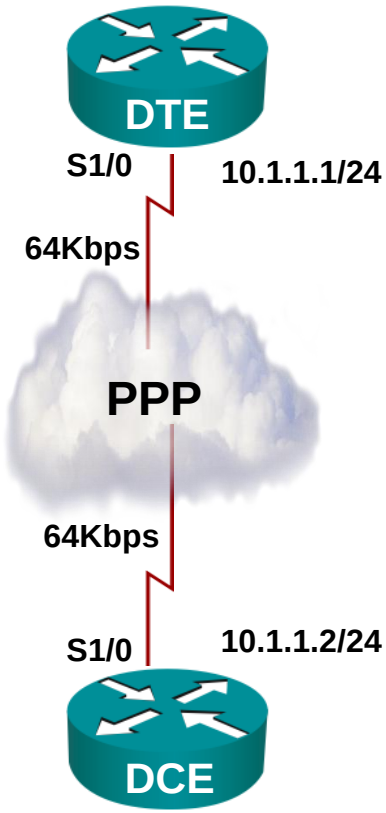
- **Module Interface Router**

```
Router(conf)#interface type slot/port
EX)
Router(conf)#interface serial 1/0
Router(conf-if)#
```

Router의 Interface 설정

- **Interface Configuration의 기본 단계**

Serial Back to Back Connection



▪ *2-계층 protocol 설정하기*

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

▪ *Address 설정하기*

```
Router(conf-if)#ip address 10.1.1.1 255.255.255.0
```

▪ *Bandwidth 설정하기*

```
Router(conf-if)#bandwidth 64
```

▪ *Clock 설정하기 (DCE Interface 에서 설정)*

```
Router(conf-if)#clock rate 64000
```

▪ *Interface 동작 시키기*

```
Router(conf-if)#no shutdown
```

Router Interface 구성 정보 검증

```
R11#show interfaces
FastEthernet0/0 is administratively down, line protocol is down
  Hardware is Gt96k FE, address is c200.1288.0000 (bia c200.1288.0000)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Half-duplex, 100Mb/s, 100BaseTX/FX
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog
     0 input packets with dribble condition detected
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 babbles, 0 late collision, 0 deferred
 --More--
```

Router Interface 구성 정보 검증

- **Interface 상태정보 검증**

```
R11#show interfaces serial 1
Serial1 is up, line protocol is up
  Hardware is M4T
  Internet address is 192.168.3.1/24
  MTU 1500 bytes, BW 1024 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
```

Carrier Detect **Keepalives**

Operational	`Serial1 is up, line protocol is up`
Connection problem	`Serial1 is up, line protocol is down`
Interface problem	`Serial1 is down, line protocol is down`
Disabled	`Serial1 is administratively down, line protocol is down`

Router Interface 구성 정보 검증

- **Serial Interface 상태정보 검증**

```
R11#show interfaces serial 1/0
Serial1/0 is up, line protocol is up
  Hardware is M4T
  Internet address is 192.168.3.1/24
  MTU 1500 bytes, BW 1024 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive set (10 sec)
  Restart-Delay is 0 secs
  Last input 00:00:00, output 00:00:02, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); 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)
     Available Bandwidth 768 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     2872 packets input, 210786 bytes, 0 no buffer
     Received 2871 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     2559 packets output, 110264 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 output buffer failures, 0 output buffers swapped out
     2 carrier transitions     DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
```

Router Interface 구성 정보 검증

- **Serial Interface의 Serial Cable Type 정보 확인**

```
R11#show controllers serial 1/0
M4T: show controller:
PAS unit 0, subunit 0, f/w version 1-45, rev ID 0x2800001, version 1
idb = 0x61935618, ds = 0x61936DC8, ssb=0x619370FC
Clock mux=0x0, ucmd_ctrl=0x1C, port_status=0x7B
Serial config=0x8, line config=0x200
maxdgram=1608, bufpool=78Kb, 120 particles
     DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
line state: up
cable type : V.11 (X.21) DCE cable, received clockrate 128000

base0 registers=0x3D000000, base1 registers=0x3D002000
mxt_ds=0x61A89BA8, rx ring entries=78, tx ring entries=128
rxring=0x79BEFA0, rxr shadow=0x6193D6E8, rx_head=52
txring=0x79BF240, txr shadow=0x6193DABC, tx_head=80, tx_tail=80, tx_count=0
throttled=0, enabled=0
halted=0, last halt reason=0
Microcode fatal errors=0
rx_no_eop_err=0, rx_no_stp_err=0, rx_no_eop_stp_err=0
rx_no_buf=0, rx_soft_overrun_err=0, dump_err= 0, bogus=0, mxt_flags=0x0
tx_underrun_err=0, tx_soft_underrun_err=0, tx_limited=1(2)
tx_fullring=0, tx_started=2896
rx_int_count=3250, tx_int_count=2898
```

Router Basic Configuration LAB

Survey

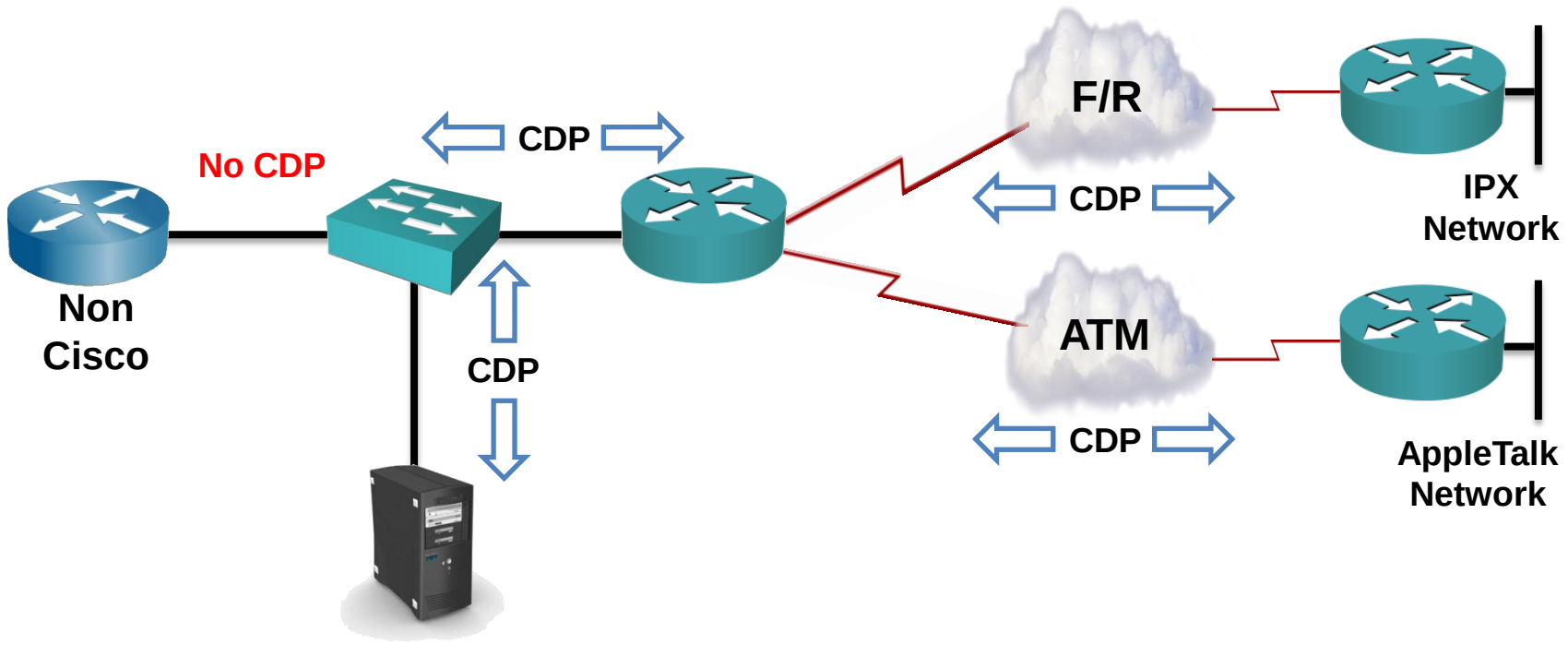
- Neighbor Device 관리 기초
- Remote Device 관리 기초
- Router의 시동 및 구성 정보 관리
- IOS Device 관리 기초

Neighbor Device 관리

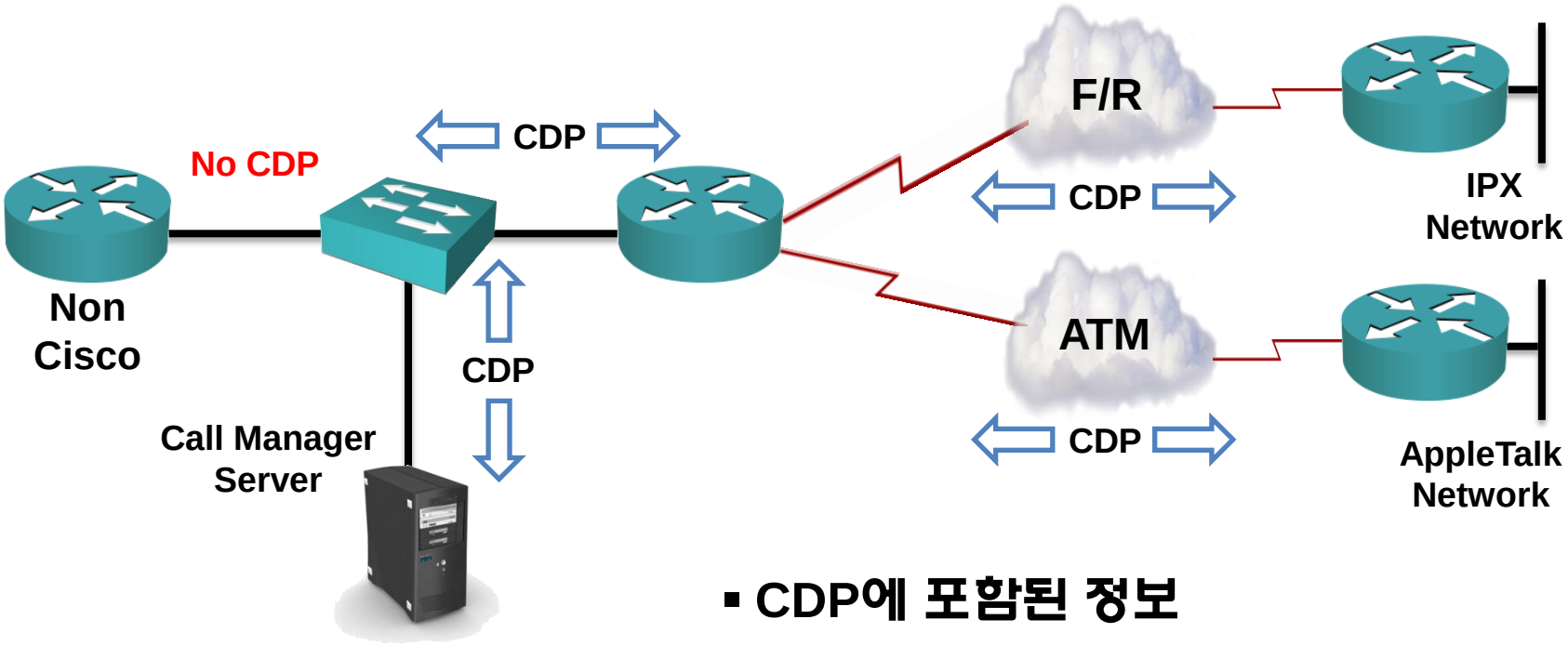
- CDP (Cisco Discovery Protocol) 개요
- CDP를 이용한 정보 수집
- CDP 설정하기
- CDP 상태정보 검증
- CDP를 이용한 Network 구조 검증

CDP(Cisco Discovery Protocol) 개요

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



CDP를 이용한 정보 수집



- **CDP에 포함된 정보**
  - Neighbor Device *Hostname*
  - Neighbor Device *Address 정보*
  - Neighbor Device *Port 정보*
  - Neighbor Device *장비 성격*
  - Neighbor Device *기종*

CDP 설정하기

- **CDP Option**

```
Router#show cdp ?
```

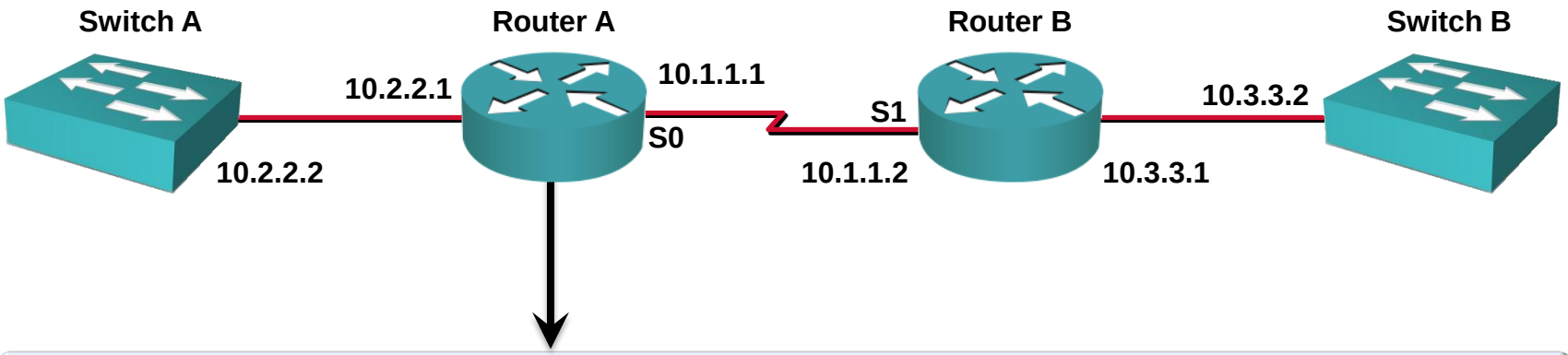
- **Global Configuration Mode**

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

- **Interface Configuration Mode**

```
Router#config terminal
Router(conf)#interface serial 0
Router(conf-line)#cdp enbale        → CDP Enable
Router(conf-line)#no cdp enable     → CDP Disable
```

CDP 상태정보 검증




```
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 Router A에 물리적으로 직접 연결된 인접한 Device의 정보만을 보여준다. 따라서 물리적으로 직접 연결되지 않은 switch B는 CDP를 이용한 정보수집이 불가능하다

CDP 상태정보 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 상태정보 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
- Telnet을 이용한 Remote Device 연결하기
- Telnet Session 관리

Router Telnet 설정

- **Virtual Terminal Configuration**

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

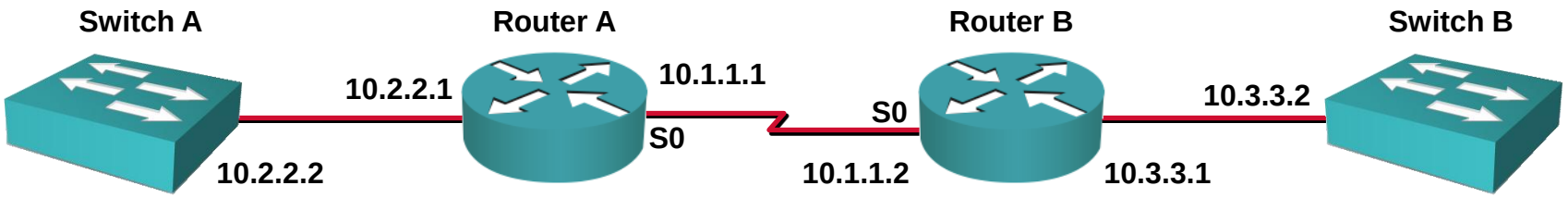
- **Local UserDB를 이용한 접속 설정**

```
Router#config terminal
Router(conf)#username admin password cisco
Router(conf)#line vty 0 4
Router(conf-line)#login local
```

- **암호 입력 없이 UserEXEC mode가지 접속 허용하기**

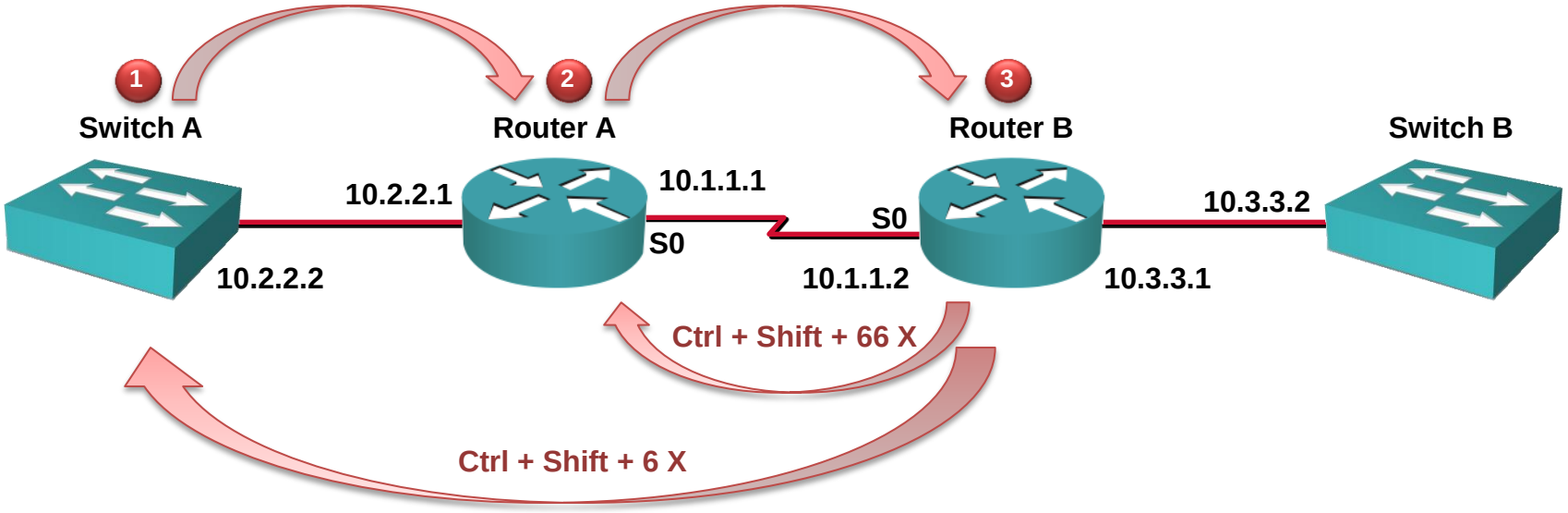
```
Router#config terminal
Router(conf)#line vty 0 4
Router(conf-line)#no password
Router(conf-line)#no login
```

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 관리

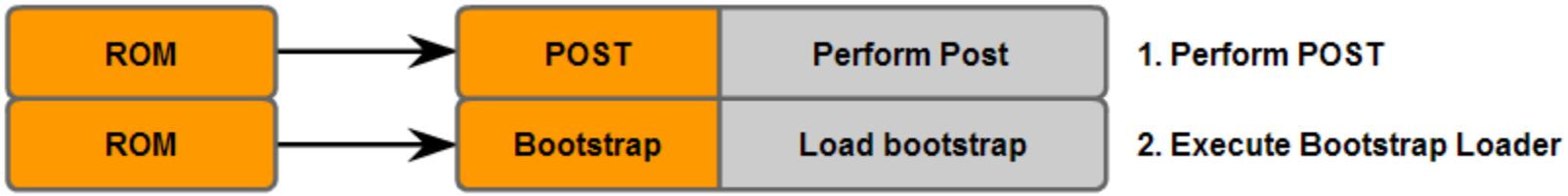


1. Ctrl + Shift + 6 X를 입력하면 telnet 접속되어 있는 현재 위치에서 처음 있었던 위치로 이동한다.
2. Enter를 2번 누르면 이전 위치로 이동한다.
3. Ctrl + Shift + 66 X 키를 누르면 2번째 위치로 이동한다. 엔터를 2번 연속 누르면 이전 위치로 이동하게 된다

Router의 시동 및 구성 정보 관리

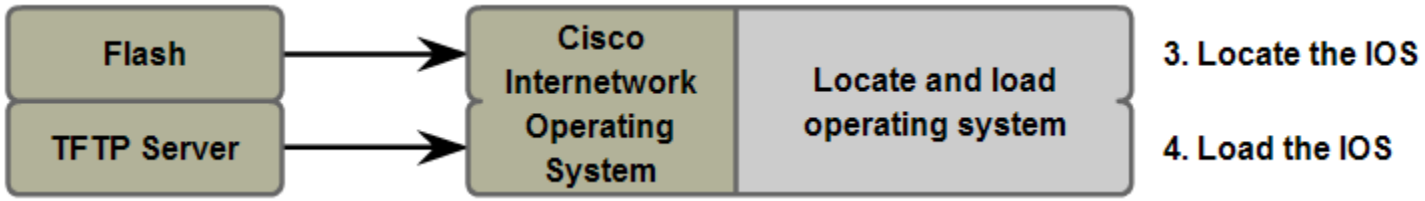
- Router의 부팅과정 소개
- Router의 내부 구성 요소
- IOS와 Configuration의 참조 동작
- Configuration register

Router의 부팅과정 소개




```
System Bootstrap, Version 12.1(3r)T2, RELEASE SOFTWARE (fc1)
Copyright (c) 2000 by cisco Systems, Inc.
cisco 2620 (MPC860) processor (revision 0x200) with 60416K/5120K bytes of memory
```

Router의 부팅과정 소개

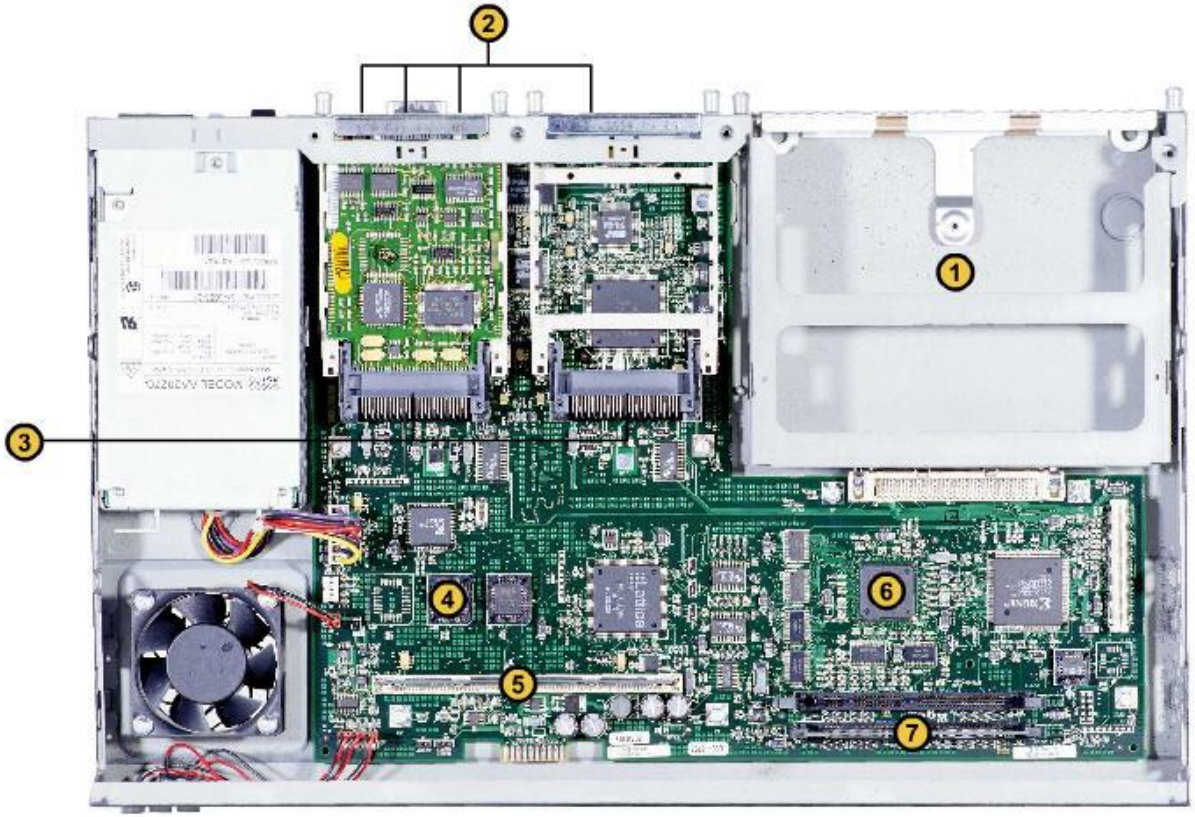



```
System Bootstrap, Version 12.1(3r)T2, RELEASE SOFTWARE (fc1)
Copyright (c) 2000 by cisco Systems, Inc.
cisco 2620 (MPC860) processor (revision 0x200) with 60416K/5120K bytes of memory

Self decompressing the image :
########################################################################## [OK]
```

Router의 부팅과정 소개

```
            Restricted Rights Legend

Use, duplication, or disclosure by the Government is
subject to restrictions as set forth in subparagraph
(c) of the Commercial Computer Software - Restricted
Rights clause at FAR sec. 52.227-19 and subparagraph
(c) (1) (ii) of the Rights in Technical Data and Computer
Software clause at DFARS sec. 252.227-7013.

           cisco Systems, Inc.
           170 West Tasman Drive
           San Jose, California 95134-1706
Cisco Internetwork Operating System Software
IOS (tm) C2600 Software (C2600-I-M), Version 12.2(28), RELEASE SOFTWARE (fc5)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2005 by cisco Systems, Inc.
Compiled Wed 27-Apr-04 19:01 by miwang

cisco 2620 (MPC860) processor (revision 0x200) with 60416K/5120K bytes of memory.

Processor board ID JAD05190MTZ (4292891495)
M860 processor: part number 0, mask 49
Bridging software.
X.25 software, Version 3.0.0.
1 FastEthernet/IEEE 802.3 interface(s)
32K bytes of non-volatile configuration memory.
16384K bytes of processor board System flash (Read/Write)
```

Router의 내부 구성 요소



1. NM slot
2. Interface
3. WIC Slot
4. ROM
5. Flash
6. CPU
7. RAM

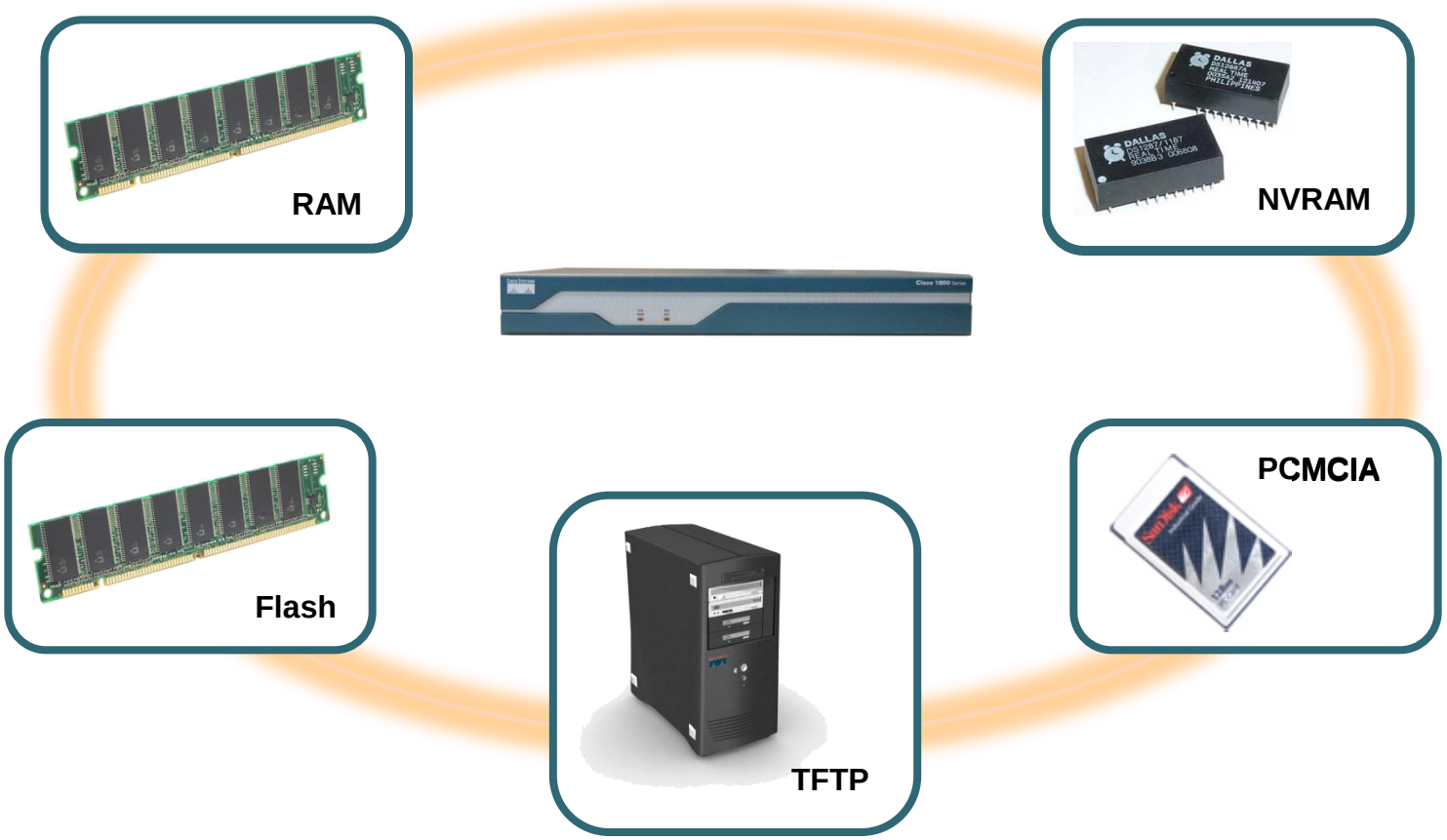
Configuration Register

```
R11#show version
Cisco Internetwork Operating System Software
IOS (tm) 3700 Software (C3725-I-M), Version 12.3(1a), RELEASE SOFTWARE (fc1)
Copyright (c) 1986-2003 by cisco Systems, Inc.
Compiled Fri 06-Jun-03 12:20 by dchih
Image text-base: 0x60008954, data-base: 0x60D52000

ROM: ROMMON Emulation Microcode
ROM: 3700 Software (C3725-I-M), Version 12.3(1a), RELEASE SOFTWARE (fc1)

R11 uptime is 16 minutes
System returned to ROM by unknown reload cause - suspect boot_data[BOOT_COUNT] 0x0, BOOT_COUNT 0,
BOOTDATA 19
System image file is "tftp://255.255.255.255/unknown"

cisco 3725 (R7000) processor (revision 0.1) with 120832K/10240K bytes of memory.
Processor board ID XXXXXXXXXXX
R7000 CPU at 80Mhz, Implementation 39, Rev 2.1, 256KB L2, 512KB L3 Cache
Bridging software.
X.25 software, Version 3.0.0.
2 FastEthernet/IEEE 802.3 interface(s)
4 Serial network interface(s)
DRAM configuration is 64 bits wide with parity enabled.
55K bytes of non-volatile configuration memory.
16384K bytes of ATA System CompactFlash (Read/Write)

Configuration register is 0x2102
```

IOS Device의 기본 관리

- IOS File System과 Device
- IOS Image 관리
- Device Configuration 정보 관리
- IOS Copy Command
- IOS Device에서 Debug 사용

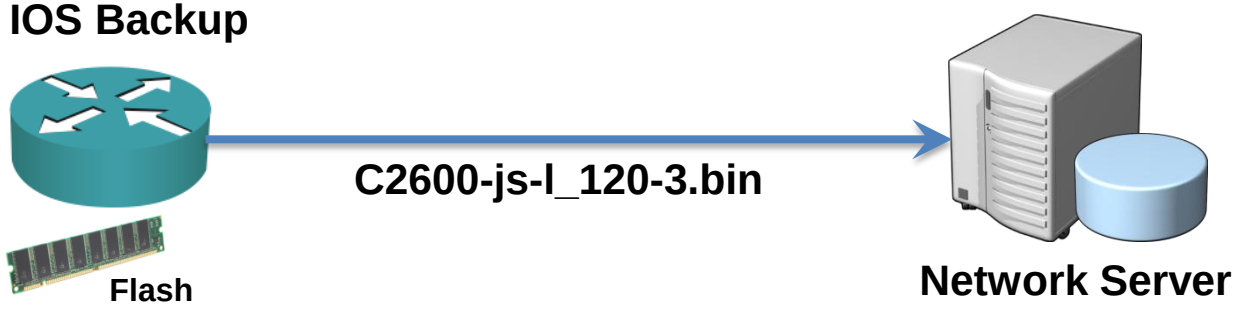
IOS File System & Device



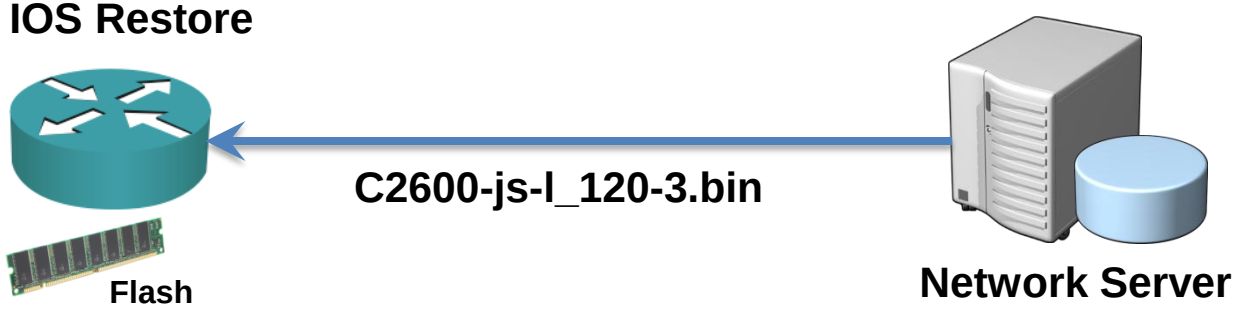
IOS Image 관리

- IOS Backup & Restore

  - IOS Backup



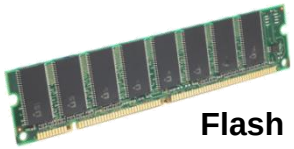
  - IOS Restore

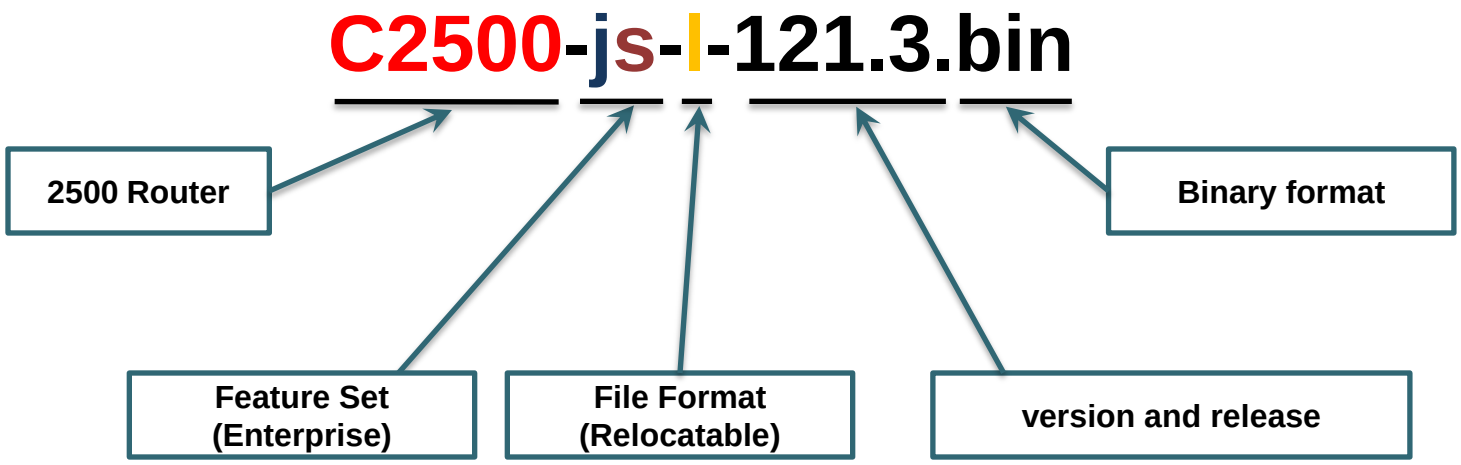


IOS Image 관리

- **IOS Image file Format Example**

```
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)
```





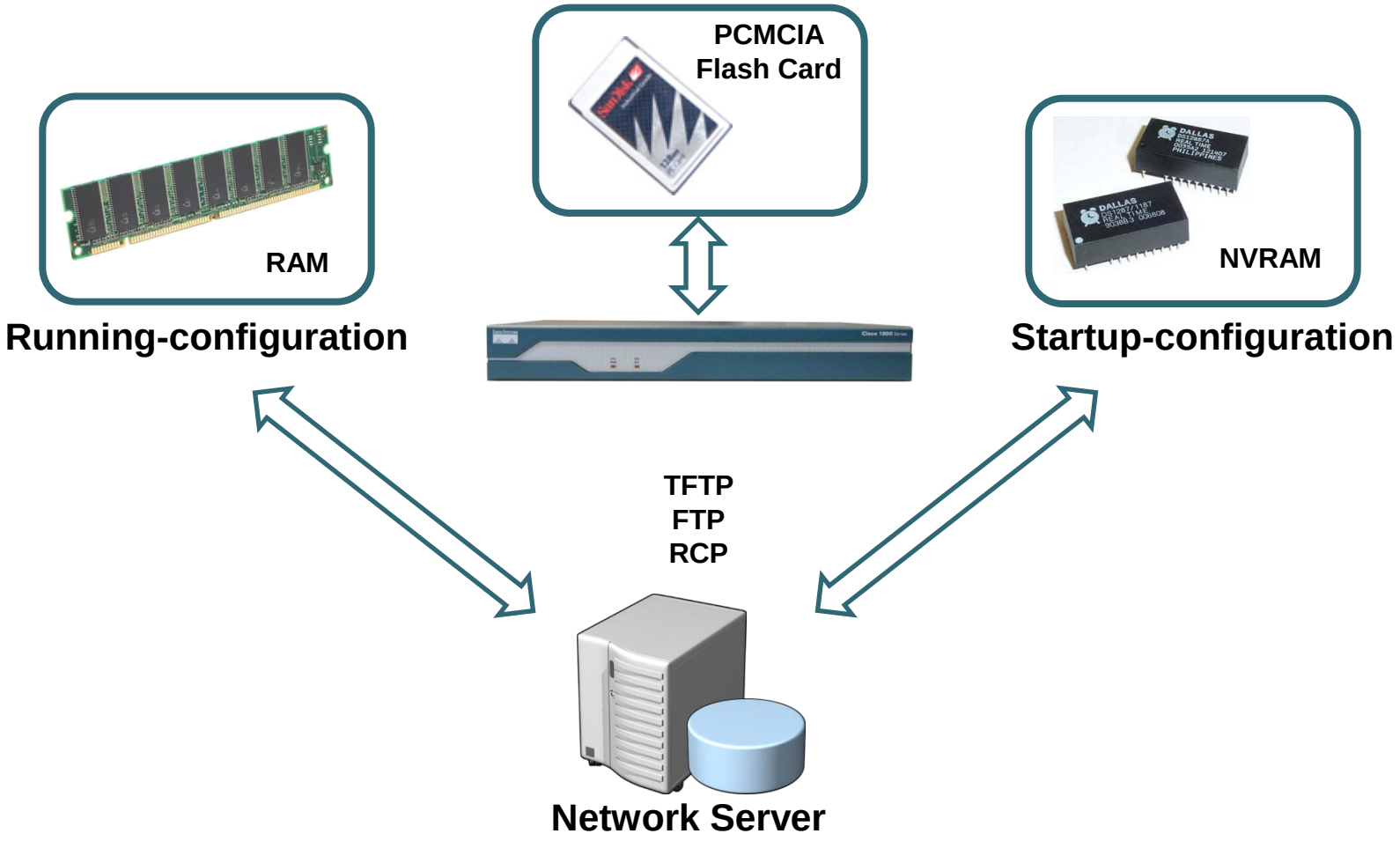
IOS Image 관리 – IOS Backup


```
Router#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)
Router#
```

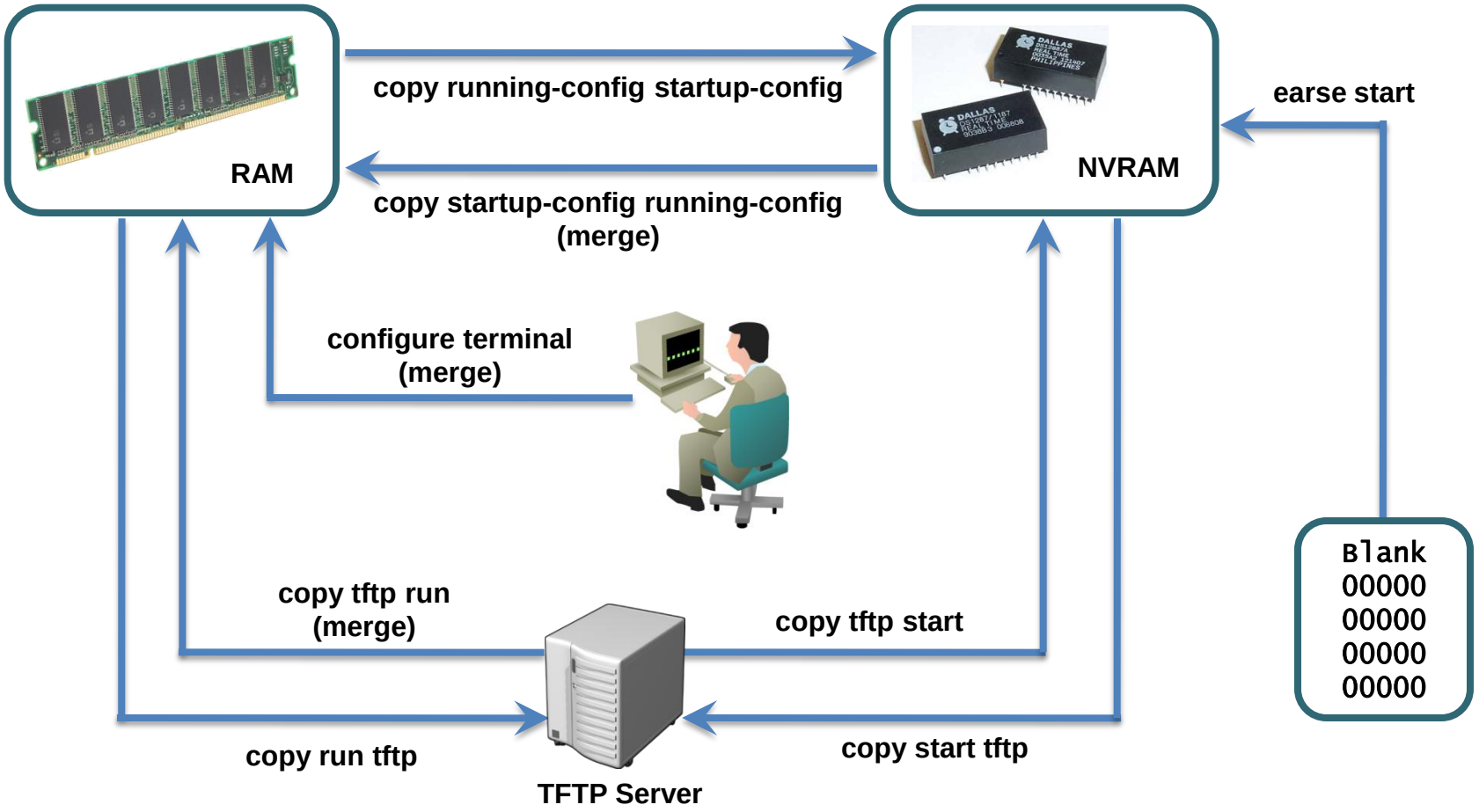
IOS Image 관리 – Restore & Upgrade


```
Router#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)
Router#
```

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 Sever의 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 (merge)

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)

Router#
```

IOS Device에서 Debug Command 사용

- **Show와 Debug Command의 비교**

구분	show	debug
실행에 따른 구분	Static	Dynamic
실행에 따른 Overhead	Low	High
주된 사용 용도	상태정보 확인	특정 동작 과정 확인

- **Show commands**
  - **interface, protocols, performance, media등의 부분적인 정보확인**
- **Debug commands**
  - **각종 protocol들의 traffic의 흐름을 분석 할 수 있으며 configuration의 문제점 확인 가능**

LAB