

Trung Tâm Tin Học Trí Việt



CCNA 640-802

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CCNP, CCSI # 31419

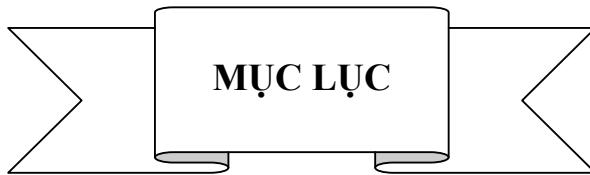
Tp.Hồ Chí Minh, 10 tháng 11 năm 2017

LỜI MỞ ĐẦU



Toàn bộ bài giảng này đều được ghi chép lại theo giáo trình của Thầy Vòng Chán Nguyên.
Mọi sự sao chép xin làm ơn đề tên tác giả.

Chân thành cảm ơn !!!



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PHẦN 1: CCENT

CCENT

CẤU HÌNH CƠ BẢN CISCO ROUTER

1. Xóa và xem cấu hình :

R3#**erase st** ---> **xoa cau hinh khoi tao cua Router (erase start)**

R3#erase startup-config

Erasing the nvram filesystem will remove all configuration files! Continue? [confirm]

[OK]

Erase of nvram: complete

R3#

*Mar 1 00:06:53.942: %SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram

R3#reload

Proceed with reload? [confirm] --> **Reload Startup config**

*Mar 1 00:06:59.812: %SYS-5-RELOAD: Reload requested by console.

System Bootstrap, Version 12.2(6r), RELEASE SOFTWARE (fc1)

TAC Support: http://www.cisco.com/tac

Copyright (c) 2001 by cisco Sy

C2600 platform with 65536 Kbytes of main memory

program load complete, entry point: 0x80008000, size: 0xe7ab88

Self decompressing the image :

#####
#####

#####
#####

#####
#####

#####
#####

#####
[OK]

Smart Init is enabled

smart init is sizing iomem

ID	MEMORY_REQ	TYPE
000091	0X0008B800	C2600 single Ethernet
	0X000F3BB0	public buffer pools
	0X00211000	public particle pools
TOTAL:	0X003903B0	

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: 4Mb.

Using 6 percent iomem. [4Mb/64Mb]

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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-J1S3-M), Version 12.2(15)T13, RELEASE SOFTWARE (fc2)
Technical Support: <http://www.cisco.com/techsupport>
Copyright (c) 1986-2004 by cisco Systems, Inc.
Compiled Wed 16-Jun-04 01:38 by hqluong
Image text-base: 0x80008098, data-base: 0x819600C8

cisco 2610 (MPC860) processor (revision 0x00) with 61440K/4096K bytes of memory.

--->Dung luong Ram

Processor board ID JAD06240CD6 (191342702)
M860 processor: part number 0, mask 49
Bridging software.
X.25 software, Version 3.0.0.
TN3270 Emulation software.
1 Ethernet/IEEE 802.3 interface(s)
1 Serial network interface(s)
32K bytes of non-volatile configuration memory. -----> NVRam
16384K bytes of processor board System flash (Read/Write) ---> Flash

--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: n

Press RETURN to get started!

*Mar 1 00:00:05.092: %LINEPROTO-5-UPDOWN: Line protocol on Interface VoIP-Null0 , changed state to up
*Mar 1 00:00:13.958: %LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up

*Mar 1 00:00:13.958: %LINK-3-UPDOWN: Interface Serial0/0, changed state to do

*Mar 1 00:00:14.960: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to down

*Mar 1 00:00:14.960: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to down

*Mar 1 00:07:03.974: %IP-5-WEBINST_KILL: Terminating DNS process

```
*Mar 1 00:07:04.872: %LINK-5-CHANGED: Interface Ethernet0/0, changed state to administratively down
*Mar 1 00:07:04.872: %LINK-5-CHANGED: Interface Serial0/0, changed state to administratively down
*Mar 1 00:07:15.658: %SYS-5-RESTART:
Cisco Internetwork Operating System Software
IOS (tm) C2600 Software (C2600-J1S3-M), Version 12.2(15)T13, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2004 by cisco Systems, Inc.
Compiled Wed 16-Jun-04 01:38 by hqluong
*Mar 1 00:07:15.658: %SNMP-5-COLDSTART: SNMP agent on host Router is undergoing a cold start
*Mar 1 00:07:15.690: %LINK-3-UPDOWN: Interface Virtual-Access1, changed state to up
*Mar 1 00:07:16.691: %LINEPROTO-5-UPDOWN: Line protocol on Interface1, changed state to up
Router>
Router>
```

Router con0 is now available

Press RETURN to get started.

Router>

Router>

Router>?

Exec commands:

access-enable	Create a temporary Access-List entry
access-profile	Apply user-profile
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
lock	Lock the terminal
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)

resume	Resume an active network connection
rlogin	Open an rlogin connection
show	Show running system information
slip	Start Serial-line IP (SLIP)
systat	Display information about terminal lines
tclquit	Quit Tool Command Language shell
telnet	Open a telnet connection
terminal	Set terminal line parameters
tn3270	Open a tn3270 connection
traceroute	Trace route to destination
tunnel	Open a tunnel connection
udptn	Open an udptn con
voice	Voice Commands
where	List active connections
x28	Become an X.28 PAD
x3	Set X.3 parameters on PAD

Router>show version

Cisco Internetwork Operating System Software
IOS (tm) C2600 Software (C2600-J1S3-M), Version 12.2(15)T13, RELEASE SOFTWARE (fc2)
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Copyright (c) 1986-2004 by cisco Systems, Inc.
Compiled Wed 16-Jun-04 01:38 by hqluong
Image text-base: 0x80008098, data-base: 0x819600C8

ROM: System Bootstrap, Version 12.2(6r), RELEASE SOFTWARE (fc1)
ROM: C2600 Software (C2600-J1S3-M), Version 12.2(15)T13, RELEASE SOFTWARE (fc2)

Router uptime is 23 minutes
System returned to ROM by reload
System image file is "flash:c2600-j1s3-mz.122-15.T13.bin"

cisco 2610 (MPC860) processor (revision 0x00) with 61440K/4096K bytes of memory.

Processor board ID JAD06240CD6 (191342702)
M860 processor: part number 0, mask 49
Bridging software.
X.25 software, Version 3.0.0.
TN3270 Emulation software.
1 Ethernet/IEEE 802.3 interface(s)
1 Serial network interface(s)
32K bytes of non-volatile configuration memory.
16384K bytes of processor board System flash (Read/Write)
Configuration register is 0x2102 ----> **gia tri thanh ghi, gia tri nay la binh thuong.**

Router>show version --> **che do Auto Completion bang phím TAB**

Cisco Internetwork Operating System Software
Cisco Internetwork Operating System Software
fc2)
Technical Support: <http://www.cisco.com/techsupport>
Copyright (c) 1986-2004 by cisco Systems, Inc.

Compiled Wed 16-Jun-04 01:38 by hqluong
Image text-base: 0x80008098, data-base: 0x819600C8

ROM: System Bootstrap, Version 12.2(6r), RELEASE SOFTWARE (fc1)
ROM: C2600 Software (C2600-J1S3-M), Version 12.2(15)T13, RELEASE SOFTWARE (fc2)

Router uptime is 37 minutes
System returned to ROM by reload
System image file is "flash:c2600-j1s3-mz.122-15.T13.bin"

cisco 2610 (MPC860) processor (revision 0x00) with 61440K/4096K bytes of memory.

Processor board ID JAD06240CD6 (191342702)

M860 processor: part number 0, mask 49

Bridging software.

X.25 software, Version 3.0.0.

TN3270 Emulation software.

1 Ethernet/IEEE 802.3 interface(s) --> Cac Interface hien co tren Router

1 Serial network interface(s)

--More--

Router>sh flash: ----> chi tiet bo nho flash

System flash directory:

File Length Name/status

1 15182972 c2600-j1s3-mz.122-15.T13.bin

[15183036 bytes used, 1594180 available, 16777216 total]

16384K bytes of processor board System flash (Read/Write) ----> chi tiet Flash , chua Cisco IOS, chua SDM (voi Router 2800)

Router>

Router#sh ip interface brief ----> Trang thai cac Intreface

Interface	IP-Address	OK?	Method	Status	Protocol
Ethernet0/0	unassigned	YES	unset	administratively down	down
Serial0/0	unassigned	YES	unset	administratively down	down
Virtual-Access1	unassigned	YES	unset	up	up

*** **Chu y:** Ve mac dinh cac Inteface vat ly cua Cisco Router se co trang thai(Status) la administratively down (tu la shutdown).

2. Lam chu dau nhac lenh

Crtl + B --> ve truoc 1 ky tu

Crtl + F --> ve sau 1 ky tu

Crtl + A ----> dau dong

Crtl + E --> cuoi dong

Crtl + D --> xoa ky tu tai vi tri con tro

Ctrl + P ----> ve cau lenh truoc do ---Previous

Ctrl + N ----> tien toi 1 cau lenh

Show history --> Router nho bao nhieu cau lenh (default 10)


```
disabl
Enter configuration commands, one per line. End with CNTL/Z.
 disconnect      Disconnect an exi
CiscoRouter2600(config)#enable password cisco
  enab
CiscoRouter2600(config)#exited commands
CiscoRouter2600#
 e
*Mar 1 01:37:46.697: %SYS-5-CONFIG_I: Configured from console by consoleexit
Description of the interactive help system
CiscoRouter2600 con0 is now available
```

Press RETURN to get started.

User Access Verification

```
Password:
CiscoRouter2600>enable
Password:
CiscoRouter2600#
 e
*Mar 1 01:37:46.697: %SYS-5-CONFIG_I: Configured from console by consoleexit
Description of the interactive help system
```

```
CiscoRouter2600 con0 is now availablelinal
Press RETURN to get started.a particular user
User Access Verification
 logout      Exit
```

```
Password:XEC
CiscoRouter2600>enable
 modemui
Password:t a modem
```

CiscoRouter2600#sh run

```
service timestamps log datetime msec cast traceroutes
no service password-encryption
 mtrace
!
hostname CiscoRouter2600cast path from destinati
!
logging queue-limit 100
enable password cisco      → Password dang PlainText(ko an toan )
 name
!o
ip subnet-zeroan existing ne
!o
!
!n
mpls ldp logging neighbor-changes
 pad
!
!
!
```

```
!
!O
!n
!
!2
!P
no voice hpi capture buffer
no voice hpi capture destinationmessages
!
!
mta receive maximum-recipients 0IETF Point-to-Point Protocol (PP
!
!
!
!
interface Ethernet0/0
no ip address      Res
shutdownive netwo
half-duplex
!
interface Serial0/0
ip http server
ip classless
!
!
!
!
!
call rsvp-sync
!
!
mgcp profile default
!
dial-peer cor custom
!
!
!
!
line con 0
password vnpro
login
line aux 0
line vty 0 4
!
--More--
```

CiscoRouter2600#copy run start --> tuong duong cau lenh #wr

Destination filename [startup-config]?

Building configuration...

[OK]

CiscoRouter2600#

*** **Chú ý**: Khi ta dang dung o cap cao Privilege muon thuc hien cac lenh cua mode Privilege thi ta them tu khoa la "do"

```
CiscoRouter2600#configure terminal  
Enter configuration commands, one per line. End with CNTL/Z.  
CiscoRouter2600(config)#do show run
```

5. Tat co che phan giao ten mien cua Router (de Router ko phan giao ten mien khi ta go sai)

```
CiscoRouter2600(config)#no ip domain-lookup  
CiscoRouter2600(config)#^Z  
CiscoRouter2600#wr  
*Mar 1 02:00:06.970: %SYS-5-CONFIG_I: Configured from console by console  
Building configuration...  
-----
```

6. Bat co che ngan ngua ngat ngang cau lenh ma ta dang go

```
CiscoRouter2600(config)#line console 0  
CiscoRouter2600(config-line)#logging synchronous  
CiscoRouter2600(config-line)#exec-timeout 0 0 -> (0 phut 0 giay)  
CiscoRouter2600(config-line)#exit  
CiscoRouter2600(config)#wr  
^  
% Invalid input detected at '^' marker.
```

```
CiscoRouter2600(config)#^Z  
CiscoRouter2600#wr  
*Mar 1 02:07:29.351: %SYS-5-CONFIG_I: Configured from console by console  
CiscoRouter2600#wr  
Building configuration...  
e> Ma hoa tat cac passwod dang "cleartext" trong cau hinh cua cac thiet bi Cisco  
CiscoRouter2600(config)#service password-encryption --->> ma hoa MD7  
Current configuration : 1214 bytes  
!  
version 12.3  
service timestamps debug datetime msec  
service timestamps log datetime msec  
service password-encryption  
!  
hostname CCNA  
!  
boot-start-marker  
boot-end-marker  
!  
enable password 7 110A1016141D  
!  
no aaa new-model  
ip subnet-zero  
!  
!  
no ip domain lookup  
!  
ip cef  
ip audit po max-events 100
```

7. Cach dat password dang nhap tu User Mode -> Privilege ma hoa MD5

```
CiscoRouter2600(config)#enable secret vnpro
```

```
CiscoRouter2600(config)#^Z
```

```
Router uptime  
CiscoRouter2600#
```

```
Current configuration : 800 bytes  
!  
version 12.2  
service timestamps debug datetime msec  
service timestamps log datetime msec  
service password-encryption  
!  
hostname CiscoRouter2600  
!  
logging queue-limit 100  
enable secret 5 $1$CWwB$mMlv5wVZKZrwpLvIGKIY81 --> co so 0 la plain text, 5 MD5,7  
MD7  
enable password 7 0822455D0A16  
!  
ip subnet-zero  
!  
!  
no ip domain lookup  
!  
mpls ldp logging neighbor-changes  
!  
!  
!  
--More--
```

=====> neu enable secret (MD5) la password dc uu tien nhat de dang nhap tu User Mode sang Privilege Mode

Ma hoa: enable secret 5 \$1\$CWwB\$mMlv5wVZKZrwpLvIGKIY81ry.
enable password 7 0822455D0A16board System flash (Read/Write)

CAU HINH KET NOI ROUTER

1. Cau hinh cong Ethernet/Fastethernet

FILE "SIMPLE1.NET":



R1 (192.168.1.77/30) ----- R2 (192.168.1.78/30)

```
CCNA(config)#interface e0/0 --> vao Mode Interface (E0/0; Fa0/0)  
CCNA(config-if)#hostname R1
```

```
R1(config-if)#ip address 192.168.1.77 255.255.255.252
```

```
R1(config-if)#no shutdown
```

```
R1#ping 192.168.1.78
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.1.78, timeout is 2 seconds:
!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
R1#

```
R1#sh run interface e0/0 --> xem lai IP  
Building configuration...
```

Current configuration : 83 bytes

```
!  
interface Ethernet0/0  
ip address 192.168.1.77 255.255.255.252  
half-duplex  
end
```

```
R1#
```

**** Chú ý: : Neu da IP sai ta co the sua lai bang 2 cach sau :
 c1: Go de len IP cu
 c2 : tra ve nguyen thuyn cua IP

```
R1(config)#default interface e0/0
```

TELNET – SSH

Có thể cấu hình bằng cách truy xuất từ xa

- Telnet (23)
- SSH (22)

====> đổi hỏi Router để cấu hình Line VTY

```
R1(config)#line vty 0 ?
<1-4> Last Line number ----> ho tro tu 5 phien ket noi tu xa
<cr>
```

```
-----  
R1(config)#line vty 0 4 ---> cho phep chi su dung 5 phien ket noi
R1(config-line)#
```

```
R1(config)#line vty 0 4
R1(config-line)#pass
R1(config-line)#password vnpro ---> pass cho VTY
R1(config-line)#login
R1(config-line)#exit
```

CISCO DISCOVERY PROTOCOL (CDP)

1. Định nghĩa :

- Là giao thức cho phép phát hiện các thiết bị Cisco khác đang kết nối "trực tiếp" với thiết bị của mình
- Hoạt động Layer 2
- Chỉ có trên thiết bị của Cisco

2. Chức năng:

- Kiểm tra trạng thái hoạt động của thiết bị láng giềng
- Lấy được thông tin của các thiết bị láng giềng
- Về số lượng

R1#sh CDP neighbors

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
R2	Eth 0/0	173	R	2620	Fas 0/0

R1#

R1#sh CDP neighbors -> kiểm tra các thiết bị nối trực tiếp với Router
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
R2	Eth 0/0	150	R	2620	Fas 0/0

R1#sh CDP neighbors

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
R2	Eth 0/0	122	R	2620	Fas 0/0

R1#sh CDP neighbors

Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge

Router#ping
00:40:36: %SYS-5-CONFIG_I: Configured from console by console

Router#ping Mr.Thanh

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.34, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

Router#
Router#show host
Default domain is not set
Name/address lookup uses static mappings

Host	Flags	Age	Type	Address(es)
Mr.Thanh	(perm, OK)	0	IP	192.168.1.34 ----> kiem tao ip nao

Router#

CAU HINH KET NOI BANG CONG SERIAL

ROUTER#sh hosts
Default domain is not set
Name/address lookup uses static mappings

Codes: UN - unknown, EX - expired, OK - OK, ?? - revalidate
temp - temporary, perm - permanent
NA - Not Applicable None - Not defined

Host	Port	Flags	Age	Type	Address(es)
BA.THANH		None	(perm, OK)	0	IP 192.168.1.2
HOANG		None	(perm, OK)	0	IP 192.168.1.1
THAO		None	(perm, OK)	0	IP 192.168.1.9
HUNG		None	(perm, OK)	0	IP 192.168.1.4
LAN		None	(perm, OK)	0	IP 192.168.1.3
HAU		None	(perm, OK)	0	IP 192.168.1.10
M.TUAN		None	(perm, OK)	0	IP 192.168.1.15

ROUTER(config)#do wr
Building configuration...
[OK]
ROUTER(config)#do sh arp → Xem bang ARP

Protocol	Address	Age (min)	Hardware Addr	Type	Interface
Internet	192.168.1.9	6	0004.c129.6360	ARPA	Ethernet0/0
Internet	192.168.1.11	-	0007.0e9a.0dc0	ARPA	Ethernet0/0
Internet	192.168.1.10	3	0007.ebfc.1d20	ARPA	Ethernet0/0
Internet	192.168.1.15	1	0009.e8c5.2d20	ARPA	Ethernet0/0
Internet	192.168.1.1	8	0009.4330.6100	ARPA	Ethernet0/0

```
Internet 192.168.1.3      8 0008.e31b.9d40 ARPA Ethernet0/0
Internet 192.168.1.2      8 0005.3233.0960 ARPA Ethernet0/0
Internet 192.168.1.4      8 000b.5f9a.d0e0 ARPA Ethernet0/0
```

```
ROUTER(config)#do sh run
```

```
memory-size iomem 15
no aaa new-model
ip subnet-zero ----> Cisco co the dung subnet 0
ip cef
```

```
*** Chu y: Cac cach Telnet
```

1. # Telnet <ip>
 2. # Telnet <host>
 3. # ip
 4. # host
-

```
ctrl + shift + 6 bo tay bam phim "x" van giu phien ket noi hien hanh
```

```
ROUTER#sh sessions ----> xem phien ket noi
```

Conn	Host	Address	Byte	Idle	Conn Name
*	1 m.tuan	192.168.1.15	0	2 m.tuan	--> dau "*" vi tri phien ket noi cuoi cung

```
ROUTER#resume 1 -> tra lai phien ket noi 1 (co dau "") hoac co the Enter 2 lan
[Resuming connection 1 to m.tuan ...]
```

```
ROUTER#sh users -> ai Telnet minh
```

Line	User	Host(s)	Idle	Location
* 0 con 0		m.tuan	00:07:50	
	hung		00:03:30	
	hau		00:02:22	
	ba.thanh		00:01:41	
	hoang		00:01:11	
	thao		00:00:55	
66 vty 0	idle		00:05:52	LAN
67 vty 1	idle		00:05:08	HUNG
68 vty 2	idle		00:01:53	M.TUAN
69 vty 3	idle		00:00:59	THAO
70 vty 4	idle		00:00:53	HAU

```
Interface User Mode Idle Peer Address
```

```
ROUTER#clear line 67 ----> ko cho nguoi khac ket noi toi(nguoi o line 67)
```

```
ROUTER#
[Resuming connection 3 to hau ... ]
```

[Connection to hau closed by foreign host]

ROUTER#

ROUTER#sh controllers s0/0

→ Kiểm tra đầu cáp V35 loại nào đang kết nối với cổng serial của mình (DTE- DCE)

Nếu là DCE ----> thi cấp xung

ROUTER(config)#int s0/0

ROUTER(config-if)#clock rate 64000

ROUTER(config-if)#shutdown

----> tắt 10s rồi no shutdown

ROUTER(config-if)# no shutdown

Xem chi tiết cổng s0/0

Serial0/0 is down, line protocol is down

Hardware is PowerQUICC Serial

MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
reliability 252/255, txload 1/255, rxload 1/255

Encapsulation HDLC, loopback not set

Keepalive set (10 sec) --> 10s gửi/nhận 1 lan

Last input 00:01:38, output never, output hang never

Last clearing of "show interface" counters 00:29:50

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 0/0/256 (active/max active/max total)

 Reserved Conversations 0/0 (allocated/max allocated)

 Available Bandwidth 1158 kilobits/sec

5 minute input rate 0 bits/sec, 0 packets/sec

5 minute output rate 0 bits/sec, 0 packets/sec

 3 packets input, 568 bytes, 0 no buffer

 Received 3 broadcasts, 0 runts, 0 giants, 0 throttles

 3 input errors, 0 CRC, 2 frame, 0 overrun, 0 ignored, 0 abort

 0 packets output, 0 bytes, 0 underruns

 0 output errors, 0 collisions, 34 interface resets

 0 output buffer failures, 0 output buffers swapped out

 6 carrier transitions

Status (Layer 1)

e.g : down

 1. Cổng serial hỏng

 2. Cable hỏng

 3. Chưa kết nối cable

 4. Không nhận được tín hiệu song song(CD)

Protocol(Layer2)

eg: down

- 1.dong goi chuan WAN ko tuong thich 2 dau ket noi
- 2.Ko nhan dc tin hieu KeepAlive
- 3.Chua cap clockrate

- b1: Gan cap(V35)
- b2: no shut 2 cong
- b3: xac dinh loai V35 nao DCE-DTE
#sh controller <serial>
- b4: Neu la DCE cap Clock rate

SSH (Secure Shell)

- De thuc hien bai LAB nay truoc tien ta disable het cac password enable password secret
Va nho no login

- Dang nhap tu xa bang Telnet phai cung cap Username & password
Cach dag nhap cong Console bang user/pass

B1: Tao CSDL de chung thuc nguoi dung tren Router

CCNA(config)#username netadmin password vnpro --> user name /pass

* Khi Telnet vao thi quyen Use mode : Privilege level 0

Privilege mode: Privilege level 15
CCNA(config)#username netadmin privilege 15 ----> cho phép user net admin đăng nhập vào Router với tham quyền cao nhất

B2: Cau hinh cong console va tai line vtv de thay doi hinh thuc dang nhap

CCNA(config)#line vty 0 10 ---> tuy w

CCNA(config-line)#login local -> cho phép đăng nhập console bằng user/pass với
user/pass lưu trong CSDL của Router

CCNA(config-line)# exit

*SSH la cai tien cua ung dung Telnet (TCP, port 23); du lieu truyen thong trong SSH (TCP, port 22) duoc ma hoa an toan

- Ma hoa theo chuan (RSA: Rivest Shamir Alderman) trong ung dung SSH (hay RSA,Diffie Helman)

- SSH hien dang co nhung phien ban : 1.0;1.5;1.99;2.0

Mot phien ket noi SSH dc dien ra giua 2 phia:

+Mot phia goi SSH Client

+ va SSH Server

***Chu y: phai su dung cung phien ban SSH su dung giua Client va Server(nen dung phien

ban 2.0)
2.0 <----> 2.0
1.0 <----> 1.5 <----> 1.99

- SSH Client (Putty,Open SSH)
- Các bước triển khai trên thiết bị Cisco:

B1 :Tạo User/Pass

B2: Thuật toán RSA đổi hỏi phải cấu hình 1 khóa(key)
được sinh ra từ 2 thông số trên thiết bị Cisco

- + Hostname (phải khác hostname Router)
- + IP domain-name

CCNA(config)#ip domain-name vnpro.org

B3: Tạo khóa

CCNA(config)#crypto key generate rsa

The name for the keys will be: CCNA.vnpro.org

Choose the size of the key modulus in the range of 360 to 2048 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

How many bits in the modulus [512]: 1024 -----> mặc định là 512, lớn nhất là 2048
% Generating 1024 bit RSA keys, keys will be non-exportable... [OK]

CCNA(config)#

*Oct 11 10:54:46.103: %SSH-5-ENABLED: SSH 1.99 has been enabled

CCNA(config)#

B4:

- + C2800: ver 1.99
- + C2600: ver 1.5 --> không thay đổi версии

Cấu hình SSH Version2 với tính năng mã hóa mạnh nhất

CCNA(config)#ip ssh version ?

<1-2> Protocol version

CCNA(config)#ip ssh version 2

B5: Cấu hình các thông số mở rộng cho SSH

- + Số lần cho phép nhập thông tin chung thực sai
- CCNA(config)#ip ssh authentication-retries ?
<0-5> Number of authentication retries
- CCNA(config)#ip ssh authentication-retries 3
- + Thời gian chờ timeout của 1 phiên kết nối SSH (default 120)
- CCNA(config)#ip ssh time-out ?
<1-120> SSH time-out interval (secs)

CCNA(config)#ip ssh time-out 60

B6: Cấu hình line VTY của thiết bị Cisco chỉ chấp nhận SSH hoặc Telnet hoặc Cả hai

VD1: chỉ sử dụng SSH

CCNA(config)#line vty 0 4

CCNA(config-line)#login local

CCNA(config-line)#transport input SSH

VD2: Dùng cả hai

CCNA(config)#line vty 0 4

```
CCNA(config-line)#login local  
CCNA(config-line)#transport input SSH Telnet  
CCNA(config-line)#+-----+
```

```
CCNA#ssh -l <login name> <IP host>
```

CCNA#ssh -l netadmin LAN -----→ hostname cua Router ket noi voi LAN

Password:

Chao mung ban den voi Router cua Lan

Lan#

```
CCNA#show ip ssh
```

SSH Enabled - version 2.0

Authentication timeout: 60 secs; Authentication retries: 3

```
CCNA#
```

QUA TRINH KHOI DONG CUA THIET BI CISCO

1. Rom monitor

```
rommon1>
```

```
hoac >
```

```
hoac $
```

* Do Admin

+ ~> Recovery password

+ ~> Thay doi gia tri thanh ghi (Configuration register)

Ex: Configuration register is 0x2102

* Khong do Admin

+ Flash hu

+ Ko load duoc IOS

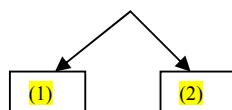
2. Boot ROM

```
Router (boot)>
```

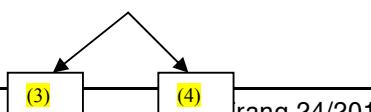
~> Muc dich nang cap Flash

3. Boot Sequence

Router (PowerOn) ----> (Run IOS from ROM) POST ----> (Configuration Register) Read & Load cau hinh trong NVRAM ----> (run) NVRAM (load Startup-config)



(1) (ko co NVRAM) ----> Tim TFTP Server



(3) co file *.config(Start-config) - --> Load len RAM

(4) ko co file *.config -----> SETUP MODE

(2) (Co NVRAM) -----> Load len RAM (Load len Running-config)

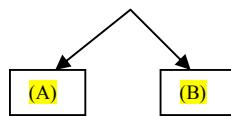
Cac gia tri thanh ghi :

+ ~> 0x2100 ---> ROM MONITOR (IOS prompt cua ROM)

+ ~> 0x2101 ----> BOOT ROM (Cisco 2500 only)

+ ~> 0x2142 Boot binh thuong nhung bo qua cau hinh Startup-config trong NVRAM
vao thang **SETUP MODE**

+~> 0x2102 (Default)-----> (normal Boot) Run Flash load Cisco IOS -----> RAM -----
> (Ko co IOS) -----> Flash Hu --->Tim TFTPver



(A) co (IOS) load ve RAM

(B) ko co(IOS) ROM MONITOR

RECOVERY PASSWORD

~~~~~> Tac dong Router, thay doi gia tri Configuration Register (Doi bit 6 =1) bo qua NVRAM

### 1. Ta cong tac nguon cua Router (30s)

Nhan to hop phim (Ctrl + Break) Dung o he dieu hanh cua ROM

Rommon 1>

System Bootstrap, Version 12.2(10r)1, RELEASE SOFTWARE (fc1)

TAC Support: <http://www.cisco.com/tac>

Copyright (c) 2002 by cisco Systems, Inc.

C2600 platform with 65536 Kbytes of main memory

monitor: command "boot" aborted due to user interrupt  
rommon 1 >

### 2. Doi gia tri thanh ghi (bo qua NVRAM)

+ 2500 : > o/r 0x42

+2600 tro di : romon2> confreg 0x2142

### 3. Khoi dong lai Router bang cach

+rommon2> i

hoac +rommon2>reset

rommon 1 > confreg 0x2142

You must reset or power cycle for new config to take effect  
rommon 2 > reset

System Bootstrap, Version 12.2(10r)1, RELEASE SOFTWARE (fc1)  
TAC Support: http://www.cisco.com/tac  
Copyright (c) 2002 by cisco Systems, Inc.  
C2600 platform with 65536 Kbytes of main memory

4. Vao Privilege, kiem tra lai Start-up config  
Copy tu Startup-config -> running-config → giữ cấu hình nhung bo pass  
# copy start run

\*\*\* **Chú ý** : Neu thuc hanh VNPro #erase st

5. Vao Mode Config, bo cac password cu dat password theo y muon
6. Thay doi lai gia tri thanh ghi ve gia tri mac dinh la 0x2102
7. Luu cau hinh vao NVRAM va Reload

## BACKUP and RESTORE

### 1. BACKUP STARTUP CONFIG → TFTP SERVER

\*\*\* Chu y la: phai noi PC vao Router

**Router (192.168.1.11) ----- TFTP Server (192.168.1.111)**

```
Saigon#copy startup-config tftp:  
Address or name of remote host []?  
Address or name of remote host []? 192.168.1.111 → Dia chi cua TFTP SERVER  
Destination filename [saigon-config]?  
!!!!  
1480 bytes copied in 0.272 secs (5441 bytes/sec)  
Saigon#
```

### 2. BACKUP Flash → TFTP SERVER

```
SAIGON#copy flash: tftp:  
Source filename []? c2600-ik8s-mz.122-11.T11.bin  
Address or name of remote host []? 192.168.1.111 → IP Address TFTP Server  
Destination filename [c2600-ik8s-mz.122-11.T11.bin]?  
.!!!!!
```

### 3. RESTORE TFTPServer → RAM (Running Config)

```
#Erase st  
#Reload  
→ Mục đích xóa cấu hình cũ để sau khi chép sẽ có lại cấu hình trước khi xóa cấu
```

## hinh

### \* Cac buoc thuc hien

Dat lai IP cho Router  
Copy TFTP Start  
Copy Start Run

```
Router#copy tftp: startup-config
Address or name of remote host []? 192.168.1.111
Source filename []? Saigon-config
Destination filename [startup-config]?
```

## 4. RESTORE IOS FLASH

```
# erase flash
#reload
vao Romon1>
System Bootstrap, Version 11.3(2)XA4, RELEASE SOFTWARE (fc1)
Copyright (c) 1999 by cisco Systems, Inc.
TAC:Home:SW:IOS:Specials for info
C2600 platform with 65536 Kbytes of main memory
```

```
device does not contain a valid magic number
boot: cannot open "flash:"
boot: cannot determine first file name on device "flash:"
```

```
System Bootstrap, Version 11.3(2)XA4, RELEASE SOFTWARE (fc1)
Copyright (c) 1999 by cisco Systems, Inc.
TAC:Home:SW:IOS:Specials for info
C2600 platform with 65536 Kbytes of main memory
```

```
device does not contain a valid magic number
boot: cannot open "flash:"
boot: cannot determine first file name on device "flash:"
```

```
System Bootstrap, Version 11.3(2)XA4, RELEASE SOFTWARE (fc1)
Copyright (c) 1999 by cisco Systems, Inc.
TAC:Home:SW:IOS:Specials for info
C2600 platform with 65536 Kbytes of main memory
```

### \* PHAN BIET HOA THUONG

rommon 1 >set ----> hien ra nhung thong so da dc cau hinh cho Router de giao tiep voi Tftp Server

```
PS1=rommon ! >
ip_address=10.10.10.6
ip_subnet_mask=255.255.255.0
tftp_server=10.10.10.1
tftp_file=7.bin
DEFAULT_GATEWAY=10.10.10.1
DEFAULT_GATWAY=10.10.10.2
DEJAULT_GATEWAY=10.10.3.200
RET_2_RCALTS=
RET_2_RUTC=0
?=0
```

```
IP_ADDRESS=192.168.1.5
IP_SUBNET_MASK=255.255.255.0
DEFAULT_GATEWAY=192.168.1.15
TFTP_SERVER=192.168.1.15
TFTP_FILE=c2600-ik8s-mz.122-11.T11.bin
BSI=0
RET_2_RTS=
rommon 2 > ----> chi ket noi voi Ethernet dau tien(neu Router co nhieu Interface)
rommon 2 >
rommon 2 > IP_ADDRESS=192.168.1.11
rommon 3 > IP_SUBNET_MASK=255.255.255.0
rommon 4 > DEFAULT_GATEWAY=192.168.1.111
rommon 5 > TFTP_SERVER=192.168.1.111
rommon 6 > TFTP_FILE=c2600-ik8s-mz.122-11.T11.bin
rommon 7 > sync
rommon 8 > set
PS1=rommon ! >
ip_address=10.10.10.6
ip_dsubnet_mask=255.255.255.0
tftp_server=10.10.10.1
tftp_file=7.bin
DEFAULT_GETWAY=10.10.10.1
DEFAULT_GATWAY=10.10.10.2
DEJAULT_GATEWAY=10.10.3.200
RET_2_RCALTS=
RET_2_RUTC=0
BSI=0
RET_2_RTS=
IP_ADDRESS=192.168.1.11
IP_SUBNET_MASK=255.255.255.0
DEFAULT_GATEWAY=192.168.1.111
TFTP_SERVER=192.168.1.111
TFTP_FILE=c2600-ik8s-mz.122-11.T11.bin
?=0
rommon 9 >
rommon 9 > tftpdnld

    IP_ADDRESS: 192.168.1.11
    IP_SUBNET_MASK: 255.255.255.0
    DEFAULT_GATEWAY: 192.168.1.111
    TFTP_SERVER: 192.168.1.111
    TFTP_FILE: c2600-ik8s-mz.122-11.T11.bin
```

Invoke this command for disaster recovery only.

WARNING: all existing data in all partitions on flash will be lost!

Do you wish to continue? y/n: [n]: y

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! -----> Co cai nay moi chep thanh cong

## 5. Copy IOS tu Router sang Router

R1 ----- R2 (TFTP SERVER)

R2: se dong vai tro lam Router chua IOS can chep

(config)#tftp-server flash: <tenIOS> alias IOSTRUNG → Dat ten dai dien

### R1: copy tfpt flash

SAIGON#copy tftp flash

Address or name of remote host []? 192.168.1.13 → IP Address Router2

Source filename []? IOSTRUNG

Destination filename [IOSTRUNG]?

Accessing tftp://192.168.1.13/IOSTRUNG...

Erase flash: before copying? [confirm]

Erase flash: before copying? [confirm]

Erasing the flash filesystem will remove all files! Continue? [confirm]

Erasing device... eeeeeeee

## BASIC SWITCHING

### I. Tat ca cac port tren 1 Switch thuoc 1 Broadcast Domain ten la VLAN1

→ Su dung 1 Network /1 Subnet

### II. Xay dung 1 co so du lieu goi la MAC Address Table = CAM (Content Address Memory)

→ Truyen du lieu "thong minh" hon HUB

### III. Co che Switch xu ly va truyen Frame

#### 1. Store and Forward: Default tren tat ca cac Switch 29xx tro di

- Switch nhan frame tu 1 port sau do kiem tra noi dung data cua Frame (CRC Cyclic Redundancy Check) kiem tra tinh toan ven Frame dam bao Frame khong loi thi moi truyen den dich tiep

Sau do dua vao dia chi Destination MAC de Forward Frame den port thich hop

- Uu Diem:

+ Co che tin cay (Most reliable)

- Nhuoc Diem:

+ Tang do tre trong tien trinh xu ly Frame (Increase Latency)

+ Do tre phu thuoc vao kich co cua Frame (Latency Fluctuate; bien thien).

#### 2. Cut - Through

Switch nhan Frame tu 1 port va se Forward Frame den dich ngay sau khi doc dia chi Destination MAC

- Uu Diem:

+ Fastest

- Nhuoc Diem:

+ Nguy co bi loi va Frame dung do den dich la cao nhat. (Fragment Frame Collision Frame: < 64 bytes) Anh huong den performance cua he thong mang.

#### 3. Fragment- Free

Switch nhan Frame tu 1 port va se Forward frame den dich voi dieu kien Frame do it nhat bang 64 Bytes (> = 64 Bytes).

-Uu Diem:

+ Loc bot Colision

-Khuyet Diem:

- + Van con nguy co truyen Frame loi den dich

\*\*\*\*\* Tom lai: dung nhieu nhat van la co che Store and Forward va ko can thiеп vao trong duoc.

#### **IV. MAC ADDRESS TABLE**

-Khi Switch nhan Frame co Destination MAC

- + Broadcast
- + Multicast 0100.5Exx.xxxx
- + Unknow Unicast (Khi Destination MAC ko co trong MAC Address Table)

-Forward Frame tren tat ca cac Port con lai cua Switch ngoai tru port ma no da nhan

-Switch xay dung MAC Address Table dua vao dia chi Source MAC cua Frame mà Switch nhận được từ các port tương ứng co ket noi cua Switch

-Dua vao bang MAC Address Table, Switch se Forward Frame theo Entry cua DESTINATION MAC va Port (Entry ton tai 300 giay)

\*\*\*\*\* Chu y:

+ MAC khong duoc Broadcast vi 1 Interface phai co MAC Address (MAC 1 thiet bi ko the la FFFF.FFFF.FFFF)  
+ 1 port co the nhieu MAC khac nhau (trong truong hop noi voi Switch khac)

#### **V. Redundancy Topology**

- So do thiet ke mang dua ra bao gom nhieu Switch ket noi voi nhau thanh 1 mach nham han che rui ro

- + Access Layer
- + Destination Layer
- + Core Layer

Tranh hien tuong “One point of Failure” -----> so do mang mang tinh du phong

Khi thuc hien Topology nay se bi cac hien tuong sau:

##### **1.\* Broadcast Storm**

- Tin hieu Broadcast se bi gui lien tuc khong ngung tren toan bo cac Switch  
- Luu thong Broadcast se chiem het toan bo bang thong cua cac luu thong binh thuong khac trong mang

##### **2.\* Multiple Frame Copies**

Xuat hien nhieu phien ban giong nhau cua Frame duoc lan truyen trong mang

- Mot thiet bi se nhan rat nhieu Frame giong nhau tu cac thiet bi khac gui den

##### **3. Mac Database Instability**

Su mat on dinh cua CSDL MAC cua Switch: 1 port tren SW co nhieu MAC, nguoc lai 1 MAC ko the co tren nhieu port, chi xuat hien 1 port nay ko dc xuat hien port khac

VI DU: port 1 co MAC A, MACB

Nguoc lai MACA, khong the co port 1, port2

Khắc phục hiện tượng =====> Giao thức Spanning Tree Protocol (CCNA)

## VI. Configure and Catalyst Switch:

- Hoạt động Layer 2
- Sử dụng Cisco IOS
- Directly Configure: Console Port
- Remotely Configure: Line vty

\*\*\* Cách thực hiện cấu hình Switch cơ bản trong trình lâm VNpro.

Xóa cấu hình cũ

\*Cách 1:

```
#erase start  
#delete vlan.dat  
#reload
```

\*Cách 2: Bấm nút Mode giữ đến khi 4 đèn sáng lên và chụp liên tục cho đến khi 4 đèn het chop thi ngung --> xóa cấu hình xong

## SWITCH CONFIGURE

\*Cấu hình IP cho VLAN1

```
SW(config)#int vlan1  
SW(config-if)#ip address 192.168.1.11 255.255.255.0  
SW(config-if)#no shut
```

\*Tắt tất cả các port của SW thuộc về 1 Broadcast domain tên là VLAN1

SW(192.168.1.x/24)----- (Router) ----- SW(192.168.2.y/24)

Tạo cấu hình Default Gateway cho SW nhằm mục đích cho phép SW có thể cấu hình từ các thiết bị khác lop mạng

```
SW(config)#ip default-gateway 192.168.1.254
```

SW#sh mac-address-table

Mac Address Table

| Vlan | Mac Address     | Type    | Ports                                        |
|------|-----------------|---------|----------------------------------------------|
| All  | 000b.5f26.ad80  | STATIC  | CPU                                          |
| All  | 0100.0ccc.cccc  | STATIC  | CPU                                          |
| All  | 0100.0ccc.ccccd | STATIC  | CPU                                          |
| All  | 0100.0cdd.dddd  | STATIC  | CPU                                          |
| 1    | 00e0.4c21.65cd  | DYNAMIC | Fa0/8 → MAC của PC gắn vào cổng Fa0/8 của SW |

Total Mac Addresses for this criterion: 5

SW#

SW#sh mac-address-table dynamic ----> cac MAC Address tu hoc duoc  
Mac Address Table

```
Vlan Mac Address Type Ports
--- -----
 1 00e0.4c21.65cd (NIC PC) DYNAMIC Fa0/8
Total Mac Addresses for this criterion: 1
SW#
```

\* Cau hinh dia chi MAC cua 1 thiet bi la 1 "Static Entry" trong bang MAC Address Table cua SW de tranh dia chi MAC tren bi xoa ra khoi bang MAC

VD: hay cau hinh cai dia chi MAC cua PC la 1 Static Entry tai port 8 cua SW

```
SW#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
SW(config)#mac-address-table static 00e0.4c21.65cd vlan 1 interface fa0/8
SW#sh mac-address-table
Mac Address Table
```

```
Vlan Mac Address Type Ports
--- -----
All 000b.5f26.ad80 STATIC CPU
All 0100.0ccc.cccc STATIC CPU
All 0100.0ccc.cccc STATIC CPU
All 0100.0cdd.dddd STATIC CPU
 1 00e0.4c21.65cd STATIC Fa0/8 ----> ton Ram cua SW
Total Mac Addresses for this criterion: 5
SW#
```

ROUTER(config)#no mac-address-table static 0000.1111.2222 vlan 1 interface fa0/20  
----> Xoa 1 Entry Static

## PORt SECURITY

**Y nghia:** Cau hinh port SW chi chap nhan 1 hoac 1 so dia chi MAC nao do do nguoi quan tri qui dinh ma thoi. Neu vi pham port tren se bi chuyen sang trang thai loi hoac bi Shutdown

Vi du : Cau hinh port Fa0/8 cua SW chi chap nhan "DUY NHAT" 1 dia chi MAC cua may tinh cua ban ma thoi. Neu vi pham thi port se bi Shutdown

\*\*\*\* Chu y: phai lam lien tuc cac command duoi

Sw(config)#int fa0/8

Sw(config-if)#switchport mode access

ROUTER(config-if)#switchport port-security mac-address ?

H.H.H 48 bit mac address

sticky Configure dynamic secure addresses as sticky -----> cau hinh port se chap nhan dia chi MAC dau tien su dung port nay sau nay cac port khac gan vao se xem la vi pham

Sw(config-if)#switchport port-security mac-address 00e0.4c21.65cd

Sw(config-if)#switchport port-security maximum ?

<1-132> Maximum addresses ----> so lan toi da cho phep vi pham khi gan vao port ko hop le

Sw(config-if)#switchport port-security maximum 1

Sw(config-if)#switchport port-security violation ? ----> vi pham se xu ly theo cac truong hop ben duoi

protect Security violation protect mode ----> port chuyen sang trang thai loi va xuat hien cac cau thong bao tren man hinh

35xx: khong hoat dong

29xx: port van hoat dong

restrict Security violation restrict mode

shutdown Security violation shutdown mode

Sw(config-if)#switchport port-security violation shutdown

Sw#sh mac-address-table

Mac Address Table

| Vlan | Mac Address    | Type   | Ports                                                          |
|------|----------------|--------|----------------------------------------------------------------|
| All  | 000b.5f26.ad80 | STATIC | CPU                                                            |
| All  | 0100.0ccc.cccc | STATIC | CPU                                                            |
| All  | 0100.0ccc.cccc | STATIC | CPU                                                            |
| All  | 0100.0cdd.dddd | STATIC | CPU                                                            |
| 1    | 00e0.4c21.65cd | STATIC | Fa0/8 -----> khi thanh cong Entry nay se tro thanh EntryStatic |

Total Mac Addresses for this criterion: 5

Sw#sh port-security interface fa0/8

Port Security : Enabled

Port Status : Secure-up

Violation Mode : Shutdown

Aging Time : 0 mins

Aging Type : Absolute

SecureStatic Address Aging: Disabled

Maximum MAC Addresses : 1

Total MAC Addresses : 1

Configured MAC Addresses : 1

Sticky MAC Addresses : 0

Last Source Address : 0000.0000.0000

Security Violation Count : 0

Sw#sh port-security int fa0/8

Port Security : Enabled

Port Status : Secure-shutdown

Violation Mode : Shutdown  
Aging Time : 0 mins  
Aging Type : Absolute  
SecureStatic Address Aging: Disabled  
Maximum MAC Addresses : 1  
Total MAC Addresses : 1  
Configured MAC Addresses : 1  
Sticky MAC Addresses : 0  
Last Source Address : 00e0.4c15.0ea1 ---->MAC PC gay ra shutdown  
Security Violation Count : 1 ----> tang len 1 lan

\*\*\*\*\* Sau do gan dung MAC nhung hien tuong port van ko hoat dong duoc  
Sw#sh port-security

| Secure Port | MaxSecureAddr | CurrentAddr | SecurityViolation | Action   |
|-------------|---------------|-------------|-------------------|----------|
| (Count)     | (Count)       | (Count)     |                   |          |
| Fa0/8       | 1             | 1           | 1                 | Shutdown |

Total Addresses in System (excluding one mac per port) : 0

Max Addresses limit in System (excluding one mac per port) : 1024

FastEthernet0/8 is down, line protocol is down (err-disabled)  
Hardware is Fast Ethernet, address is 000b.5f26.ad88 (bia 000b.5f26.ad88)  
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)  
Auto-duplex, Auto-speed, media type is 100BaseTX  
input flow-control is unsupported output flow-control is unsupported  
ARP type: ARPA, ARP Timeout 04:00:00  
Last input 00:07:24, output 00:07:24, 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  
107 packets input, 14275 bytes, 0 no buffer  
Received 98 broadcasts (0 multicast)  
0 runts, 0 giants, 0 throttles  
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored  
0 watchdog, 10 multicast, 0 pause input  
0 input packets with dribble condition detected  
240 packets output, 20502 bytes, 0 underruns

----->>>>>>>>>> Cach phuc hoi lai port da shutdown

Mac dinh tat ca cac Intreface vat ly cua SW o trang thai "down" vi vay khi ket noi voi PC  
nguoil dung port se hoat dong

De nang cao tinh bao mat ta nen Shutdown nhung port khong su dung tren SW tranh truong  
hop truy xuat trai phep.

Sw(config)#int fa0/8  
Sw(config-if)#shutdown  
Sw(config-if)#no shut

```
Sw(config-if)#  
00:32:00: %LINK-5-CHANGED: Interface FastEthernet0/8, changed state to administratively down  
Sw(config-if)#  
00:32:03: %LINK-3-UPDOWN: Interface FastEthernet0/8, changed state to up  
00:32:04: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/8, changed state to up  
Sw(config-if)#
```

## CAU HINH TAC DONG LEN NHIEU INTERFACE CUA SWITCH

Vidu1: hay shutdown port Fa0/1 den Fa0/5

```
SW(config)#int range Fa0/1 -5  
Sw(config-if-range)#shutdown
```

Vidu2: hay shutdown port Fa0/6 den Fa0/8 , F0/10 , Fa0/12

```
Swconfig)#int range Fa0/6-8 , Fa0/10 , Fa0/12  
Swconfig-if-range)#shutdown
```

Vidu3: hay shutdown port Fa0/9, Fa0/11, Fa0/13 -19

```
Sw(config)#int range Fa0/9 , Fa0/11 , Fa0/13 -19  
Sw(config-if-range)#shutdown
```

## DEN HIEU CUA SWITCH

**BIA:** Burned-in address

**MTU:** Maximum Transfer Units

Một interface của Switch mặc định hoạt động ở chế độ:

- + Duplex: Auto (còn 2 Auto thì Full)
  - + Speed: Auto (còn 2 Auto thì Max)
- Duplex mismatch --> Nguy cơ mạch không hoạt động  
Speed mismatch --> Mạch bị ngắt

### Một số tin hiệu về đèn Led

SYST (System Led):

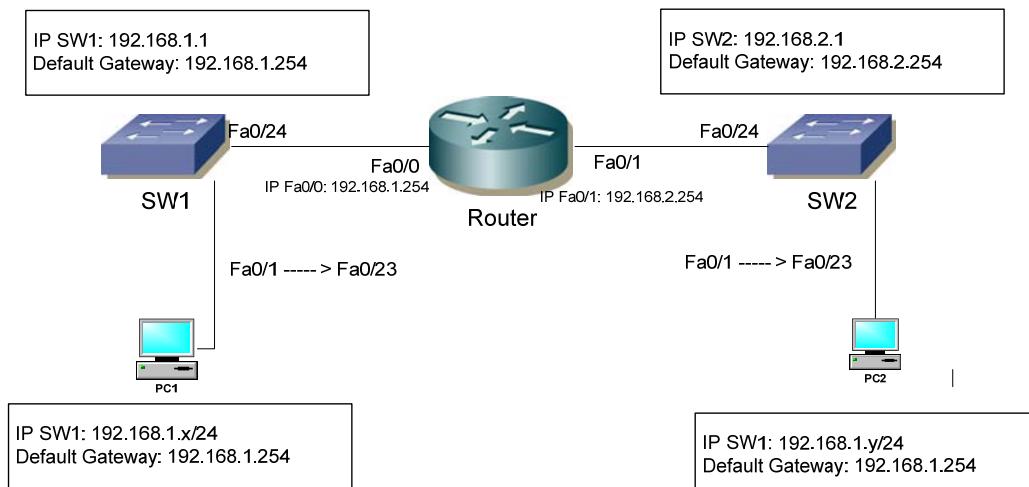
|                                                |                                                      |
|------------------------------------------------|------------------------------------------------------|
| Green:                                         | Operational                                          |
| Green & Flash:                                 | Lost IOS                                             |
| Amber (Ho phach, Cam) :<br>bi hong), POST Fail | System Malfunction (hệ thống bên trong<br>POST Fail) |

Port Led:

|                   |                          |
|-------------------|--------------------------|
| Amber --> Green : | Operational              |
| Green --> Amber : | Port Faulty (Port bị hư) |

## CAU HINH ROUTER 2800 LAM DHCP SERVER BANG SDM

Mo hinh: Mo hinh nay se xay dung duoc trong noi bo Cong Ty gom 2 phong ban.



### Buoc 1: Khoi dong dich vu HTTPS tren Router

```
(config)#ip http secure-server
```

### Buuoc2: Tao User Account de cho phep cau hinh Router bang SDM

\*\*\*\*\* Luu y: Account nay phai co privilege 15 moi co quyen su dung SDM

```
CCNA(config)#username netadmin password vnpro  
CCNA(config)#username netadmin privilege 15
```

### Buoc 3:

```
(config)#ip http authentication local
```

~~~~~> cho phep nguoi dung cau hinh Router bang giao dien Web. Khi dang nhap Router se chung thuc nguoi dung bang CSDL cuc bo tren **Rsrouter**

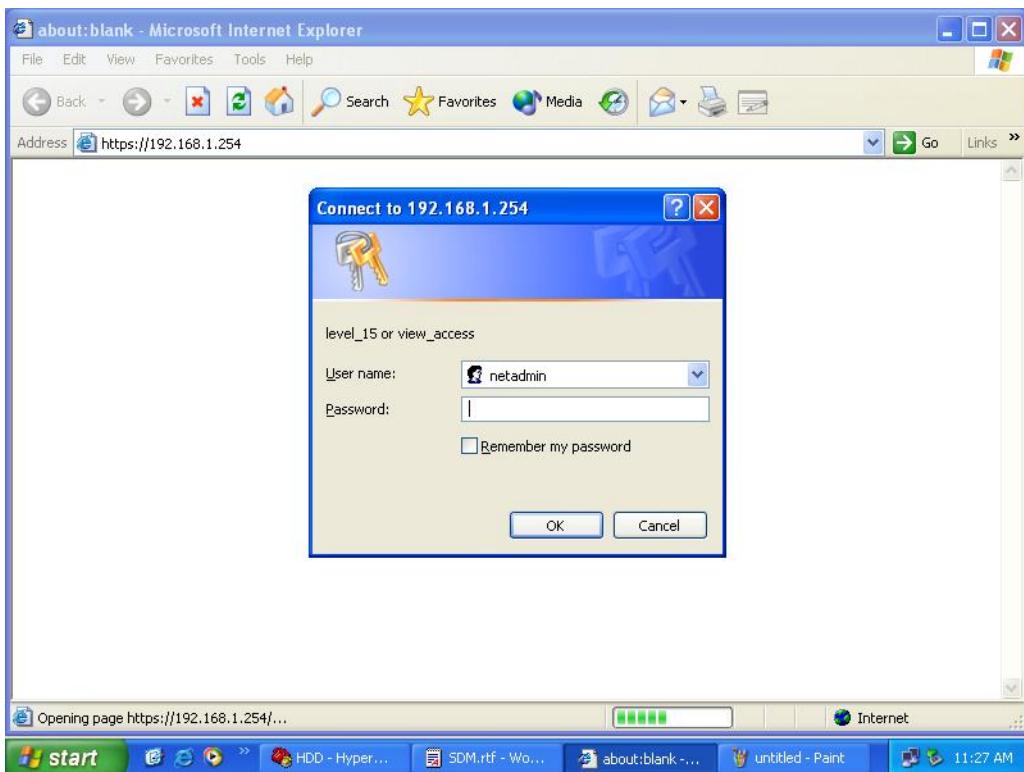
Cach thuc hien:

*** **Chu y :** SDM

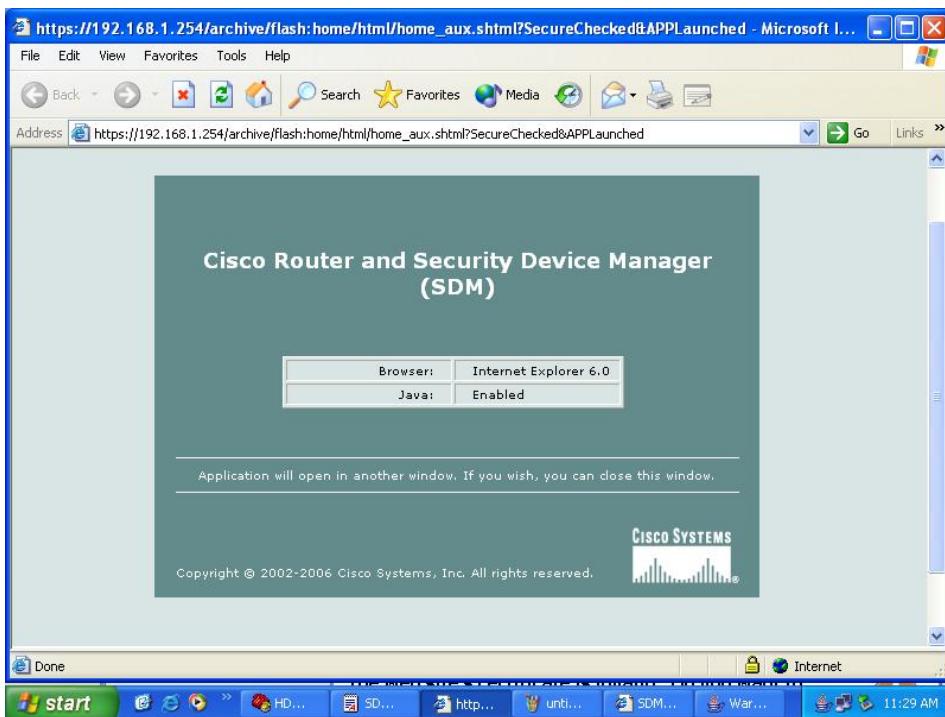
Cau hinh Router 2800 bang SDM doi hoi:

- + Router da co cai SDM
- + PC co cai JavaRuntimeEnviroment

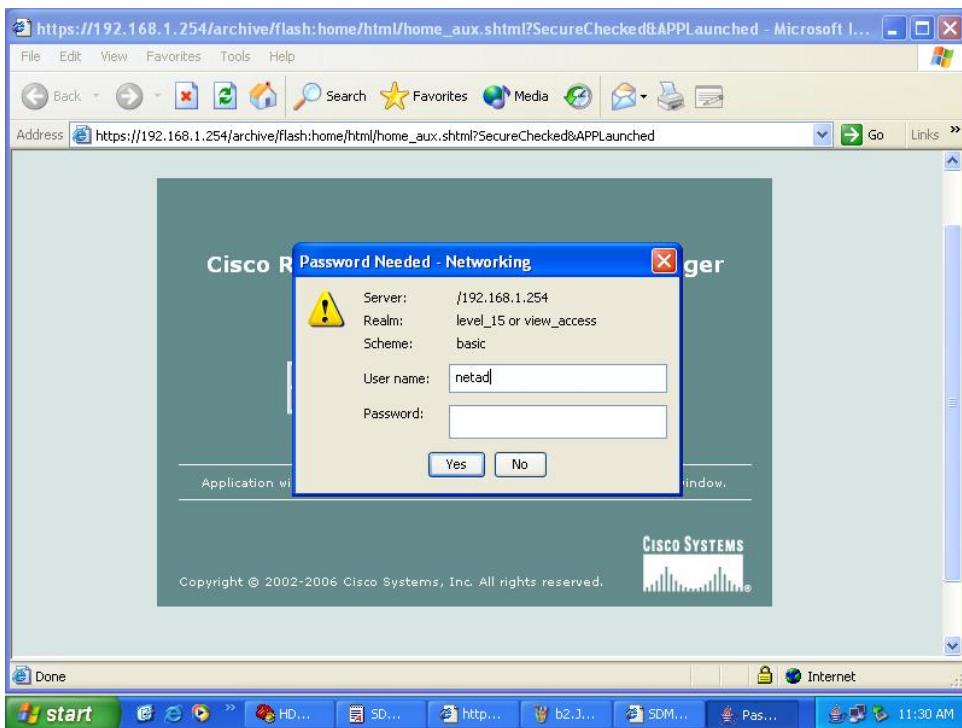
1. Qua trinh dang nhap :



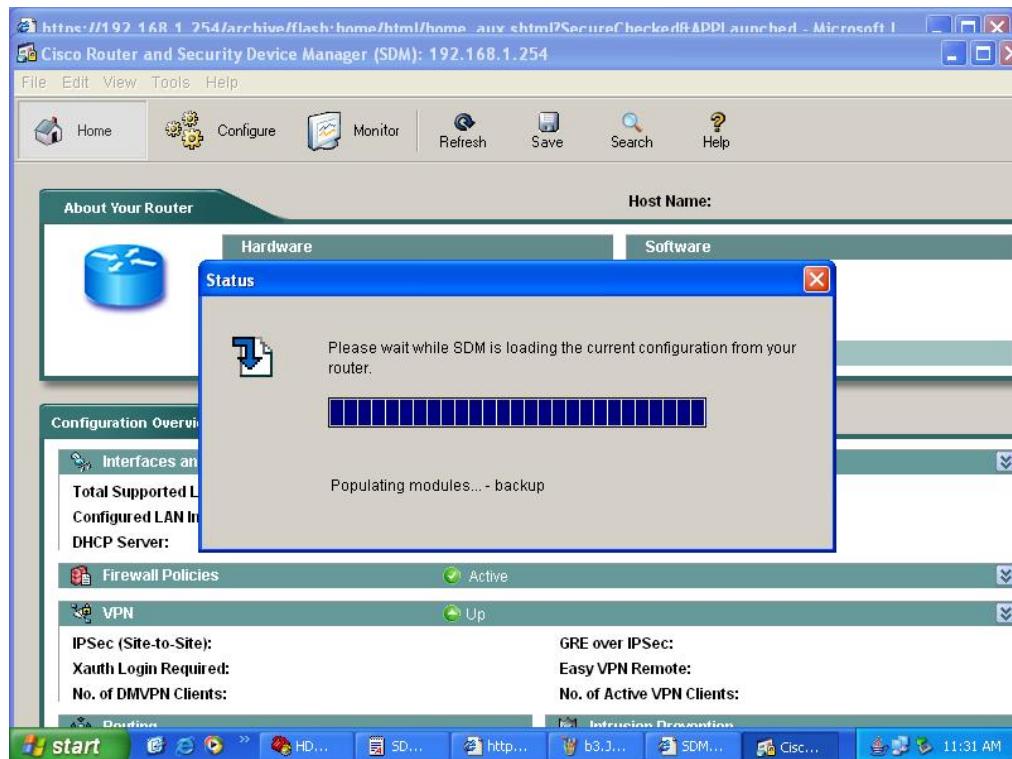
2. Nhập username: netadmin; pass: vnpro tao o buoc tren



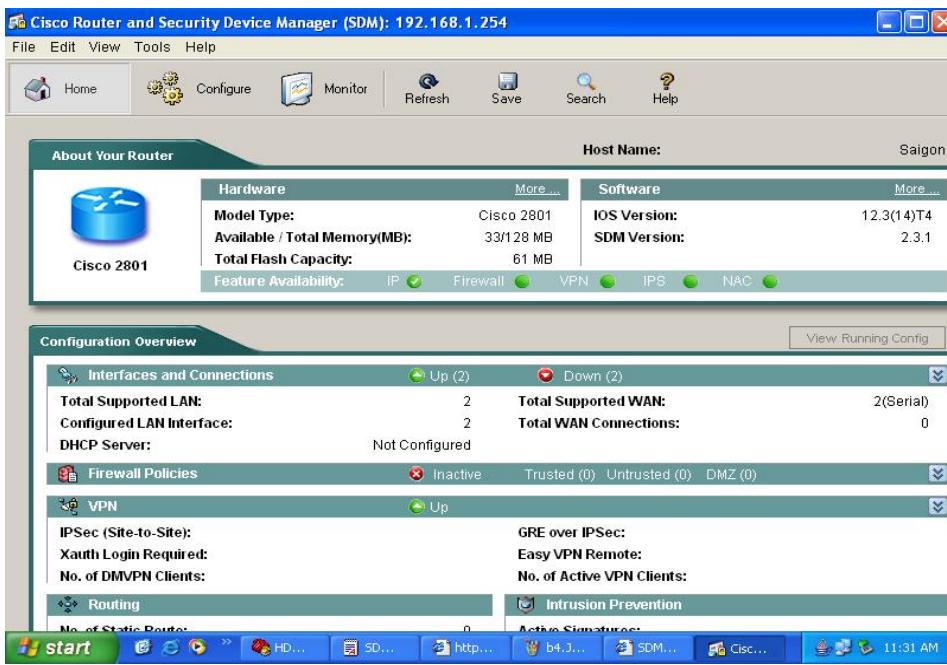
3. Tiếp



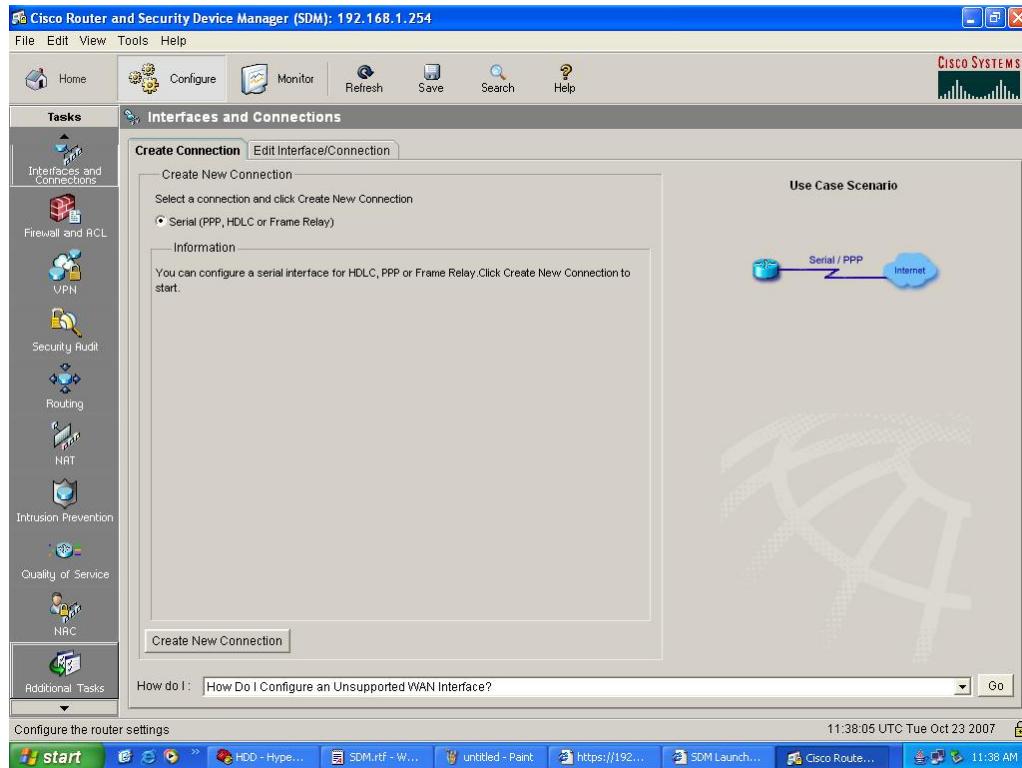
4. Khoi tao ket noi



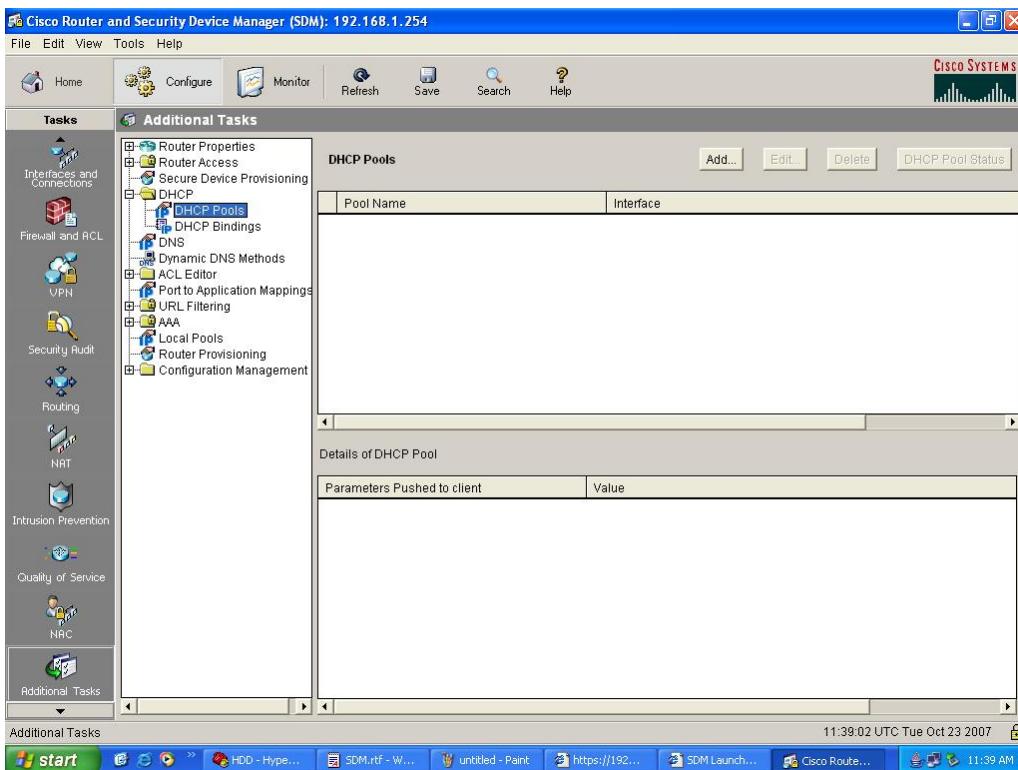
5. Tiep



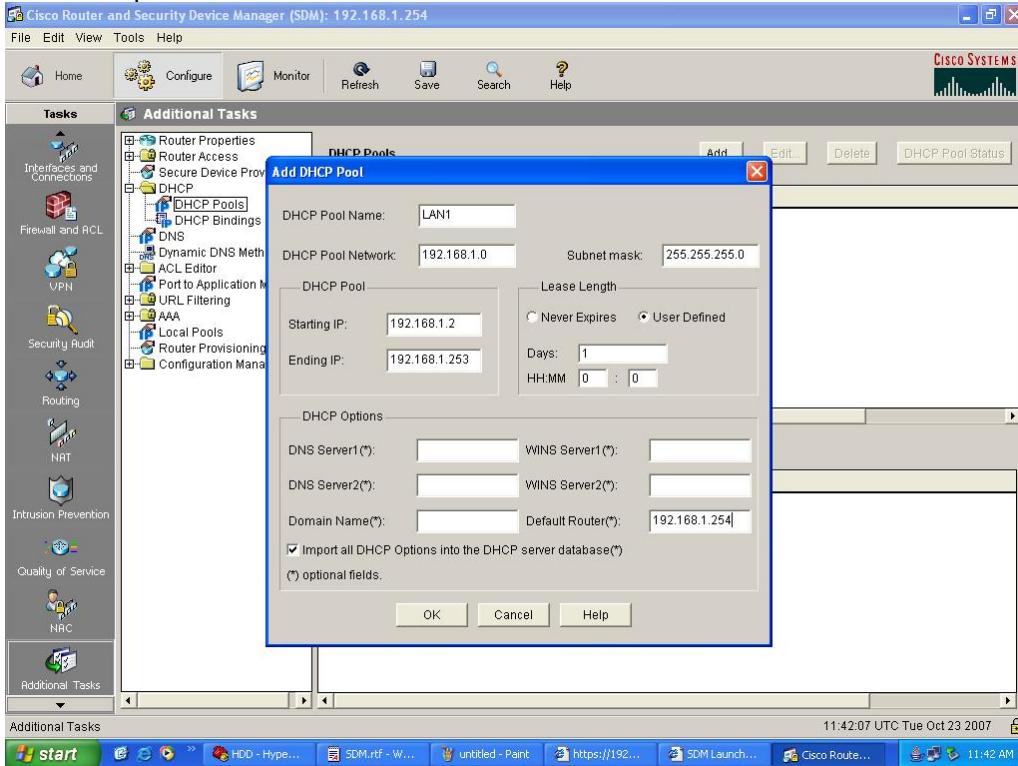
6. Tiếp



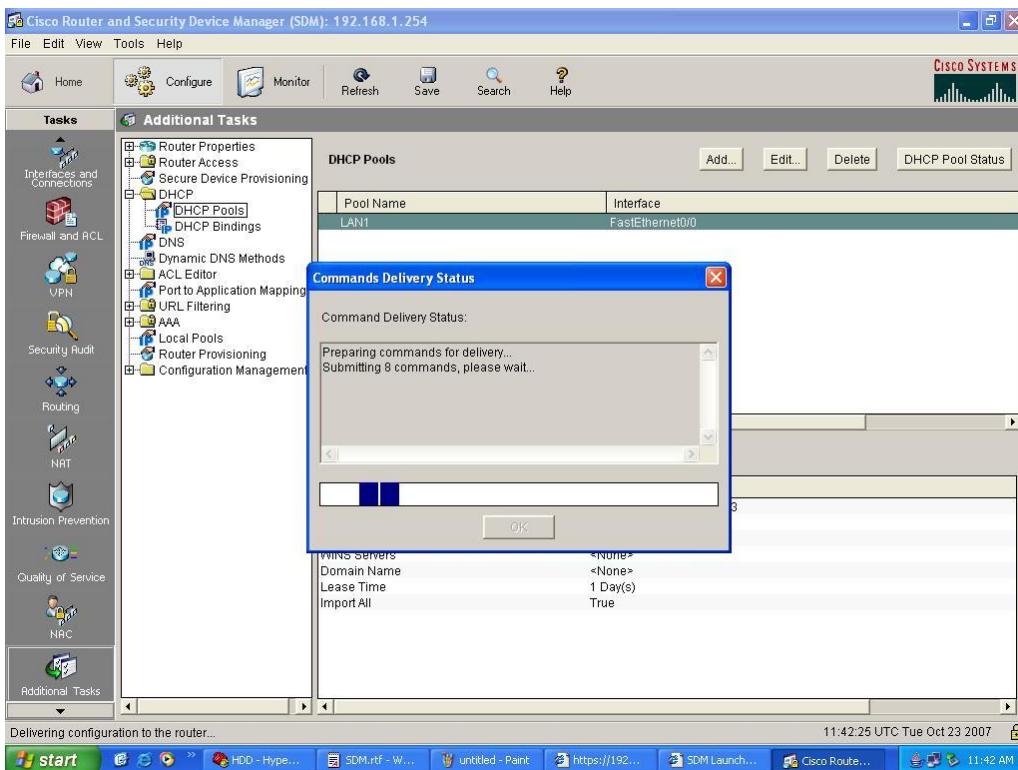
7. Nhập vào Additional Tabs



8. Tiếp



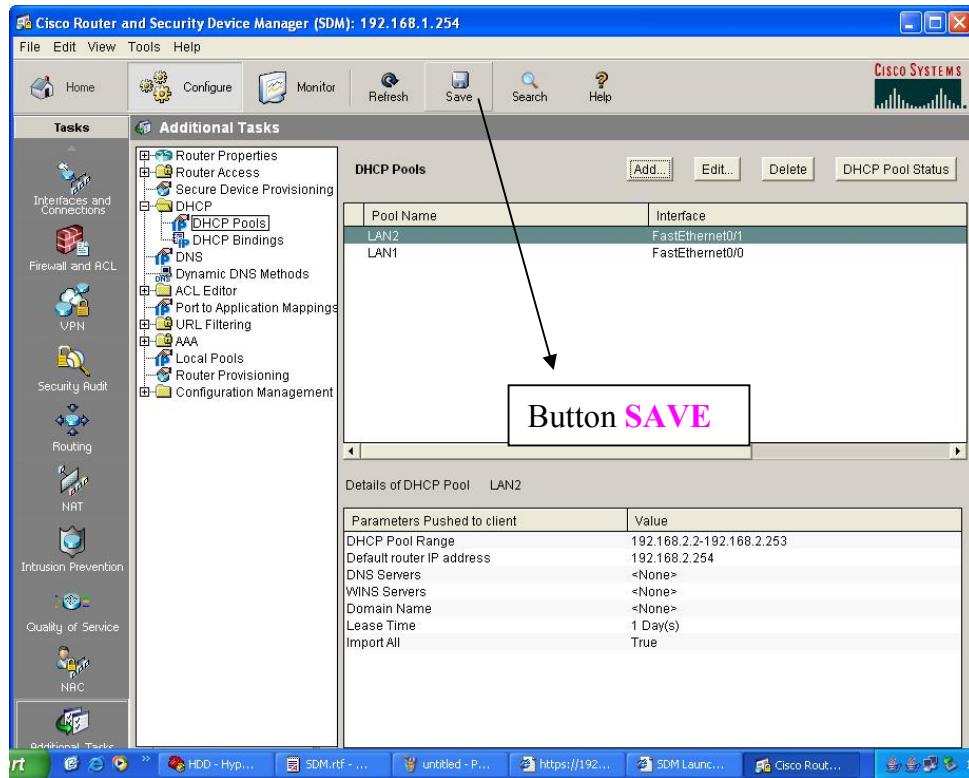
9. Tạo IP subnet cho LAN 1



10. Tao thanh cong



11. LAN 2 tao tuong tu



12. Nhập vào **Save** Button để kết thúc

13. Kiểm tra bằng cách gán PC1 vào SW1, PC2 vào SW2

- Router sẽ cấp IP cho PC1 : 192.168.1.x/24
- Router sẽ cấp IP cho PC2 : 192.168.2.x/24
- Tiến hành ping từ PC2 → PC1 và ngược lại

*** Lưu ý: trong trường hợp này Routing Table sẽ được xây dựng sẵn cho các Broad Cast Domain nó thuộc về.

TAO CAC MANG LOOPBACK

*** Tao interface Loopback: ----> interface Loopback khong bi down

Router R1

```
(config)#int lo0  
(config)#ip add 192.168.1.94 255.255.255.224 -----→ Chon dia chi cuoi cung la  
192.168.1.94 (Magic Number la 32, SM : 255.255.255.224)  
-----→ ko no shut vi la card Loopback
```

```
(config)#int lo1  
(config)#ip add 192.168.2.62 255.255.255.240 -----→ ko no shut
```

```
R1#sh ip int bri  
Router#sh ip int bri  
Interface          IP-Address      OK? Method Status       Prot  
ocol  
FastEthernet0/0    unassigned     YES unset administratively down down  
Serial1/0          200.100.100.25 YES manual up           up  
Serial1/1          unassigned     YES unset administratively down down  
Serial1/2          unassigned     YES unset administratively down down  
Serial1/3          unassigned     YES unset administratively down down  
Serial1/4          unassigned     YES unset administratively down down  
Serial1/5          unassigned     YES unset administratively down down  
Serial1/6          unassigned     YES unset administratively down down  
Serial1/7          unassigned     YES unset administratively down down  
FastEthernet2/0    unassigned     YES unset administratively down down  
FastEthernet2/1    unassigned     YES unset administratively down down  
Loopback0          192.168.1.94  YES manual up           up  
Loopback1          192.168.2.62  YES manual up           up --> card Loop back  
trang thai luon UP/UP
```

R1#

R1s#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, * - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

200.100.100.0/30 is subnetted, 1 subnets

C 200.100.100.24 is directly connected, Serial1/0

192.168.1.0/27 is subnetted, 1 subnets

C 192.168.1.64 is directly connected, Loopback0

192.168.2.0/28 is subnetted, 1 subnets

C 192.168.2.48 is directly connected, Loopback1

Router#

Router R2

R2(config)#int lo0

R2(config-if)#ip address 192.168.30.176 255.255.255.240

R2(config-if)#exit

R2(config)#int lo1

R2(config-if)#ip add 192.168.40.254 255.255.255.192

R2(config-if)#

| Interface | IP-Address | OK? | Method | Status | Prot |
|-----------------|----------------|-----|--------|-----------------------|------|
| FastEthernet0/0 | unassigned | YES | unset | administratively down | down |
| Serial1/0 | 200.100.100.26 | YES | manual | up | up |
| Serial1/1 | unassigned | YES | unset | administratively down | down |
| Serial1/2 | unassigned | YES | unset | administratively down | down |
| Serial1/3 | unassigned | YES | unset | administratively down | down |
| Serial1/4 | unassigned | YES | unset | administratively down | down |
| Serial1/5 | unassigned | YES | unset | administratively down | down |
| Serial1/6 | unassigned | YES | unset | administratively down | down |
| Serial1/7 | unassigned | YES | unset | administratively down | down |
| FastEthernet2/0 | unassigned | YES | unset | administratively down | down |
| FastEthernet2/1 | unassigned | YES | unset | administratively down | down |
| Loopback0 | 192.168.30.174 | YES | manual | up | up |

Loopback1 192.168.40.254 YES manual up up

R2#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

192.168.30.0/28 is subnetted, 1 subnets
C 192.168.30.160 is directly connected, Loopback0
192.168.40.0/26 is subnetted, 1 subnets
C 192.168.40.192 is directly connected, Loopback1
200.100.100.0/30 is subnetted, 1 subnets
C 200.100.100.24 is directly connected, Serial1/0

R2#

CAC LOAI GIAO THUC DINH TUYEN

1. **Static Router :** là cách thực hiện chính nhà quản trị cấu hình thông tin các Network trong hệ thống mà Router chưa biết (Bang tay: Manual Configure)

AS (Autonomous System): Tập hợp tất cả các thiết bị mạng hoạt động dưới sự quản trị chung của 1 tổ chức nào đó.

- Ưu điểm:

- + Phù hợp cho AS nhỏ
- + Thông tin định tuyến trong Router là tin cay

- Nhược điểm:

- + Tốn công quản trị nếu AS có nhiều Network
- + Không có khả năng cập nhật sự thay đổi của các Network đang xa trong hệ thống trong bảng định tuyến của từng Router

2. **Dynamic Router:** là cách thực hiện các Router tự động trao đổi thông tin định tuyến với nhau nhằm mục đích xây dựng bảng định tuyến hoàn hảo

- Ưu điểm: + Các Router có khả năng cập nhật bảng định tuyến của nó khi có sự thay đổi trong hệ thống

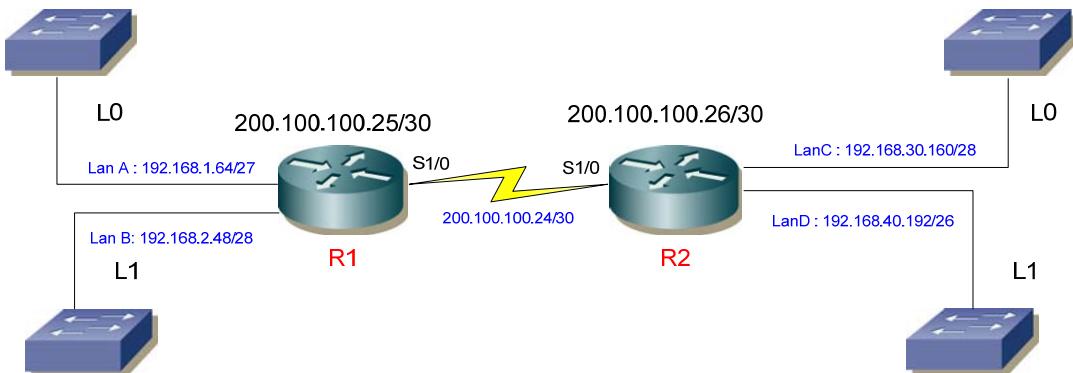
- Nhược điểm:

- + Nhưng có thể trao đổi thông tin định tuyến tự động làm tiêu tốn băng thông của mạng tại 1 số thời điểm (someday) ----> **Routing Overhead**.

- + Một số giao thức định tuyến đóng có thể bị lỗi từ chậm đến nhanh có thể gây Routing Loop

- + Một số giao thức định tuyến đóng lỗi có thể gây tốn nhiều băng thông (RAM&CPU) của Router

STATIC ROUTER



*****R1 cau hinh Static Router, ta phai day cho no LAN C va LAN D

R1(config)#ip route 192.168.30.160 255.255.255.240 * -----> di den duong mang co Subnet :192.168.30.160

Tai * co 2 tuy chon : <Out interface> va <Nexthop IP Address>

- **Out Interface:**

R1(config)#ip route 192.168.30.160 255.255.255.240 S0/0 -----> cong ra truc tiep tren Router cua minh(R1)

****ip route khi router nhan duoc packet co Destination Network la 192.168.30.160

AD=0

- **Nexthop ip address:**

R1(config)#ip route 192.168.30.160 255.255.255.240 200.100.100.26 -----> dia chi cua IP ke can noi toi Router minh -----> dia chi cong serial cua R2 trong truong hop nay

AD=1

+**AD (Administrative Distance):** la thong so ma dua vao no Router se danh gia thong tin dinh tuyen ve 1 Network nao do dang tin cay hon.

+AD cang nho cang dang tin cay.

Router chi dua vao bang dinh tuyen cua no nhung thong tin duong mang tin cay va tot nhat

~~~~> Trong cau hinh Static Router ta nen cau hinh theo cach Nexthop IP address

~~~~> Dung cho mo hinh da truy cap (Multile Access)

R1#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, * - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

192.168.30.0/28 is subnetted, 1 subnets
S 192.168.30.160 [1/0] via 200.100.100.26 -----→ Duong mang cua R2
192.168.40.0/28 is subnetted, 1 subnets -----→ Dung NextHop ip address
S 192.168.40.192 is directly connected, Serial1/0 -----→ Duong mang cua R2
-----→ Dung Out Interface(S1/0)
200.100.100.0/30 is subnetted, 1 subnets
C 200.100.100.24 is directly connected, Serial1/0
192.168.1.0/27 is subnetted, 1 subnets
C 192.168.1.64 is directly connected, Loopback0
192.168.2.0/28 is subnetted, 1 subnets
C 192.168.2.48 is directly connected, Loopback1
R1#

*****R2 cau hinh Static Router, ta phai day cho no LAN A va LAN B

```
R2(config)#ip route 192.168.1.64 255.255.255.224 200.100.100.25
R2(config)#ip route 192.168.2.48 255.255.255.240 S1/0
```

R2#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

192.168.30.0/28 is subnetted, 1 subnets
C 192.168.30.160 is directly connected, Loopback0
192.168.40.0/26 is subnetted, 1 subnets
C 192.168.40.192 is directly connected, Loopback1
200.100.100.0/30 is subnetted, 1 subnets
C 200.100.100.24 is directly connected, Serial1/0
192.168.1.0/27 is subnetted, 1 subnets
S 192.168.1.64 [1/0] via 200.100.100.25
192.168.2.0/28 is subnetted, 1 subnets
S 192.168.2.48 is directly connected, Serial1/0

*****→ Kiem tra R1

R1#ping 192.168.1.94

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.1.94, timeout is 2 seconds:
!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/4 ms

R1#

*****→ Kiem tra R1 ping toi duong mang 192.168.40.192 cua R2 Ko noi truc tiep

R1#ping 192.168.40.192

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.40.192, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 16/64/212 ms

R1#

***** Kiem tra tuong hop khi R2 tat Loopback0 thi thong tin dinh tuyen con trong R1 ko ???

R2#configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

R2(config)#int lo0

R2(config-if)#shu

R2(config-if)#shutdown

R2(config-if)#

| | | |
|-----------------|----------------|---|
| Serial1/1 | unassigned | YES unset administratively down down |
| Serial1/2 | unassigned | YES unset administratively down down |
| Serial1/3 | unassigned | YES unset administratively down down |
| Serial1/4 | unassigned | YES unset administratively down down |
| Serial1/5 | unassigned | YES unset administratively down down |
| Serial1/6 | unassigned | YES unset administratively down down |
| Serial1/7 | unassigned | YES unset administratively down down |
| FastEthernet2/0 | unassigned | YES unset administratively down down |
| FastEthernet2/1 | unassigned | YES unset administratively down down |
| Loopback0 | 192.168.30.174 | YES manual administratively down down → da bi tat |
| Loopback1 | 192.168.40.254 | YES manual up up |

==> thong tin dinh tuyen o R2: khong con duong mang 192.168.30.160

Gateway of last resort is not set

192.168.40.0/26 is subnetted, 1 subnets

C 192.168.40.192 is directly connected, Loopback1

200.100.100.0/30 is subnetted, 1 subnets

C 200.100.100.24 is directly connected, Serial1/0

192.168.1.0/27 is subnetted, 1 subnets

S 192.168.1.64 [1/0] via 200.100.100.25

192.168.2.0/28 is subnetted, 1 subnets

S 192.168.2.48 is directly connected, Serial1/0

R2#

==> thong tin dinh tuyen o R1

R1#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, * - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

192.168.30.0/28 is subnetted, 1 subnets

S 192.168.30.160 [1/0] via 200.100.100.26 -----→ Neu khong mat thi sau 3 phut se mat (Trong bang dinh tuyen R1 van con duong mang Loopback0)

192.168.40.0/28 is subnetted, 1 subnets

S 192.168.40.192 [1/0] via 200.100.100.26
is directly connected, Serial1/0

200.100.100.0/30 is subnetted, 1 subnets

C 200.100.100.24 is directly connected, Serial1/0

192.168.1.0/27 is subnetted, 1 subnets

C 192.168.1.64 is directly connected, Loopback0

192.168.2.0/28 is subnetted, 1 subnets

C 192.168.2.48 is directly connected, Loopback1

R1#

***** Chú ý:

+ Thông tin của Route của các interface kết nối trực tiếp với Router chỉ hiện thi trong bảng định tuyến khi Interface do là ở trạng thái UP/UP

+ Thông tin định tuyến Static Router chỉ mat khi match với giữa 2 Router bị gian đoạn (Không còn ở trạng thái UP/UP)

R1#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, * - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

192.168.1.0/27 is subnetted, 1 subnets

C 192.168.1.64 is directly connected, Loopback0 -----→ Mat hết các đường mạng thuộc Router 2.

192.168.2.0/28 is subnetted, 1 subnets

C 192.168.2.48 is directly connected, Loopback1

R1#

***** Cập nhật lại bảng định tuyến:

R2#clear ip router *

STATIC ROUTER (Backup Line)

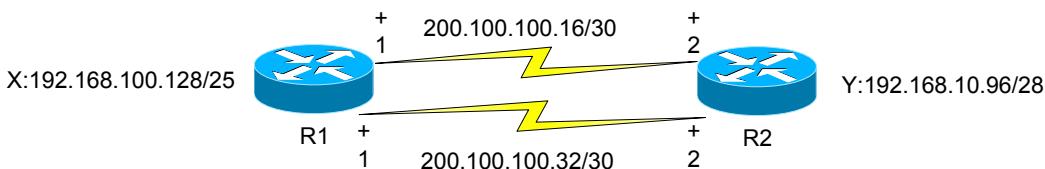
I. Lý thuyết :

1. Floating Static Route :

-Là cách thực hiện Static Router thay đổi thông số AD mặc định
-Cấu hình Floating Static Route thì ta phải cấu hình "Nexthop IP Address"

* Mục đích : Cấu hình Floating Static Route nhằm mục đích cấu hình 1 line Backup cho đường truyền chính (Thông thường sử dụng Dynamic Routing Protocol)

Ví dụ :



=====> Cấu hình R1

```
(config)#ip route 192.168.10.96 255.255.255.240 200.100.100.18
```

-----> (Default NetxHop Ip Route: AD=1)

```
(config)#ip route 192.168.10.96 255.255.255.240 200.100.100.34 8
```

--> (Khai bao NetxHop Ip Route: AD=8 nhằm giảm ưu tiên)

AD= {1-255}

=====> R2: cấu hình Static Route phải cấu hình hai chiều

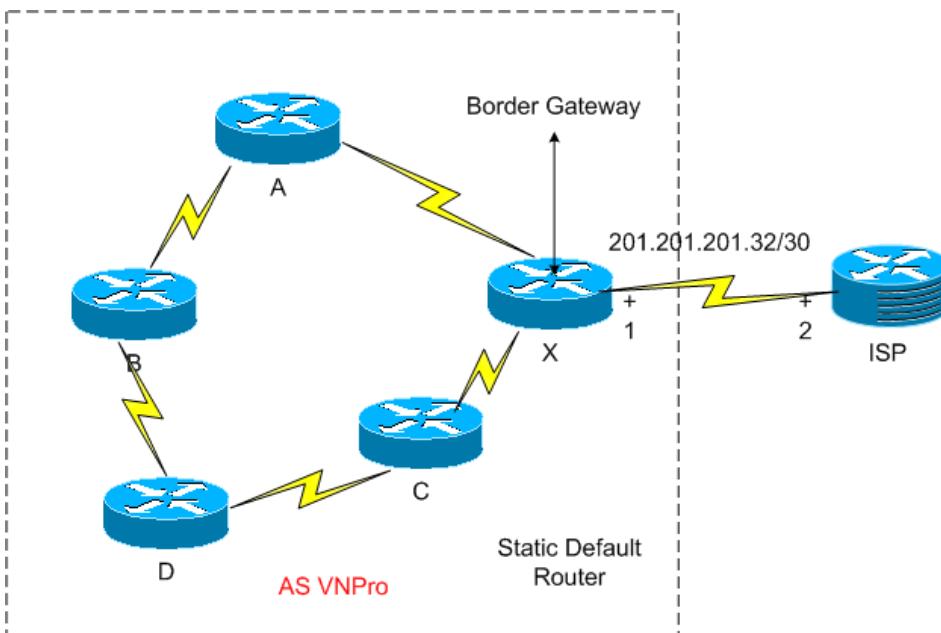
```
(config)#ip route 192.168.100.128 255.255.255.128 200.100.100.17
```

-> (Default NetxHop Ip Route: AD=1)

```
(config)#ip route 192.168.100.128 255.255.255.128 200.100.100.33 8 ----->(Khai bao NetxHop IP Route: AD=8 nhằm giảm ưu tiên)
```

2. Tùy chỉnh "Permanent" trong lệnh Static Route:

Là 1 loại Static Route đặc biệt thường dùng cấu hình trên Border Gateway Router có tên gọi Gateway of Last Resort (Router vừa giao tiếp với các Router khác trên cùng AS và vừa giao tiếp với Router của nhà cung cấp dịch vụ Internet (ISP))



* Mục đích: Nham muc dich de Router trong AS se Forward cac goi tin (packet) co Destination Network Address khong nam trong bang dinh tuyen cua Router

X(config)#ip route 0.0.0.0 0.0.0.0 201.201.201.34 permanent -----> IP cua ISP

Trong bang Routing Table se co

S* 0.0.0/0

Tu khoa Permanent thuong duoc cau hinh trong cau lenh cau hinh Static Default Route tren Border Gateway nham muc dich bao toan thong tin Static Default Route trong bang dinh tuyen cua Router Border Gateway trong truong hop duong ket noi giua Border Gateway Router va Router cua ISP bi chap chon (Flapping), nham on dinh thong tin bang dinh tuyen cua cac router khac trong cung AS su dung Routing Protocol

Trong truong hop link ket noi giua Border Gateway Router trong va Router ISP that su hong, tu khoa Permanent se giu thong tin Static Default Route 3 phut trong Routing Table cua no.

3. Theo doi cong viec ben duoi cua Router:

#debug ip packet----->Bat Debug
#u all-----> tat ket noi

*****Xem Debug router khi ta Telnet toi thiet bi khac:
#terminal monitor (neu R2 telnet toi R1)

*** Khi ta dung tren Router ping kiem tra cac ket noi den mang dang xa thi Router se lay IP of Out Interface cua no lam IP Source

SU DUNG PING MO RONG(Extended Ping)

De doi Source IP cua goi tin Ping tren Router nham muc dich tang tinh uyien chuyen cho Admin trong viec kiem tra ket noi trong co so ha tang mang tu LAN nay sang LAN kia.

R1#ping

Protocol [ip]:

Target IP address: 192.168.10.254

Repeat count [5]: 10 -----> Một lần gửi 10 tin nhắn

Datagram size [100]:

Timeout in seconds [2]:

Extended commands [n]: y -----> sử dụng lệnh mở rộng không? trả lời Y

Source address or interface: 192.168.1.94 -----> Lo0

Type of service [0]:

Set DF bit in IP header? [no]:

Validate reply data? [no]:

Data pattern [0xABCD]:

Loose, Strict, Record, Timestamp, Verbose[none]:

Sweep range of sizes [n]:

Type escape sequence to abort.

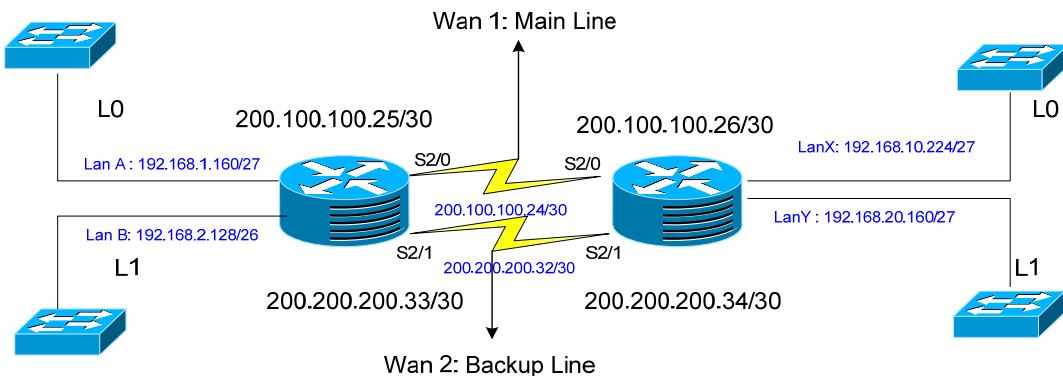
Sending 10, 100-byte ICMP Echos to 192.168.10.254, timeout is 2 seconds:

Packet sent with a source address of 192.168.1.94

!!!!!! -----> 10 dấu "!" là 10 tin nhắn đến đích

Success rate is 100 percent (10/10), round-trip min/avg/max = 1/3/4 ms

II. Thực hành:



1. Cấu hình kết nối giữa 2 Router :

* Router Saigon:

| Interface | IP-Address | OK? | Method | Status | Prot |
|------------------|-----------------------|------------|---------------|-----------------------|------|
| FastEthernet0/0 | unassigned | YES | unset | administratively down | down |
| FastEthernet1/0 | unassigned | YES | unset | administratively down | down |
| FastEthernet1/1 | unassigned | YES | unset | administratively down | down |
| Serial2/0 | 200.100.100.25 | YES | manual | up | |
| Serial2/1 | 200.200.200.33 | YES | manual | up | |
| Serial2/2 | unassigned | YES | unset | administratively down | down |
| Serial2/3 | unassigned | YES | unset | administratively down | dow |

* **Router HANOI:**

```
HaNoi#sh ip int bri
Interface          IP-Address      OK? Method Status      Prot
ocol
FastEthernet0/0    unassigned     YES unset administratively down down
FastEthernet1/0    unassigned     YES unset administratively down down
FastEthernet1/1    unassigned     YES unset administratively down down
Serial2/0          200.100.100.26 YES manual up           up
Serial2/1          200.200.200.34 YES manual up           up
Serial2/2          unassigned     YES unset administratively down down
Serial2/3          unassigned     YES unset administratively down down
```

==> Kiểm tra kết nối giữa hai router

- Router HaNoi voi dia chi 200.100.100.26
SaiGon#ping 200.100.100.26

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 200.100.100.26, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/52/84 ms

- Router HaNoi voi dia chi 200.200.200.34
SaiGon#ping 200.200.200.34

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 200.200.200.34, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/48/76 ms

SaiGon#sh cdp nei
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 |
|-----------|----------------|------------|------------|----------------|----------------|
| HaNoi | Ser 2/1 | 135 | R | 7206VXR | Ser 2/1 |
| HaNoi | Ser 2/0 | 135 | R | 7206VXR | Ser 2/0 |

➔ Kết nối đến router HaNoi bằng 2 line.

2. Cấu hình các card Loopback

* **Router Saigon:**

-LAN A (Loopback 0):
SaiGon(config)#int lo0
SaiGon(config-if)#ip address 192.168.1.190 255.255.255.224

-LAN B (Loopback 1):

```
SaiGon(config)#int lo1  
SaiGon(config-if)#ip address  
SaiGon(config-if)#ip address 192.168.2.190 255.255.255.192
```

SaiGon#sh ip int bri

| Interface | IP-Address | OK? | Method | Status | Prot |
|------------------|----------------------|------------|---------------|------------------|-----------|
| FastEthernet0/0 | unassigned | YES | unset | administratively | down down |
| FastEthernet1/0 | unassigned | YES | unset | administratively | down down |
| FastEthernet1/1 | unassigned | YES | unset | administratively | down down |
| Serial2/0 | 200.100.100.25 | YES | manual | up | up |
| Serial2/1 | 200.200.200.33 | YES | manual | up | up |
| Serial2/2 | unassigned | YES | unset | administratively | down down |
| Serial2/3 | unassigned | YES | unset | administratively | down down |
| Loopback0 | 192.168.1.190 | YES | manual | up | up |
| Loopback1 | 192.168.2.190 | YES | manual | up | up |

* **Router HaNoi:**

-LAN X (Loopback 0):

```
HaNoi(config)#int lo0  
HaNoi(config-if)#ip address  
HaNoi(config-if)#ip address 192.168.10.254 255.255.255.224
```

-LAN Y (Loopback 0):

```
HaNoi(config)#int lo1  
HaNoi(config-if)#ip add  
HaNoi(config-if)#ip address 192.168.20.190 255.255.255.224
```

aNoi#sh ip

*Oct 31 09:30:15.231: %SYS-5-CONFIG_I: Configured from console by console
HaNoi#sh ip int bri

| Interface | IP-Address | OK? | Method | Status | Prot |
|-----------------|----------------|-----|--------|------------------|-----------|
| FastEthernet0/0 | unassigned | YES | unset | administratively | down down |
| FastEthernet1/0 | unassigned | YES | unset | administratively | down down |
| FastEthernet1/1 | unassigned | YES | unset | administratively | down down |
| Serial2/0 | 200.100.100.26 | YES | manual | up | up |
| Serial2/1 | 200.200.200.34 | YES | manual | up | up |
| Serial2/2 | unassigned | YES | unset | administratively | down down |

Serial2/3 unassigned YES unset administratively down down

Loopback0 192.168.10.254 YES manual up up

Loopback1 192.168.20.190 YES manual up up

3. Tạo Static Router :

SaiGon#ping 192.168.10.254

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.10.254, timeout is 2 seconds:

.....

Success rate is 0 percent (0/5)

Kiểm tra kết nối giữa Router SaiGon và mạng LAN X bên trong Router HaNoi không thành công mặc dù 2 Router này đã tạo kết nối

====> Cách giải quyết là tạo kết nối bằng Static Router (Manually Configure)

* Router Saigon:

- Line chính :

SaiGon(config)#ip route 192.168.10.224 255.255.255.224 200.100.100.26

=> dong nay se cho ket noi toi LAN X voi AD default (AD=1)

SaiGon(config)#ip route 192.168.20.160 255.255.255.224 200.100.100.26

=> dong nay se cho ket noi toi LAN Y voi AD default (AD=1)

- Line Backup

SaiGon(config)#ip route 192.168.10.224 255.255.255.224 200.200.200.34 10

=> dong nay se cho ket noi toi LAN X voi AD = 10

SaiGon(config)#ip route 192.168.20.160 255.255.255.224 200.200.200.34 10

=> dong nay se cho ket noi toi LAN Y voi AD =10

SaiGon(config)#do sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, * - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

200.200.200.0/30 is subnetted, 1 subnets

C 200.200.200.32 is directly connected, Serial2/1

192.168.10.0/27 is subnetted, 1 subnets

S 192.168.10.224 [1/0] via 200.100.100.26

200.100.100.0/30 is subnetted, 1 subnets
C 200.100.100.24 is directly connected, Serial2/0
192.168.20.0/27 is subnetted, 1 subnets
S 192.168.20.160 [1/0] via 200.100.100.26
192.168.1.0/27 is subnetted, 1 subnets
C 192.168.1.160 is directly connected, Loopback0
192.168.2.0/26 is subnetted, 1 subnets
C 192.168.2.128 is directly connected, Loopback1

* **Router Hanoi:**

HaNoi(config)#ip route 192.168.1.160 255.255.255.224 200.100.100.25
HaNoi(config)#ip route 192.168.2.128 255.255.255.192 200.100.100.25
=> dong nay se cho ket noi toi LAN A,B voi AD default (AD=1)

HaNoi(config)#ip route 192.168.1.160 255.255.255.224 200.200.200.33 10
HaNoi(config)#ip route 192.168.2.128 255.255.255.192 200.200.200.33 10
=> dong nay se cho ket noi toi LAN A,B voi AD=10

HaNoi#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

200.200.200.0/30 is subnetted, 1 subnets
C 200.200.200.32 is directly connected, Serial2/1
192.168.10.0/27 is subnetted, 1 subnets
C 192.168.10.224 is directly connected, Loopback0
200.100.100.0/30 is subnetted, 1 subnets
C 200.100.100.24 is directly connected, Serial2/0
192.168.20.0/27 is subnetted, 1 subnets
C 192.168.20.160 is directly connected, Loopback1
192.168.1.0/27 is subnetted, 1 subnets
S 192.168.1.160 [1/0] via 200.100.100.25
192.168.2.0/26 is subnetted, 1 subnets
S 192.168.2.128 [1/0] via 200.100.100.25

====> Kiểm tra kết nối giữa Router SaiGon và mạng LAN X bên trong Router HaNoi

SaiGon#ping 192.168.10.254

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.10.254, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 24/47/76 ms

4. Shutdown:

> Trong bảng định tuyến ta không thấy giá trị của line 200.200.200.200.32/30

Tiến hành ngắt kết nối giữa Router Saigon và Hanoi trên line 200.100.100.24/30
 Xem thử Saigon và Hanoi có xây dựng bảng định tuyến cho các Lan A,B,X,Y và trao đổi thông tin trên line 200.200.200.32/30(line Backup) không ???

❖ Trạng thái trước khi Shutdown :

SaiGon#sh ip int bri

| Interface | IP-Address | OK? | Method | Status | Prot |
|------------------|-----------------------|------------|---------------|-----------------------|------|
| FastEthernet0/0 | unassigned | YES | unset | administratively down | down |
| FastEthernet1/0 | unassigned | YES | unset | administratively down | down |
| FastEthernet1/1 | unassigned | YES | unset | administratively down | down |
| Serial2/0 | 200.100.100.25 | YES | manual | up | |
| Serial2/1 | 200.200.200.33 | YES | manual | up | |

* Routing Table:

SaiGon(config)#do sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
 E1 - OSPF external type 1, E2 - OSPF external type 2
 i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
 ia - IS-IS inter area, * - candidate default, U - per-user static route
 o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

200.200.200.0/30 is subnetted, 1 subnets
 C 200.200.200.32 is directly connected, Serial2/1
192.168.10.0/27 is subnetted, 1 subnets
 S **192.168.10.224 [1/0] via 200.100.100.26**
 200.100.100.0/30 is subnetted, 1 subnets
 C 200.100.100.24 is directly connected, Serial2/0
192.168.20.0/27 is subnetted, 1 subnets
 S **192.168.20.160 [1/0] via 200.100.100.26**
 192.168.1.0/27 is subnetted, 1 subnets
 C 192.168.1.160 is directly connected, Loopback0
 192.168.2.0/26 is subnetted, 1 subnets
 C 192.168.2.128 is directly connected, Loopback1

❖ Sau khi Shutdown :

SaiGon#sh ip int bri

| Interface | IP-Address | OK? | Method | Status | Prot |
|-----------------|------------|-----|--------|-----------------------|------|
| FastEthernet0/0 | unassigned | YES | unset | administratively down | down |

| | | | | |
|------------------|---|-----------|-----------------------|------|
| FastEthernet1/0 | unassigned | YES unset | administratively down | down |
| FastEthernet1/1 | unassigned | YES unset | administratively down | down |
| Serial2/0 | 200.100.100.25 YES manual administratively down down | | | |
| Serial2/1 | 200.200.200.33 YES manual up | | up | |

* Routing Table:

SaiGon#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

200.200.200.0/30 is subnetted, 1 subnets
C 200.200.200.32 is directly connected, Serial2/1
192.168.10.0/27 is subnetted, 1 subnets
S **192.168.10.224 [10/0] via 200.200.200.34**
192.168.20.0/27 is subnetted, 1 subnets
S **192.168.20.160 [10/0] via 200.200.200.34**
192.168.1.0/27 is subnetted, 1 subnets
C 192.168.1.160 is directly connected, Loopback0
192.168.2.0/26 is subnetted, 1 subnets
C 192.168.2.128 is directly connected, Loopback1

5. Theo doi xu ly ben duoi cua Router:

1. Chua thay doi Source IP :

SaiGon#debug ip packet
IP packet debugging is on
SaiGon#ping 192.168.10.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.10.254, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/41/88 ms
SaiGon#
*Oct 31 10:25:09.835: IP: tableid=0, s=**200.200.200.33 (local)**, d=**192.168.10.254** (Serial2/1),
routed via FIB
*Oct 31 10:25:09.839: IP: s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1), len 100,
sending
*Oct 31 10:25:09.915: IP: tableid=0, s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1),
routed via RIB
*Oct 31 10:25:09.919: IP: s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), len 100,
rcvd 3
*Oct 31 10:25:09.927: IP: tableid=0, s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1),
routed via FIB

```
*Oct 31 10:25:09.931: IP: s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1), len 100,  
sending  
*Oct 31 10:25:09.951: IP: tableid=0, s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1),  
routed via RIB  
*Oct 31 10:25:09.955: IP: s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), len 100,  
rcvd 3  
*Oct 31 10:25:09.963: IP: tableid=0, s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1),  
routed via FIB  
*Oct 31 10:25:09.967: IP: s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1),  
routed via RIB  
*Oct 31 10:25:09.967: IP: s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1),  
routed via FIB  
SaiGon#0.33 (local), d=192.168.10.254 (Serial2/1), len 100, sending  
*Oct 31 10:25:09.983: IP: tableid=0, s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1),  
routed via RIB  
*Oct 31 10:25:09.987: IP: s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), len 100,  
rcvd 3  
*Oct 31 10:25:09.991: IP: tableid=0, s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1),  
routed via FIB  
*Oct 31 10:25:09.991: IP: s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1), len 100,  
sending  
*Oct 31 10:25:10.011: IP: tableid=0, s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1),  
routed via RIB  
*Oct 31 10:25:10.011: IP: s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), len 100,  
rcvd 3  
*Oct 31 10:25:10.011: IP: tableid=0, s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1),  
routed via FIB  
*Oct 31 10:25:10.011: IP: s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1), len 100,  
sending  
*Oct 31 10:25:10.043: IP: tableid=0, s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Se  
SaiGon#rial2/1), routed via RIB  
*Oct 31 10:25:10.047: IP: s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), len 100,  
rcvd 3  
SaiGon#u all  
Port Statistics for unclassified packets is not turned on.
```

All possible debugging has been turned off

2. Thay đổi Source :

```
SaiGon#debug ip packet  
IP packet debugging is on  
SaiGon#ping  
Protocol [ip]:  
Target IP address: 192.168.10.254  
Repeat count [5]: 10  
Datagram size [100]:  
Timeout in seconds [2]:  
Extended commands [n]: y  
Source address or interface: 192.168.1.190  
Type of service [0]:  
Set DF bit in IP header? [no]:  
Validate reply data? [no]:  
Data pattern [0xABCD]:  
Loose, Strict, Record, Timestamp, Verbose[none]:  
Sweep range of sizes [n]:  
Type escape sequence to abort.  
Sending 10, 100-byte ICMP Echos to 192.168.10.254, timeout is 2 seconds:
```

Packet sent with a source address of 192.168.1.190

*Oct 31 10:30:55.435: IP: tableid=0, s=**192.168.1.190 (local)**, d=**192.168.10.254** (Serial2/1),
routed via FIB
*Oct 31 10:30:55.435: IP: s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1), len 100,
sending.
*Oct 31 10:30:57.435: IP: tableid=0, s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1),
routed via FIB
*Oct 31 10:30:57.435: IP: s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1), len 100,
sending.
*Oct 31 10:30:59.435: IP: tableid=0, s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1),
routed via FIB
*Oct 31 10:30:59.435: IP: s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1), len 100,
sending.
*Oct 31 10:31:01.435: IP: tableid=0, s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1),
routed via FIB
*Oct 31 10:31:01.439: IP: s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1), len 100,
sending.
*Oct 31 10:31:03.435: IP: tableid=0, s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1),
routed via FIB
*Oct 31 10:31:03.439: IP: s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1), len 100,
sending.
*Oct 31 10:31:05.435: IP: tableid=0, s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1),
routed via FIB
*Oct 31 10:31:05.435: IP: s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1), len 100,
sending.
*Oct 31 10:31:07.435: IP: tableid=0, s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1),
routed via FIB
*Oct 31 10:31:07.439: IP: s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1), len 100,
sending.
*Oct 31 10:31:09.435: IP: tableid=0, s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1),
routed via FIB
*Oct 31 10:31:09.435: IP: s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1), len 100,
sending.
*Oct 31 10:31:11.435: IP: tableid=0, s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1),
routed via FIB
*Oct 31 10:31:11.435: IP: s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1), len 100,
sending.
*Oct 31 10:31:13.435: IP: tableid=0, s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1),
routed via FIB
*Oct 31 10:31:13.435: IP: s=192.168.1.190 (local), d=192.168.10.254 (Serial2/1), len 100,
sending.
Success rate is 0 percent (0/10)
SaiGon#ping 192.168.10.254

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.10.254, timeout is 2 seconds:

!!!

*Oct 31 10:31:26.611: IP: tableid=0, s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1),
routed via FIB
*Oct 31 10:31:26.615: IP: s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1), len 100,
sending
*Oct 31 10:31:26.675: IP: tableid=0, s=192.168.10.254 (Serial2/1), d=200.200.200.33
(Serial2/1), routed via RIB

*Oct 31 10:31:26.679: IP: s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), len 100, rcvd 3
*Oct 31 10:31:26.687: IP: tableid=0, s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1), routed via FIB
*Oct 31 10:31:26.691: IP: s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1), len 100, sending
*Oct 31 10:31:26.735: IP: tableid=0, s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), routed via RIB
*Oct 31 10:31:26.739: IP: s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), len 100, rcvd 3
*Oct 31 10:31:26.747: IP: tableid=0, s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1), routed via FIB
*Oct 31 10:31:26.747: IP: s=200.200.200.20!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/41/72 ms
SaiGon#0.33 (local), d=192.168.10.254 (Serial2/1), len 100, sending
*Oct 31 10:31:26.767: IP: tableid=0, s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), routed via RIB
*Oct 31 10:31:26.771: IP: s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), len 100, rcvd 3
*Oct 31 10:31:26.779: IP: tableid=0, s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1), routed via FIB
*Oct 31 10:31:26.783: IP: s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1), len 100, sending
*Oct 31 10:31:26.795: IP: tableid=0, s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), routed via RIB
*Oct 31 10:31:26.799: IP: s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), len 100, rcvd 3
*Oct 31 10:31:26.827: IP: tableid=0, s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1), routed via FIB
*Oct 31 10:31:26.831: IP: s=200.200.200.33 (local), d=192.168.10.254 (Serial2/1), len 100, sending
SaiGon#
*Oct 31 10:31:26.855: IP: tableid=0, s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), routed via RIB
*Oct 31 10:31:26.855: IP: s=192.168.10.254 (Serial2/1), d=200.200.200.33 (Serial2/1), len 100, rcvd 3
SaiGon#u all
Port Statistics for unclassified packets is not turned on.

All possible debugging has been turned off

GIOI THIEU CAC LOAI ROUTING PROTOCOL

- Interior Gateway Protocol (IGP): nhung giao thuc dinh tuyen dong ma cac Router su dung de trao doi thong tin dinh tuyen voi nhau trong cung 1 AS (Autonomous System): RIP, EIGRP, OSPF
- Exterior Gateway Protocol (EGP): la giao thuc dinh tuyen dung de trao doi giua ISP, AS tam co Quoc Gia voi nhau.

1. Classful Routing Overview

- Doi hoi toan bo he thong phai co gia tri Subnetmask cua cac Network la dong nhat. Các Router trao đổi thông tin định tuyến với nhau nhưng không gửi kèm giá trị **Subnet Mask** trong thông tin định tuyến. (Khong ho tro VLSM)
- Thong tin dinh tuyen trao doi giua cac Router khong bao gom SM
- Thong tin dinh tuyen khi duoc quang ba tu 1 Router qua 1 Router khac thong qua 1 network khac MAJORNETWORK thi se bi "Auto-Summary"
 - + Ta khong the can thiеп vao co che Auto Summary nay.

2. Classless Routing Overview

- Cho phep nhieu gia tri SM khac nhau cua cac Network trong he thong (ho tro VLSM)
- Thong tin dinh tuyen trao doi giua cac Router co bao gom gia tri SM
- Van con hien tuong Auto Summary tuy nhien o giao thuc nay ta co the khong che va dieu khien duoc.
- Doi voi Cisco IOS tu 11.0 tro ve truoc cac Router su dung giao thuc dang "Classful", nghia la Router tin rang no so huu tat ca cac Subnetwork co cung Major Network voi cac Subnetwork cua cac Interface ma no dang co, Do do khi Router nhan duoc Packet co Destination Network Address khong nam trong bang dinh tuyen nhung co cung Major Network voi nhung Major Network ma no dang co thi Router se "Drop" ngay ca khi tren Router co cau hinh "Static Default Route"
 - + De tranh hien tuong tren nguoi ta phai cau hinh them cau lenh IP Classless tren cac IP Router chay IOS tu 11.0 tro ve truoc.
- Tren cac dong IOS tu 11.X tro ve sau thi thi cau lenh:"IP Classless" duoc **Enable by Default (config)# ip classless**

Câu lệnh **ip classless** đã được **enable by default** trên các IOS từ **11.x** trở về sau.

3. Distance Vector Routing Protocols

- Các Router trao đổi thông tin định tuyến theo chu kỳ (**Rip: 30s**)
- Thông tin định tuyến trao đổi giữa các Router là nội dung của toàn bộ bảng định tuyến.
- Chu kỳ trao đổi thông tin định tuyến xảy ra là bắt buộc ngay cả khi không có sự thay đổi nào trong hệ thống, dễ dẫn tới hiện tượng **Routing Overhead**
- Các Router hoàn toàn không biết được sơ đồ tổng quan mạng của toàn bộ hệ thống, Router chỉ có thể biết thông tin của các đường mạng khác trong hệ thống thông qua các Router láng giềng (**neighbor**) mà thôi.

-Đối với **RIP V.2**: hoạt động theo kiểu **Distance Vector**, các Router sử dụng Router Protocol RIP trao đổi thông tin định tuyến theo thời gian 30 giây/lần.

RIP có **Metric** là số **Hop Count** (số Router mà nó đi qua).

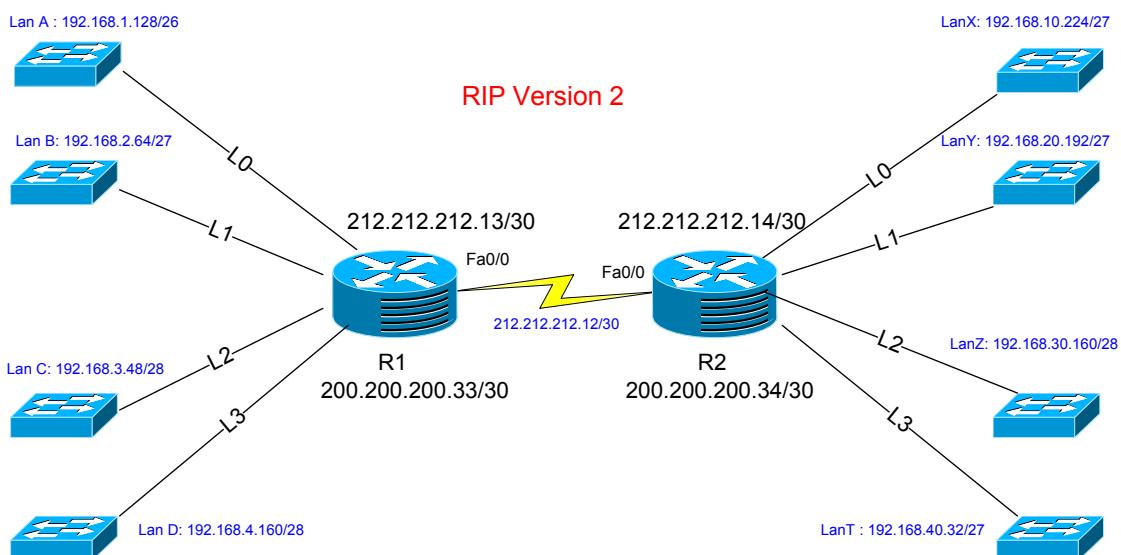
Metric là tiêu chí đánh giá độ tốt tùy thuộc giao thức định tuyến về thông tin của 1 đường mạng nào do của Router. Đối với Dynamic Routing Protocol khác nhau sẽ có Metric khác nhau

+ Hop Count càng nhỏ thì đường đi càng tốt (Hop Count ≤ 15 , Infinite (so với cũ), AD=120)

Khi Router biết được thông tin 1 Network thông qua nhiều Router khác với **Metric** bằng nhau thì dữ liệu gửi đến đường mạng trên sẽ được gửi theo cách **Load Balance** (cân bằng tải - Minimum: 4 (Default); Maximum: 16)

- Router sẽ tăng **Metric** của một đường mạng mà nó có lén 1 trước khi gửi cho láng giềng của nó
- Các Router sử dụng RIPv2 để trao đổi thông tin định tuyến sẽ giao tiếp với nhau bằng địa chỉ **Multicast 224.0.0.9**

***** THỰC HÀNH *****



1. Bước 1 : Cấu hình mục cơ bản(IP

2. Cấu hình RIP V2 :

a. Cấu hình R1

```
R1(config)#router rip
R1(config-router)#version 2
R1(config-router)#network 192.168.1.0
R1(config-router)#network 192.168.2.0
R1(config-router)#network 192.168.3.0
R1(config-router)#network 192.168.4.0
R1(config-router)#network 212.212.212.0
```

=> Router sẽ quảng bá các mạng mà nó đang có

*** Muon lam lai (truong hop lam sai):

R1(config)#no router rip

b. Cau hinh R2:

=====> Telnet sang R2 xem Routing Table

aa>>

RR2#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP:50:46.895: %LINEPROTO-5-
UPDOWN: Line protocol on Interface Lo

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area for unclassified
changed state to uped on.

Saigon(co

ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

212.212.212.0/30 is subnetted, 1 subnets

C 212.212.212.12 is directly connected, FastEthernet0/0
192.168.30.0/28 is subnetted, 1 subnets
C 192.168.30.160 is directly connected, Loopback2
192.168.10.0/27 is subnetted, 1 subnets
C 192.168.10.224 is directly connected, Loopback0
192.168.40.0/27 is subnetted, 1 subnets
C 192.168.40.32 is directly connected, Loopback3
R 192.168.4.0/24 [120/1] via 212.212.212.13, 00:00:00, FastEthernet0/0
192.168.20.0/27 is subnetted, 1 subnets
C 192.168.20.192 is directly connected, Loopback1
R 192.168.1.0/24 [120/1] via 212.212.212.13, 00:00:00, FastEthernet0/0
R 192.168.2.0/24 [120/1] via 212.212.212.13, 00:00:00, FastEthernet0/0
R 192.168.3.0/24 [120/1] via 212.212.212.13, 00:00:04, FastEthernet0/0

bb>>

RR2#sh ip route RIP

R 192.168.4.0/24 [120/1] via 212.212.212.13, 00:00:16, FastEthernet0/0
R 192.168.1.0/24 [120/1] via 212.212.212.13, 00:00:16, FastEthernet0/0
R 192.168.2.0/24 [120/1] via 212.212.212.13, 00:00:16, FastEthernet0/0
R 192.168.3.0/24 [120/1] via 212.212.212.13, 00:00:16, FastEthernet0/0

• Giai thich :

AD = 120

Matric = 1 ---> qua 1 Router

/24 --> Bi Auto Sumary

cc>>

Neu Router la RIPv2 thi:

R1(config)#router rip

R1(config-router)#no auto-summary

R1(config-router)#+

R1#clear ip route *

R1#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP:50:46.895: %LINEPROTO-5-

UPDOWN: Line protocol on Interface Lo

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter areas for unclassified
changed state to uped on.

Saigon(co)

ia - IS-IS inter area, * - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

212.212.212.0/30 is subnetted, 1 subnets

C 212.212.212.12 is directly connected, FastEthernet0/0

192.168.30.0/28 is subnetted, 1 subnets

R 192.168.30.160 [120/1] via 212.212.212.14, 00:00:03, FastEthernet0/0

192.168.10.0/27 is subnetted, 1 subnets

R 192.168.10.224 [120/1] via 212.212.212.14, 00:00:03, FastEthernet0/0

192.168.40.0/27 is subnetted, 1 subnets

R 192.168.40.32 [120/1] via 212.212.212.14, 00:00:03, FastEthernet0/0

192.168.4.0/28 is subnetted, 1 subnets

C 192.168.4.160 is directly connected, Loopback3

192.168.20.0/27 is subnetted, 1 subnets

R 192.168.20.192 [120/1] via 212.212.212.14, 00:00:03, FastEthernet0/0

192.168.1.0/26 is subnetted, 1 subnets

C 192.168.1.128 is directly connected, Loopback0

192.168.2.0/27 is subnetted, 1 subnets

C 192.168.2.64 is directly connected, Loopback1

192.168.3.0/28 is subnetted, 1 subnets

C 192.168.3.48 is directly connected, Loopback2

R1#sh ip route rip

192.168.30.0/28 is subnetted, 1 subnets

R 192.168.30.160 [120/1] via 212.212.212.14, 00:00:04, FastEthernet0/0

192.168.10.0/27 is subnetted, 1 subnets

R 192.168.10.224 [120/1] via 212.212.212.14, 00:00:04, FastEthernet0/0

192.168.40.0/27 is subnetted, 1 subnets

R 192.168.40.32 [120/1] via 212.212.212.14, 00:00:04, FastEthernet0/0

192.168.20.0/27 is subnetted, 1 subnets

R 192.168.20.192 [120/1] via 212.212.212.14, 00:00:04, FastEthernet0/0 ---> thời gian

Router cap nhat bang dinh tuyen

R1#

====> ko bi Auto Sumamry

dd>> Xem protocol su dung

R1(config-router)#do sh ip protocol

Incoming update filter list for all interfaces is not set

Redistributing: rip

Default version control: send version 2, receive version 2

Interface Send Recv Triggered RIP Key-chain

FastEthernet0/0 2 2

Loopback0 2 2

```
Loopback1      2   2
Loopback2      2   2
Loopback3      2   2
```

Automatic network summarization is not in effect

Maximum path: 4 ---> Load Balance 4

Routing for Networks:

```
192.168.1.0
192.168.2.0
192.168.3.0
192.168.4.0
212.212.212.0
```

Routing Information Sources:

| Gateway | Distance | Last Update |
|----------------|----------|-------------|
| Gateway | Distance | Last Update |
| 212.212.212.14 | 120 | 00:00:25 |

Distance: (default is 120) ---> AD =120

ee>> Thay doi Load Balance

```
R1(config)#router rip
R1(config-router)#maximum-paths ?
<1-16> Number of paths
R1(config-router)#maximum-paths 6
```

R1(config-router)#do sh ip protocol

Incoming update filter list for all interfaces is not set

Redistributing: rip

Default version control: send version 2, receive version 2

| Interface | Send | Recv | Triggered RIP | Key-chain |
|-----------------|------|------|---------------|-----------|
| FastEthernet0/0 | 2 | 2 | | |
| Loopback0 | 2 | 2 | | |
| Loopback1 | 2 | 2 | | |
| Loopback2 | 2 | 2 | | |
| Loopback3 | 2 | 2 | | |

Automatic network summarization is not in effect

Maximum path: 6 -----> chinh Load Blance 6

Routing for Networks:

```
192.168.1.0
192.168.2.0
192.168.3.0
192.168.4.0
212.212.212.0
```

Routing Information Sources:

| Gateway | Distance | Last Update |
|----------------|----------|-------------|
| Gateway | Distance | Last Update |
| 212.212.212.14 | 120 | 00:00:04 |

Distance: (default is 120)

R1(config-router)#
=====

3. Buoc 3: Capure RIP:

```
R1#debug ip rip
RIP protocol debugging is on
R1#
```

R1#u all

de

R1(config-router)#default_ ^ _b
R1(config-router)#deb^Z
% Invalid input detected at '^' marker.

R1#d

*Nov 3 04:40:51.451: %SYS-5-CONFIG_I: Configured from console by console

R1#de

R1#deb

R1#debug ip r

R1#debug ip rip

RIP protocol debugging is on

R1#

*Nov 3 04:41:07.247: RIP: sending v2 update to 224.0.0.9 via Loopback1 (192.168.2.94)

*Nov 3 04:41:07.247: RIP: build update entries

*Nov 3 04:41:07.247: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:41:07.247: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:41:07.247: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:41:07.247: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0

*Nov 3 04:41:07.247: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0

*Nov 3 04:41:07.247: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0

*Nov 3 04:41:07.247: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0

*Nov 3 04:41:07.247: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:41:07.247: RIP: ignored v2 packet from 192.168.2.94 (sourced from one of our addresses)

*Nov 3 04:41:07.791: RIP: sending v2 update to 224.0.0.9 via Loopback2 (192.168.3.62)

*Nov 3 04:41:07.791: RIP: build update entries

*Nov 3 04:41:07.791: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:41:07.791: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:41:07.791: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:41:07.791: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0

*Nov 3 04:41:07.791: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0

R1#

*Nov 3 04:41:07.791: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0

*Nov 3 04:41:07.791: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0

*Nov 3 04:41:07.791: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:41:07.791: RIP: ignored v2 packet from 192.168.3.62 (sourced from one of our addresses)

*Nov 3 04:41:08.003: RIP: sending v2 update to 224.0.0.9 via Loopback3 (192.168.4.174)

*Nov 3 04:41:08.003: RIP: build update entries

*Nov 3 04:41:08.003: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:41:08.003: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:41:08.003: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0

R1#

*Nov 3 04:41:08.003: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0

*Nov 3 04:41:08.003: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0

*Nov 3 04:41:08.003: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0

*Nov 3 04:41:08.003: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0

*Nov 3 04:41:08.003: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:41:08.003: RIP: ignored v2 packet from 192.168.4.174 (sourced from one of our addresses)

R1#

*Nov 3 04:41:09.315: RIP: received v2 update from 212.212.212.14 on FastEthernet0/0

*Nov 3 04:41:09.315: 192.168.10.224/27 via 0.0.0.0 in 1 hops
*Nov 3 04:41:09.315: 192.168.20.192/27 via 0.0.0.0 in 1 hops
*Nov 3 04:41:09.315: 192.168.30.160/28 via 0.0.0.0 in 1 hops
*Nov 3 04:41:09.315: 192.168.40.32/27 via 0.0.0.0 in 1 hops
R1#
*Nov 3 04:41:13.143: RIP: sending v2 update to 224.0.0.9 via Loopback0 (192.168.1.190)
*Nov 3 04:41:13.143: RIP: build update entries
*Nov 3 04:41:13.143: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:13.143: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:13.143: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:13.143: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:13.143: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:13.143: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:13.143: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
R1#
*Nov 3 04:41:13.143: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:13.143: RIP: ignored v2 packet from 192.168.1.190 (sourced from one of our addresses)
R1#
*Nov 3 04:41:14.963: RIP: sending v2 update to 224.0.0.9 via FastEthernet0/0 (212.212.212.13)
*Nov 3 04:41:14.963: RIP: build update entries
*Nov 3 04:41:14.963: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:14.963: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:14.963: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:14.963: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
R1#
*Nov 3 04:41:35.367: RIP: sending v2 update to 224.0.0.9 via Loopback1 (192.168.2.94)
*Nov 3 04:41:35.367: RIP: build update entries
*Nov 3 04:41:35.367: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:35.367: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:35.367: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:35.367: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:35.367: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:35.367: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:35.367: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
R1#
*Nov 3 04:41:35.367: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:35.367: RIP: ignored v2 packet from 192.168.2.94 (sourced from one of our addresses)
*Nov 3 04:41:36.375: RIP: sending v2 update to 224.0.0.9 via Loopback2 (192.168.3.62)
*Nov 3 04:41:36.375: RIP: build update entries
*Nov 3 04:41:36.375: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:36.375: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:36.375: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:36.375: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:36.375: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:36.375: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:36.375: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
R1#
*Nov 3 04:41:36.375: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:36.375: RIP: ignored v2 packet from 192.168.3.62 (sourced from one of our addresses)
*Nov 3 04:41:37.759: RIP: received v2 update from 212.212.212.14 on FastEthernet0/0
*Nov 3 04:41:37.759: 192.168.10.224/27 via 0.0.0.0 in 1 hops

*Nov 3 04:41:37.759: 192.168.20.192/27 via 0.0.0.0 in 1 hops
*Nov 3 04:41:37.759: 192.168.30.160/28 via 0.0.0.0 in 1 hops
*Nov 3 04:41:37.759: 192.168.40.32/27 via 0.0.0.0 in 1 hops
*Nov 3 04:41:37.791: RIP: sending v2 update to 224.0.0.9 via Loopback3 (192.168.4.174)
*Nov 3 04:41:37.791: RIP: build update entries
*Nov 3 04:41:37.791: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:37.791: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
R1#
*Nov 3 04:41:37.791: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:37.791: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:37.791: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:37.791: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:37.791: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:37.791: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:37.791: RIP: ignored v2 packet from 192.168.4.174 (sourced from one of our addresses)
R1#
*Nov 3 04:41:41.367: RIP: sending v2 update to 224.0.0.9 via Loopback0 (192.168.1.190)
*Nov 3 04:41:41.367: RIP: build update entries
*Nov 3 04:41:41.367: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:41.367: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:41.367: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:41.367: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:41.367: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:41.367: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:41:41.367: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
R1#
*Nov 3 04:41:41.367: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:41.367: RIP: ignored v2 packet from 192.168.1.190 (sourced from one of our addresses)
R1#
*Nov 3 04:41:44.675: RIP: sending v2 update to 224.0.0.9 via FastEthernet0/0 (212.212.212.13)
*Nov 3 04:41:44.675: RIP: build update entries
*Nov 3 04:41:44.675: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:44.675: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:44.675: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:41:44.675: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
R1#
*Nov 3 04:42:03.087: RIP: sending v2 update to 224.0.0.9 via Loopback1 (192.168.2.94)
*Nov 3 04:42:03.087: RIP: build update entries
*Nov 3 04:42:03.087: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:03.087: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:03.087: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:03.087: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:03.087: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:03.087: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:03.087: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
R1#
*Nov 3 04:42:03.087: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:03.087: RIP: ignored v2 packet from 192.168.2.94 (sourced from one of our addresses)
*Nov 3 04:42:04.307: RIP: sending v2 update to 224.0.0.9 via Loopback2 (192.168.3.62)
*Nov 3 04:42:04.307: RIP: build update entries
*Nov 3 04:42:04.307: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:42:04.307: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:04.307: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:04.307: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:04.307: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:04.307: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:04.307: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
R1#
*Nov 3 04:42:04.307: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:04.307: RIP: ignored v2 packet from 192.168.3.62 (sourced from one of our addresses)
R1#
*Nov 3 04:42:06.051: RIP: received v2 update from 212.212.212.14 on FastEthernet0/0
*Nov 3 04:42:06.051: 192.168.10.224/27 via 0.0.0.0 in 1 hops
*Nov 3 04:42:06.051: 192.168.20.192/27 via 0.0.0.0 in 1 hops
*Nov 3 04:42:06.051: 192.168.30.160/28 via 0.0.0.0 in 1 hops
*Nov 3 04:42:06.051: 192.168.40.32/27 via 0.0.0.0 in 1 hops
*Nov 3 04:42:06.823: RIP: sending v2 update to 224.0.0.9 via Loopback3 (192.168.4.174)
*Nov 3 04:42:06.823: RIP: build update entries
*Nov 3 04:42:06.823: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:06.823: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
R1#
*Nov 3 04:42:06.823: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:06.823: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:06.823: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:06.823: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:06.823: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:06.823: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:06.823: RIP: ignored v2 packet from 192.168.4.174 (sourced from one of our addresses)
R1#
*Nov 3 04:42:07.955: RIP: sending v2 update to 224.0.0.9 via Loopback0 (192.168.1.190)
*Nov 3 04:42:07.955: RIP: build update entries
*Nov 3 04:42:07.955: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:07.955: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:07.955: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:07.955: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:07.955: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:07.955: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:07.955: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
R1#
*Nov 3 04:42:07.955: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:07.955: RIP: ignored v2 packet from 192.168.1.190 (sourced from one of our addresses)
R1#
*Nov 3 04:42:12.387: RIP: sending v2 update to 224.0.0.9 via FastEthernet0/0 (212.212.212.13)
*Nov 3 04:42:12.387: RIP: build update entries
*Nov 3 04:42:12.387: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:12.387: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:12.387: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:12.387: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
R1#
*Nov 3 04:42:30.011: RIP: sending v2 update to 224.0.0.9 via Loopback1 (192.168.2.94)
*Nov 3 04:42:30.011: RIP: build update entries
*Nov 3 04:42:30.011: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0

*Nov 3 04:42:30.011: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:30.011: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:30.011: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:30.011: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:30.011: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:30.011: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
R1#
*Nov 3 04:42:30.011: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:30.011: RIP: ignored v2 packet from 192.168.2.94 (sourced from one of our addresses)
*Nov 3 04:42:31.215: RIP: sending v2 update to 224.0.0.9 via Loopback2 (192.168.3.62)
*Nov 3 04:42:31.215: RIP: build update entries
*Nov 3 04:42:31.215: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:31.215: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:31.215: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:31.215: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:31.215: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:31.215: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:31.215: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
R1#
*Nov 3 04:42:31.215: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:31.215: RIP: ignored v2 packet from 192.168.3.62 (sourced from one of our addresses)
R1#
*Nov 3 04:42:33.431: RIP: received v2 update from 212.212.212.14 on FastEthernet0/0
*Nov 3 04:42:33.431: 192.168.10.224/27 via 0.0.0.0 in 1 hops
*Nov 3 04:42:33.431: 192.168.20.192/27 via 0.0.0.0 in 1 hops
*Nov 3 04:42:33.431: 192.168.30.160/28 via 0.0.0.0 in 1 hops
*Nov 3 04:42:33.431: 192.168.40.32/27 via 0.0.0.0 in 1 hops
*Nov 3 04:42:33.607: RIP: sending v2 update to 224.0.0.9 via Loopback0 (192.168.1.190)
*Nov 3 04:42:33.607: RIP: build update entries
*Nov 3 04:42:33.607: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:33.607: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
R1#
*Nov 3 04:42:33.607: 192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:33.607: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:33.607: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:33.607: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:33.607: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:33.607: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:33.607: RIP: ignored v2 packet from 192.168.1.190 (sourced from one of our addresses)
*Nov 3 04:42:34.359: RIP: sending v2 update to 224.0.0.9 via Loopback3 (192.168.4.174)
*Nov 3 04:42:34.359: RIP: build update entries
R1#
*Nov 3 04:42:34.359: 192.168.1.128/26 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:34.359: 192.168.2.64/27 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:34.359: 192.168.3.48/28 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:34.359: 192.168.10.224/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:34.359: 192.168.20.192/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:34.359: 192.168.30.160/28 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:34.359: 192.168.40.32/27 via 0.0.0.0, metric 2, tag 0
*Nov 3 04:42:34.359: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 3 04:42:34.359: RIP: ignored v2 packet from 192.168.4.174 (sourced from one of our addresses)

R1#

```
*Nov 3 04:42:38.343: RIP: sending v2 update to 224.0.0.9 via FastEthernet0/0  
(212.212.212.13)  
*Nov 3 04:42:38.343: RIP: build update entries  
*Nov 3 04:42:38.343:      192.168.1.128/26 via 0.0.0.0, metric 1, tag 0  
*Nov 3 04:42:38.343:      192.168.2.64/27 via 0.0.0.0, metric 1, tag 0  
*Nov 3 04:42:38.343:      192.168.3.48/28 via 0.0.0.0, metric 1, tag 0  
*Nov 3 04:42:38.343:      192.168.4.160/28 via 0.0.0.0, metric 1, tag 0
```

R1#

=====

4.Buoc 4:

- Mac dinh Router Rip V2 se cap nhat bang dinh tuyen cho cac Interface ket noi truc tiep cua no moi 30s
- Khi Router chay RIPv2 ta muon khong gui cap nhat bang dinh tuyen vao cac Interface ket noi vao LAN cu moi 30s

```
R1(config)#router rip  
R1(config-router)#passive-interface lo0  
R1(config-router)#passive-interface lo1  
R1(config-router)#passive-interface lo2  
R1(config-router)#passive-interface lo3  
R1(config-router)#passive-interface lo4
```

```
R1#debug ip rip  
RIP protocol debugging is on  
R1#  
*Nov 3 04:54:42.791: RIP: received v2 update from 212.212.212.14 on FastEtherne  
t0/0  
*Nov 3 04:54:42.791:      192.168.10.224/27 via 0.0.0.0 in 1 hops  
*Nov 3 04:54:42.791:      192.168.20.192/27 via 0.0.0.0 in 1 hops  
*Nov 3 04:54:42.791:      192.168.30.160/28 via 0.0.0.0 in 1 hops  
*Nov 3 04:54:42.791:      192.168.40.32/27 via 0.0.0.0 in 1 hops  
R1#u all  
Port Statistics for unclassified packets is not turned on.
```

All possible debugging has been turned off
R1#

ROUTING LOOP

Để ngăn chặn Routing Loop trong giao thức định tuyến Distance Vector. Người ta quy định ra 5 nguyên tắc sau:

- **Split Horizon:** thông tin định tuyến của Router A mà nó học được từ Router B khác sẽ không được quảng bá ngược lại trong thông tin cập nhật bảng định tuyến gửi cho B.

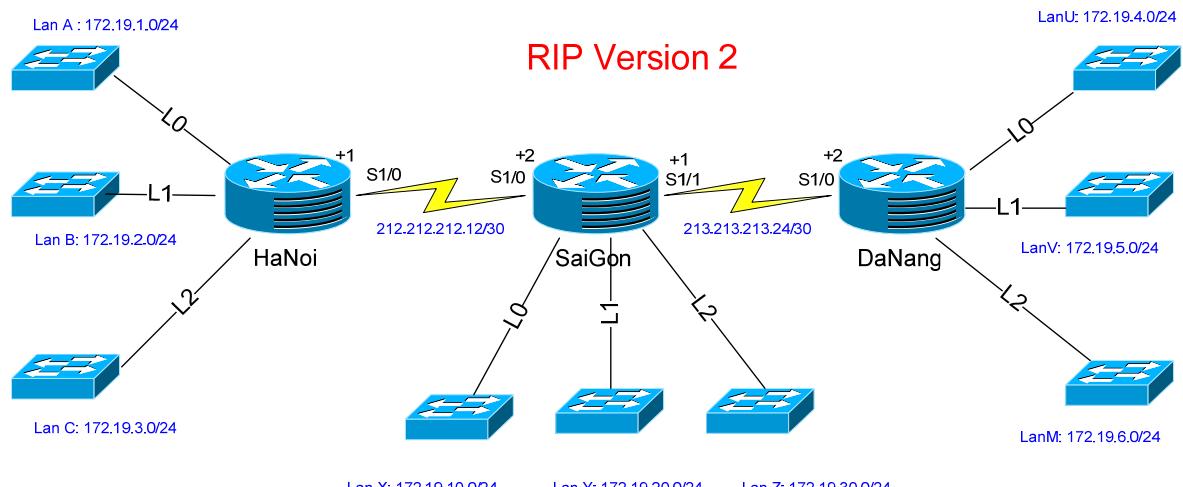
- **Route Poisoning:** Khi một thông tin Network nào đó trên Router bị mất đi, thì nó sẽ gửi cập nhật cho các Router láng giềng của nó về thông tin đường mạng đã chết trên với Metric là Infinity 16

- **Poison Reverse:** khi Router nhận được thông tin của láng giềng của nó báo về một đường mạng đã chết => Router sẽ gửi gói Poison Reverse (giống như 1 thông tin Ack) khẳng định là Router đã biết về việc đó.

- **Holddown Timers:** khi Router B nhận được thông tin từ Router A báo về một Network X đã mất thì Router B vẫn giữ thông tin về đường mạng X trong bảng định tuyến trong khoảng thời gian Holddown Timers là 180s. Trong khoảng thời gian trên nếu như Router B nhận được thông tin về đường mạng X từ các Router khác Router A với Metric = hoặc kém tốt hơn Metric từ Router A thì Router B sẽ không học thông tin về đường mạng X từ các Router trên. Nhưng nếu tốt hơn thì học ngay. Sau thời gian Holddown Timers, nếu như có 1 Router nào đó báo cho Router B thông tin về đường mạng X với bất kỳ Metric nào thì Router B sẽ học thông tin về đường mạng X qua Router trên, tuy nhiên vẫn giữ thông tin về đường mạng X qua Router A thêm 60s.

- **Trigger Update:** khi Router có sự thay đổi thông tin về 1 Network nào đó thì ngay lập tức nó sẽ gửi cập nhật về sự thay đổi đó cho các láng giềng của nó mà không cần phải đợi đến đúng chu kỳ

BÀI TẬP:



6. Cấu hình kết nối giữa 3 Router :

* Router HaNoi:

| | | | | |
|-----------------|----------------|------------|-----------------------|------|
| FastEthernet0/0 | unassigned | YES unset | administratively down | down |
| Serial1/0 | 212.212.212.13 | YES manual | up | up |
| Serial1/1 | unassigned | YES unset | administratively down | down |
| Serial1/2 | unassigned | YES unset | administratively down | down |
| Serial1/3 | unassigned | YES unset | administratively down | down |
| Serial1/4 | unassigned | YES unset | administratively down | down |
| Serial1/5 | unassigned | YES unset | administratively down | down |
| Serial1/6 | unassigned | YES unset | administratively down | down |
| Serial1/7 | unassigned | YES unset | administratively down | down |
| Loopback0 | 172.19.1.254 | YES manual | up | up |
| Loopback1 | 172.19.2.254 | YES manual | up | up |
| Loopback2 | 172.19.3.254 | YES manual | up | up |

* Router SaiGon:

| | | | | |
|-----------------|----------------|------------|-----------------------|------|
| FastEthernet0/0 | unassigned | YES unset | administratively down | down |
| Serial1/0 | 212.212.212.14 | YES SLARP | up | up |
| Serial1/1 | 213.213.213.25 | YES manual | up | up |
| Serial1/2 | unassigned | YES unset | administratively down | down |
| Serial1/3 | unassigned | YES unset | administratively down | down |
| Serial1/4 | unassigned | YES unset | administratively down | down |
| Serial1/5 | unassigned | YES unset | administratively down | down |
| Serial1/6 | unassigned | YES unset | administratively down | down |
| Serial1/7 | unassigned | YES unset | administratively down | down |
| Loopback0 | 172.19.10.254 | YES manual | up | up |
| Loopback1 | 172.19.20.254 | YES manual | up | up |
| Loopback2 | 172.19.30.254 | YES manual | up | up |

* **Router DaNang:**

| Interface | IP-Address | OK? | Method | Status | Protocol |
|-----------------|----------------|-----|--------|-----------------------|----------|
| FastEthernet0/0 | unassigned | YES | unset | administratively down | down |
| Serial1/0 | 213.213.213.26 | YES | manual | up | up |
| Serial1/1 | unassigned | YES | unset | administratively down | down |
| Serial1/2 | unassigned | YES | unset | administratively down | down |
| Serial1/3 | unassigned | YES | unset | administratively down | down |
| Serial1/4 | unassigned | YES | unset | administratively down | down |
| Serial1/5 | unassigned | YES | unset | administratively down | down |
| Serial1/6 | unassigned | YES | unset | administratively down | down |
| Serial1/7 | unassigned | YES | unset | administratively down | down |
| Loopback0 | 172.19.4.254 | YES | manual | up | up |
| Loopback1 | 172.19.5.254 | YES | manual | up | up |
| Loopback2 | 172.19.6.254 | YES | manual | up | up |

7. Cấu hình Dynamic Routing Protocol:

* **Ha Noi :**

```

HaNoi(config)#router rip
HaNoi(config-router)#ver
HaNoi(config-router)#version ? -----→ RIP Version 2
<1-2> version
HaNoi(config-router)#network 172.19.0.0
HaNoi(config-router)#network 212.212.212.0

```

==> Xem Routing Table :

```

HaNoi#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2
      i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
      ia - IS-IS inter area, * - candidate default, U - per-user static route
      o - ODR, P - periodic downloaded static route

```

Gateway of last resort is not set

```

R  213.213.213.0/24 [120/1] via 212.212.212.14, 00:00:05, Serial1/0
      212.212.212.0/30 is subnetted, 1 subnets

```

```
C  212.212.212.12 is directly connected, Serial1/0
    172.19.0.0/16 is variably subnetted, 4 subnets, 2 masks
C    172.19.3.0/24 is directly connected, Loopback2
C    172.19.2.0/24 is directly connected, Loopback1
C    172.19.1.0/24 is directly connected, Loopback0
R    172.19.0.0/16 [120/1] via 212.212.212.14, 00:00:05, Serial1/0
```

*** SaiGon :**

```
SaiGon(config)#router
SaiGon(config)#router rip
SaiGon(config-router)#version 2
SaiGon(config-router)#network 172.19.0.0
SaiGon(config-router)#network 212.212.212.0
SaiGon(config-router)#network 213.213.213.0
```

SaiGon#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

```
C  213.213.213.0/24 is directly connected, Serial1/1
    212.212.212.0/30 is subnetted, 1 subnets
C    212.212.212.12 is directly connected, Serial1/0
    172.19.0.0/16 is variably subnetted, 4 subnets, 2 masks
C      172.19.30.0/24 is directly connected, Loopback2
C      172.19.20.0/24 is directly connected, Loopback1
C      172.19.10.0/24 is directly connected, Loopback0
R      172.19.0.0/16 [120/1] via 213.213.213.26, 00:00:21, Serial1/1
          [120/1] via 212.212.212.13, 00:00:00, Serial1/0
```

*** DaNang:**

```
DaNang(config)#router rip
DaNang(config-router)#version 2
DaNang(config-router)#network 172.19.0.0
DaNang(config-router)#network 213.213.213.0
```

DaNang#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

```
213.213.213.0/30 is subnetted, 1 subnets
C    213.213.213.24 is directly connected, Serial1/0
R    212.212.212.0/24 [120/1] via 213.213.213.25, 00:00:25, Serial1/0
    172.19.0.0/16 is variably subnetted, 4 subnets, 2 masks
C      172.19.6.0/24 is directly connected, Loopback2
C      172.19.5.0/24 is directly connected, Loopback1
C      172.19.4.0/24 is directly connected, Loopback0
R      172.19.0.0/16 [120/1] via 213.213.213.25, 00:00:25, Serial1/0
```

AD= 120

1= Matric---> qua 1 Router

24--> Bi Auto Sumary

```
HaNoi(config-router)#no auto-summary --> tắt Summary
SaiGon(config-router)#no auto-summary --> tắt Summary
DaNang(config-router)#no auto-summary --> tắt Summary
```

===> Se không bi Auto-Sumary

- **Ha Noi :**

```
HaNoi#sh ip route rip
213.213.213.0/30 is subnetted, 1 subnets
R    213.213.213.24 [120/1] via 212.212.212.14, 00:00:14, Serial1/0
    172.19.0.0/24 is subnetted, 9 subnets
R      172.19.30.0 [120/1] via 212.212.212.14, 00:00:14, Serial1/0
R      172.19.20.0 [120/1] via 212.212.212.14, 00:00:14, Serial1/0
R      172.19.10.0 [120/1] via 212.212.212.14, 00:00:14, Serial1/0
R      172.19.6.0 [120/2] via 212.212.212.14, 00:00:14, Serial1/0
R      172.19.5.0 [120/2] via 212.212.212.14, 00:00:14, Serial1/0
R      172.19.4.0 [120/2] via 212.212.212.14, 00:00:14, Serial1/0
```

- **SaiGon :**

```
SaiGon#sh ip route rip
172.19.0.0/24 is subnetted, 9 subnets
R    172.19.6.0 [120/1] via 213.213.213.26, 00:00:24, Serial1/1
R    172.19.5.0 [120/1] via 213.213.213.26, 00:00:24, Serial1/1
R    172.19.4.0 [120/1] via 213.213.213.26, 00:00:24, Serial1/1
R    172.19.3.0 [120/1] via 212.212.212.13, 00:00:25, Serial1/0
R    172.19.2.0 [120/1] via 212.212.212.13, 00:00:25, Serial1/0
R    172.19.1.0 [120/1] via 212.212.212.13, 00:00:25, Serial1/0
```

- **DaNang:**

```
DaNang#sh ip route rip
212.212.212.0/30 is subnetted, 1 subnets
R    212.212.212.12 [120/1] via 213.213.213.25, 00:00:13, Serial1/0
    172.19.0.0/24 is subnetted, 9 subnets
R      172.19.30.0 [120/1] via 213.213.213.25, 00:00:13, Serial1/0
R      172.19.20.0 [120/1] via 213.213.213.25, 00:00:13, Serial1/0
R      172.19.10.0 [120/1] via 213.213.213.25, 00:00:13, Serial1/0
R      172.19.3.0 [120/2] via 213.213.213.25, 00:00:13, Serial1/0
R      172.19.2.0 [120/2] via 213.213.213.25, 00:00:13, Serial1/0
```

R 172.19.1.0 [120/2] via 213.213.213.25, 00:00:13, Serial1/0

HaNoi#sh ip protocols -----→ kiểm tra **Load Balance** và **AD**

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 26 seconds

Invalid after 180 seconds, hold down 180, flushed after 240

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Redistributing: rip

Default version control: send version 2, receive version 2

| Interface | Send | Recv | Triggered RIP | Key-chain |
|-----------|------|------|---------------|-----------|
|-----------|------|------|---------------|-----------|

| | | | | |
|-----------|---|---|--|--|
| Serial1/0 | 2 | 2 | | |
|-----------|---|---|--|--|

| | | | | |
|-----------|---|---|--|--|
| Loopback0 | 2 | 2 | | |
|-----------|---|---|--|--|

| | | | | |
|-----------|---|---|--|--|
| Loopback1 | 2 | 2 | | |
|-----------|---|---|--|--|

| | | | | |
|-----------|---|---|--|--|
| Loopback2 | 2 | 2 | | |
|-----------|---|---|--|--|

Automatic network summarization is not in effect

Maximum path: 4 ---> **Load Balance 4**

Routing for Networks:

172.19.0.0

212.212.212.0

213.213.213.0

Routing Information Sources:

| Gateway | Distance | Last Update |
|---------|----------|-------------|
|---------|----------|-------------|

| | | |
|----------------|-----|----------|
| 212.212.212.14 | 120 | 00:00:25 |
|----------------|-----|----------|

 -----> Lan Update Routing table each day 25s

Distance: (default is 120) → AD

=====> **Thay đổi Load Balance**

HaNoi(config)#router rip

HaNoi(config-router)#maximum-paths 10 ---> Đổi Load Balance bằng 10

HaNoi#sh ip protocols

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 21 seconds

Invalid after 180 seconds, hold down 180, flushed after 240 → theo nguyên tắc **Holddown**

Timers

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Redistributing: rip

Default version control: send version 2, receive version 2

| Interface | Send | Recv | Triggered RIP | Key-chain |
|-----------|------|------|---------------|-----------|
|-----------|------|------|---------------|-----------|

| | | | | |
|-----------|---|---|--|--|
| Serial1/0 | 2 | 2 | | |
|-----------|---|---|--|--|

| | | | | |
|-----------|---|---|--|--|
| Loopback0 | 2 | 2 | | |
|-----------|---|---|--|--|

| | | | | |
|-----------|---|---|--|--|
| Loopback1 | 2 | 2 | | |
|-----------|---|---|--|--|

| | | | | |
|-----------|---|---|--|--|
| Loopback2 | 2 | 2 | | |
|-----------|---|---|--|--|

Automatic network summarization is not in effect

Maximum path: 10 ---> **Load Balance 4**

Routing for Networks:

172.19.0.0

212.212.212.0

213.213.213.0

Routing Information Sources:

| Gateway | Distance | Last Update |
|---------|----------|-------------|
|---------|----------|-------------|

212.212.212.14 120 00:00:05
Distance: (default is 120)

8. Capture RIP version 2

```
HaNoi#debug ip rip
RIP protocol debugging is on
HaNoi#
*Nov 6 18:02:51.463: RIP: sending v2 update to 224.0.0.9 via Serial1/0 (212.212.212.13)
*Nov 6 18:02:51.467: RIP: build update entries
*Nov 6 18:02:51.467:    172.19.1.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:02:51.471:    172.19.2.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:02:51.475:    172.19.3.0/24 via 0.0.0.0, metric 1, tag 0
HaNoi#
*Nov 6 18:02:58.883: RIP: sending v2 update to 224.0.0.9 via Loopback2 (172.19.3.254) ->
Thoa man 5 nguyen tac ngan chan routing Loop (Split Horizon) không gọi trở lại cho Network
172.19.3.0/24
*Nov 6 18:02:58.887: RIP: build update entries
*Nov 6 18:02:58.887:    172.19.1.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:02:58.891:    172.19.2.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:02:58.891:    172.19.4.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:02:58.895:    172.19.5.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:02:58.899:    172.19.6.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:02:58.903:    172.19.10.0/24 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:02:58.903:    172.19.20.0/24 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:02:58.907:    172.19.30.0/24 via 0.0.0.0, metric 2, tag 0
HaNoi#
*Nov 6 18:02:58.907:    212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:02:58.907:    213.213.213.24/30 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:02:58.927: RIP: ignored v2 packet from 172.19.3.254 (sourced from one of our
addresses)
HaNoi#
*Nov 6 18:03:03.103: RIP: received v2 update from 212.212.212.14 on Serial1/0
*Nov 6 18:03:03.103:    172.19.4.0/24 via 0.0.0.0 in 2 hops
*Nov 6 18:03:03.107:    172.19.5.0/24 via 0.0.0.0 in 2 hops
*Nov 6 18:03:03.111:    172.19.6.0/24 via 0.0.0.0 in 2 hops
*Nov 6 18:03:03.115:    172.19.10.0/24 via 0.0.0.0 in 1 hops
*Nov 6 18:03:03.119:    172.19.20.0/24 via 0.0.0.0 in 1 hops
*Nov 6 18:03:03.119:    172.19.30.0/24 via 0.0.0.0 in 1 hops
*Nov 6 18:03:03.123:    213.213.213.24/30 via 0.0.0.0 in 1 hops
HaNoi#
*Nov 6 18:03:06.131: RIP: sending v2 update to 224.0.0.9 via Loopback0 (172.19.1.254)
*Nov 6 18:03:06.135: RIP: build update entries
*Nov 6 18:03:06.139:    172.19.2.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:03:06.139:    172.19.3.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:03:06.139:    172.19.4.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:03:06.139:    172.19.5.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:03:06.139:    172.19.6.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:03:06.139:    172.19.10.0/24 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:06.139:    172.19.20.0/24 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:06.139:    172.19.30.0/24 via 0.0.0.0, metric 2, tag 0
HaNoi#
*Nov 6 18:03:06.139:    212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
```

*Nov 6 18:03:06.139: 213.213.213.24/30 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:06.147: RIP: ignored v2 packet from 172.19.1.254 (sourced from one of our addresses)
HaNoi#
*Nov 6 18:03:13.907: RIP: sending v2 update to 224.0.0.9 via Loopback1 (172.19.2.254)
*Nov 6 18:03:13.911: RIP: build update entries
*Nov 6 18:03:13.915: 172.19.1.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:03:13.915: 172.19.3.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:03:13.919: 172.19.4.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:03:13.923: 172.19.5.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:03:13.923: 172.19.6.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:03:13.923: 172.19.10.0/24 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:13.923: 172.19.20.0/24 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:13.923: 172.19.30.0/24 via 0.0.0.0, metric 2, tag 0
HaNoi#
*Nov 6 18:03:13.923: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:03:13.923: 213.213.213.24/30 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:13.927: RIP: ignored v2 packet from 172.19.2.254 (sourced from one of our addresses)
HaNoi#
*Nov 6 18:03:19.895: RIP: sending v2 update to 224.0.0.9 via Serial1/0 (212.212.212.13)
*Nov 6 18:03:19.899: RIP: build update entries
*Nov 6 18:03:19.899: 172.19.1.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:03:19.903: 172.19.2.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:03:19.907: 172.19.3.0/24 via 0.0.0.0, metric 1, tag 0
HaNoi#
*Nov 6 18:03:26.879: RIP: sending v2 update to 224.0.0.9 via Loopback2 (172.19.3.254)
*Nov 6 18:03:26.883: RIP: build update entries
*Nov 6 18:03:26.883: 172.19.1.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:03:26.887: 172.19.2.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:03:26.887: 172.19.4.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:03:26.887: 172.19.5.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:03:26.887: 172.19.6.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:03:26.887: 172.19.10.0/24 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:26.887: 172.19.20.0/24 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:26.887: 172.19.30.0/24 via 0.0.0.0, metric 2, tag 0
HaNoi#
*Nov 6 18:03:26.887: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:03:26.887: 213.213.213.24/30 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:26.895: RIP: ignored v2 packet from 172.19.3.254 (sourced from one of our addresses)
HaNoi#
*Nov 6 18:03:29.555: RIP: received v2 update from 212.212.212.14 on Serial1/0
*Nov 6 18:03:29.559: 172.19.4.0/24 via 0.0.0.0 in 2 hops
*Nov 6 18:03:29.563: 172.19.5.0/24 via 0.0.0.0 in 2 hops
*Nov 6 18:03:29.563: 172.19.6.0/24 via 0.0.0.0 in 2 hops
*Nov 6 18:03:29.567: 172.19.10.0/24 via 0.0.0.0 in 1 hops
*Nov 6 18:03:29.571: 172.19.20.0/24 via 0.0.0.0 in 1 hops
*Nov 6 18:03:29.575: 172.19.30.0/24 via 0.0.0.0 in 1 hops
*Nov 6 18:03:29.579: 213.213.213.24/30 via 0.0.0.0 in 1 hops
HaNoi#
*Nov 6 18:03:34.199: RIP: sending v2 update to 224.0.0.9 via Loopback0 (172.19.1.254)
*Nov 6 18:03:34.199: RIP: build update entries
*Nov 6 18:03:34.199: 172.19.2.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:03:34.203: 172.19.3.0/24 via 0.0.0.0, metric 1, tag 0

```
*Nov 6 18:03:34.207: 172.19.4.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:03:34.211: 172.19.5.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:03:34.211: 172.19.6.0/24 via 0.0.0.0, metric 3, tag 0
*Nov 6 18:03:34.211: 172.19.10.0/24 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:34.211: 172.19.20.0/24 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:34.211: 172.19.30.0/24 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:34.211: 212.212.212.12/30 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:03:34.211: 213.213.213.24/30 via 0.0.0.0, metric 2, tag 0
*Nov 6 18:03:34.227: RIP: ignored v2 packet from 172.19.1.254 (sourced from one of our
addresses)
HaNoi#u all
Port Statistics for unclassified packets is not turned on.
```

All possible debugging has been turned off

=====> Mac dinh Router Rip V2 se cap nhat bang dinh tuyen cho cac Interface ket noi
truc tiep cua no moi 30s

Khi Router chay RIPv2:

+ Khong gui cap nhat bang dinh tuyen vao cac Interface ket noi vao LAN

```
HaNoi(config-router)#passive-interface lo0
HaNoi(config-router)#passive-interface lo1
HaNoi(config-router)#passive-interface lo2
=====
```

HaNoi#debug ip rip

RIP protocol debugging is on

HaNoi#

```
*Nov 6 18:08:33.519: RIP: received v2 update from 212.212.212.14 on Serial1/0
*Nov 6 18:08:33.519: 172.19.4.0/24 via 0.0.0.0 in 2 hops
*Nov 6 18:08:33.523: 172.19.5.0/24 via 0.0.0.0 in 2 hops
*Nov 6 18:08:33.527: 172.19.6.0/24 via 0.0.0.0 in 2 hops
*Nov 6 18:08:33.531: 172.19.10.0/24 via 0.0.0.0 in 1 hops
*Nov 6 18:08:33.535: 172.19.20.0/24 via 0.0.0.0 in 1 hops
*Nov 6 18:08:33.535: 172.19.30.0/24 via 0.0.0.0 in 1 hops
*Nov 6 18:08:33.539: 213.213.213.24/30 via 0.0.0.0 in 1 hops
```

HaNoi#

```
*Nov 6 18:08:49.499: RIP: sending v2 update to 224.0.0.9 via Serial1/0 (212.212.212.13)
*Nov 6 18:08:49.503: RIP: build update entries
*Nov 6 18:08:49.503: 172.19.1.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:08:49.507: 172.19.2.0/24 via 0.0.0.0, metric 1, tag 0
*Nov 6 18:08:49.511: 172.19.3.0/24 via 0.0.0.0, metric 1, tag 0
```

HaNoi#

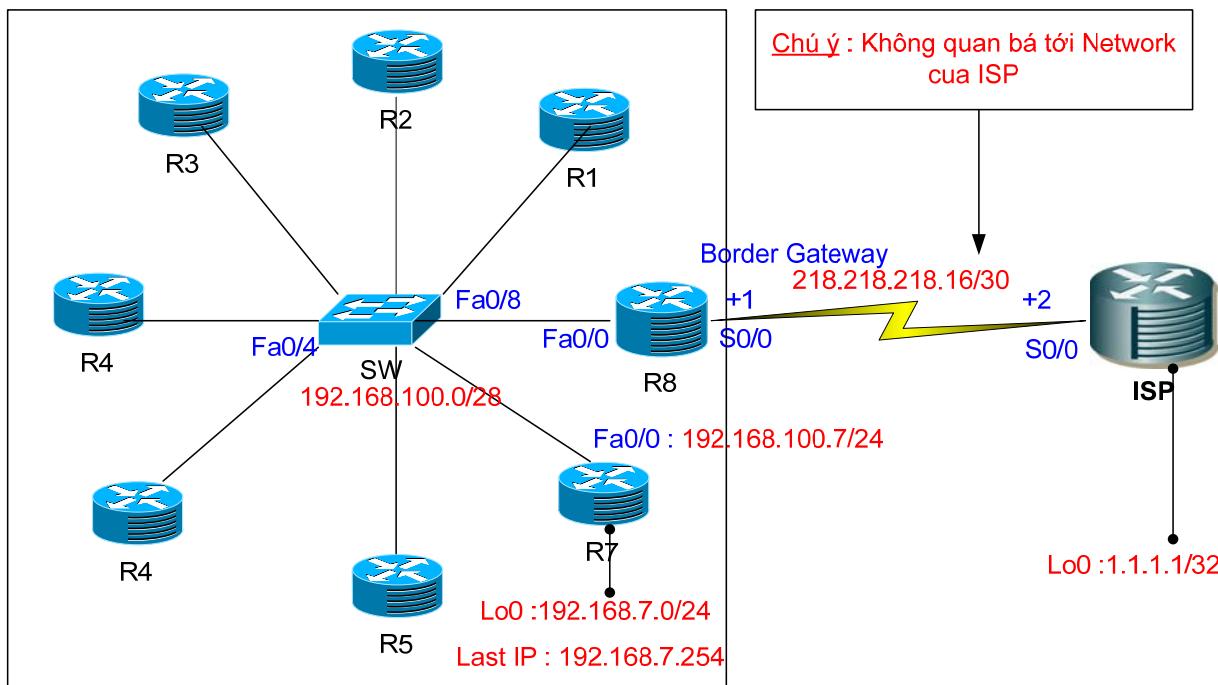
```
*Nov 6 18:09:00.339: RIP: received v2 update from 212.212.212.14 on Serial1/0
*Nov 6 18:09:00.343: 172.19.4.0/24 via 0.0.0.0 in 2 hops
*Nov 6 18:09:00.347: 172.19.5.0/24 via 0.0.0.0 in 2 hops
*Nov 6 18:09:00.351: 172.19.6.0/24 via 0.0.0.0 in 2 hops
*Nov 6 18:09:00.355: 172.19.10.0/24 via 0.0.0.0 in 1 hops
*Nov 6 18:09:00.359: 172.19.20.0/24 via 0.0.0.0 in 1 hops
*Nov 6 18:09:00.359: 172.19.30.0/24 via 0.0.0.0 in 1 hops
*Nov 6 18:09:00.363: 213.213.213.24/30 via 0.0.0.0 in 1 hops
```

HaNoi#u all

Port Statistics for unclassified packets is not turned on.

All possible debugging has been turned off
HaNoi#

Thực hành :



1. Bước 1 : Cau hinh co ban cho Route R7 va Loopback0

2. Bước 2 : Cau hinh Default Route

Router Border gateway khong tu dong quang ba Default Route ma no co cho cac Router ben trong cung AS voi no. Muon cho Router Border Gateway quang ba default Router cho cac Router ben trong cung AS ta phai thuc hien cau lenh

```
(config-router)#router rip
(config-router)#default-information originate
```

```
sh run
Building configuration...
```

```
Current configuration: 1360 bytes
!
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R8
```


!
end

R8#

****Thong tin dinh tuyen cua Route R7

R7#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is 192.168.100.8 to network 0.0.0.0

R 192.168.8.0/24 [120/1] via 192.168.100.8, 00:00:08, FastEthernet0/0
R 192.168.4.0/24 [120/1] via 192.168.100.4, 00:00:02, FastEthernet0/0
R 192.168.5.0/24 [120/1] via 192.168.100.5, 00:00:11, FastEthernet0/0
R 192.168.6.0/24 [120/1] via 192.168.100.6, 00:00:11, FastEthernet0/0
C 192.168.7.0/24 is directly connected, Loopback0
C 192.168.100.0/24 is directly connected, FastEthernet0/0
R 192.168.3.0/24 [120/1] via 192.168.100.3, 00:00:03, FastEthernet0/0
R* 0.0.0.0/0 [120/1] via 192.168.100.8, 00:00:08, FastEthernet0/0

R7#

****Thong tin dinh tuyen cua Route R8

R8#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is 218.218.218.18 to network 0.0.0.0

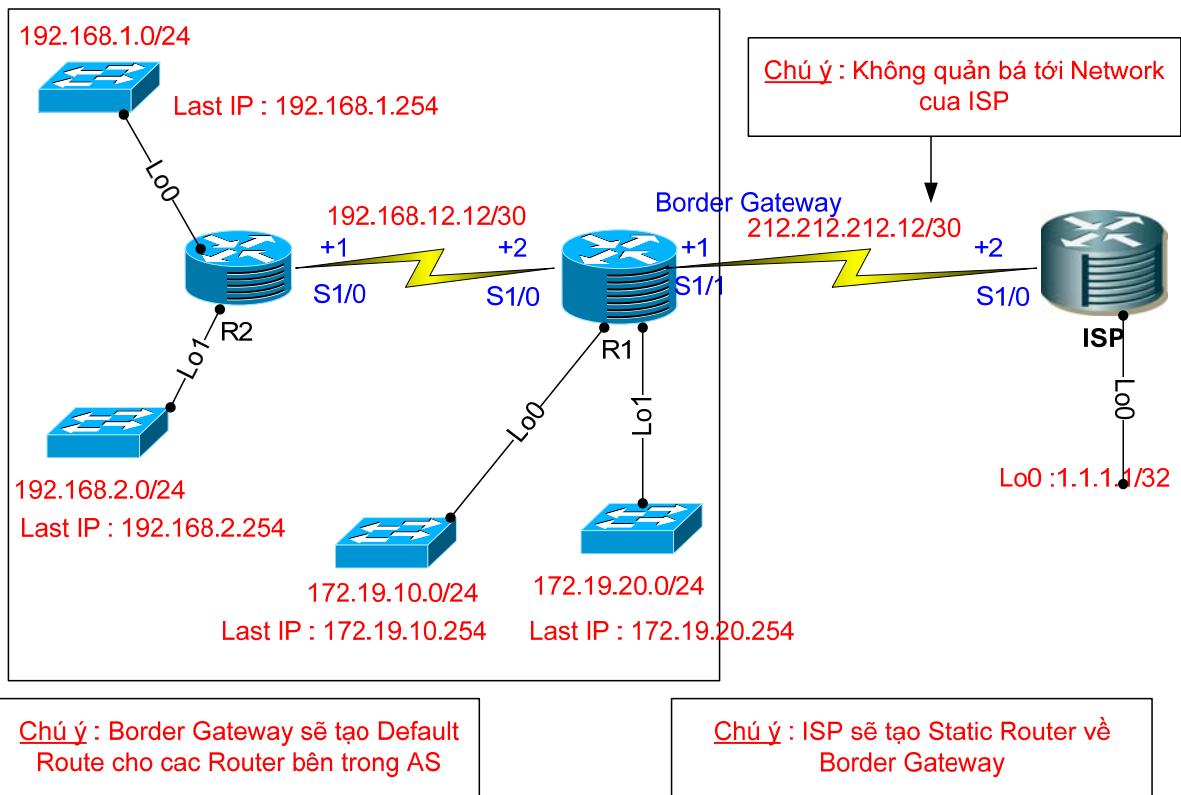
218.218.218.0/30 is subnetted, 1 subnets
C 218.218.218.16 is directly connected, FastEthernet0/1
C 192.168.8.0/24 is directly connected, Loopback0
R 192.168.4.0/24 [120/1] via 192.168.100.4, 00:00:10, FastEthernet0/0
R 192.168.5.0/24 [120/1] via 192.168.100.5, 00:00:00, FastEthernet0/0
R 192.168.6.0/24 [120/1] via 192.168.100.6, 00:00:00, FastEthernet0/0
R 192.168.7.0/24 [120/1] via 192.168.100.7, 00:00:17, FastEthernet0/0
192.168.100.0/28 is subnetted, 1 subnets
C 192.168.100.0 is directly connected, FastEthernet0/0
R 192.168.3.0/24 [120/1] via 192.168.100.3, 00:00:13, FastEthernet0/0
S* 0.0.0.0/0 [1/0] via 218.218.218.18

3. Bước 3 : Cau hinh ISP Route

cau hinh static route la 0.0.0.0 0.0.0.0 218.218.218.17


```
!
interface Serial0/1
no ip address
shutdown
!
ip http server
no ip http secure-server
ip classless
ip route 0.0.0.0 0.0.0.0 218.218.218.17
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!--More-- _____ line con 0
exec-timeout 0 0
logging synchronous
line aux 0
line vty 0 4
privilege level 15
no login
line vty 5 15
privilege level 15
no login
!
!
end
```

ISP#



1. Bước 1 : Cấu hình cơ bản cho Router R2 và Loopback0

```
R1#sh ip int bri
octl
FastEthernet0/0      unassigned    YES unset administratively down down
Serial1/0            192.168.12.13 YES manual up
Serial1/1            unassigned    YES unset administratively down down
Serial1/2            unassigned    YES unset administratively down down
Serial1/3            unassigned    YES unset administratively down down
Serial1/4            unassigned    YES unset administratively down down
Serial1/5            unassigned    YES unset administratively down down
Serial1/6            unassigned    YES unset administratively down down
Serial1/7            unassigned    YES unset administratively down down
Loopback0            192.168.1.254 YES manual up
Loopback1            192.168.2.254 YES manual up
```

```
sh run
Building configuration...

Current configuration : 1553 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname R1
!
boot-start-marker
boot-end-marker
!
enable secret 5 $1$VWZ$FdtFgUqc.JjKrsZ1f.EZq0
enable password 7 045802150C2E
!
no aaa new-model
!
resource policy
!
ip subnet-zero
!
!
!--More-- □□□□□□□□□□    □□□□□□□□□□ ip cef
no ip domain lookup
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!
!--More-- □□□□□□□□□□    □□□□□□□□□□ !
!
interface Loopback0
```

```
ip address 192.168.1.254 255.255.255.0
!
interface Loopback1
ip address 192.168.2.254 255.255.255.0
!
interface FastEthernet0/0
no ip address
shutdown
duplex half
!
interface Serial1/0
ip address 192.168.12.13 255.255.255.252
serial restart-delay 0
!
interface Serial1/1
no ip address
shutdown
serial restart-delay 0
!
interface Serial1/2
--More-- □□□□□□□□□□    □□□□□□□□□ no ip address
shutdown
serial restart-delay 0
!
interface Serial1/3
no ip address
shutdown
serial restart-delay 0
!
interface Serial1/4
no ip address
shutdown
serial restart-delay 0
!
interface Serial1/5
no ip address
shutdown
serial restart-delay 0
!
interface Serial1/6
no ip address
shutdown
serial restart-delay 0
--More-- □□□□□□□□□    □□□□□□□□□!
interface Serial1/7
no ip address
shutdown
serial restart-delay 0
!
router rip
version 2
network 192.168.1.0
network 192.168.2.0
network 192.168.12.0
no auto-summary
```

```
!
ip classless
!
no ip http server
no ip http secure-server
!
!
!
!
!
!
--More-- □□□□□□□□□□    □□□□□□□□□ control-plane
!
!
!
!
!
gatekeeper
shutdown
!
!
line con 0
exec-timeout 0 0
password 7 02100A4B1909
logging synchronous
login
stopbits 1
line aux 0
stopbits 1
line vty 0 4
password 7 095A40190B0A
login
!
--More-- □□□□□□□□□    □□□□□□□□□!
end
```

R1#

R1#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

192.168.12.0/30 is subnetted, 1 subnets
C 192.168.12.12 is directly connected, Serial1/0
R 192.168.10.0/24 [120/1] via 192.168.12.14, 00:00:11, Serial1/0

```
R 192.168.20.0/24 [120/1] via 192.168.12.14, 00:00:11, Serial1/0
C 192.168.1.0/24 is directly connected, Loopback0
C 192.168.2.0/24 is directly connected, Loopback1
R1#
```

2. Bước 2 : Cau hinh Default Route

Router Border gateway khong tu dong quang ba Default Route ma no co cho cac Router ben trong cung AS voi no. Muon cho Router Border Gateway quang ba default Router cho cac Router ben trong cung AS ta phai thuc hien cau lenh

```
Border(config)#router rip
Border(config-router)#default-information originate
```

```
Border#sh run
Building configuration...
```

```
Current configuration : 1660 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname Border
!
boot-start-marker
boot-end-marker
!
enable secret 5 $1$rti0$HIqR1cvjzNYhBreaUY9ko1
enable password 7 02050D480809
!
no aaa new-model
!
resource policy
!
ip subnet-zero
!
!
--More-- □□□□□□□□□□    □□□□□□□□□□ ip cef
no ip domain lookup
!
!
!
!
!
!
```

```
!
!
!
!
!
!
--More-- □□□□□□□□□     □□□□□□□□□!
!
interface Loopback0
ip address 192.168.10.254 255.255.255.0
!
interface Loopback1
ip address 192.168.20.254 255.255.255.0
!
interface FastEthernet0/0
no ip address
shutdown
duplex half
!
interface Serial1/0
ip address 192.168.12.14 255.255.255.252
serial restart-delay 0
!
interface Serial1/1
ip address 212.212.212.13 255.255.255.252
serial restart-delay 0
!
interface Serial1/2
no ip address
--More-- □□□□□□□□□     □□□□□□□□□ shutdown
serial restart-delay 0
!
interface Serial1/3
no ip address
shutdown
serial restart-delay 0
!
interface Serial1/4
no ip address
shutdown
serial restart-delay 0
!
interface Serial1/5
no ip address
shutdown
serial restart-delay 0
!
interface Serial1/6
no ip address
shutdown
serial restart-delay 0
!
--More-- □□□□□□□□□     □□□□□□□□□ interface Serial1/7
```

```
no ip address
shutdown
serial restart-delay 0
!
router rip
version 2
network 192.168.10.0
network 192.168.12.0
network 192.168.20.0
default-information originate
no auto-summary
!
ip classless
ip route 0.0.0.0 0.0.0.0 212.212.212.14 permanent
!
no ip http server
no ip http secure-server
!
!
!
!
!
!
--More-- □□□□□□□□□□      □□□□□□□□□□!
control-plane
!
!
!
!
!
!
gatekeeper
shutdown
!
!
line con 0
exec-timeout 0 0
password 7 111F1715051D
logging synchronous
login
stopbits 1
line aux 0
stopbits 1
line vty 0 4
password 7 051D081F3343
login
--More-- □□□□□□□□□□      □□□□□□□□□□!
!
end
```

Border#

****Thong tin dinh tuyen cua Route R1

R1#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is 192.168.12.14 to network 0.0.0.0

192.168.12.0/30 is subnetted, 1 subnets
C 192.168.12.12 is directly connected, Serial1/0
R 192.168.10.0/24 [120/1] via 192.168.12.14, 00:00:19, Serial1/0
R 192.168.20.0/24 [120/1] via 192.168.12.14, 00:00:19, Serial1/0
C 192.168.1.0/24 is directly connected, Loopback0
C 192.168.2.0/24 is directly connected, Loopback1
R* 0.0.0.0/0 [120/1] via 192.168.12.14, 00:00:19, Serial1/0

****Thong tin danh tuyen cua Route R2 (Border Gateway)

Border#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is 212.212.212.14 to network 0.0.0.0

192.168.12.0/30 is subnetted, 1 subnets
C 192.168.12.12 is directly connected, Serial1/0
212.212.212.0/30 is subnetted, 1 subnets
C 212.212.212.12 is directly connected, Serial1/1
C 192.168.10.0/24 is directly connected, Loopback0
C 192.168.20.0/24 is directly connected, Loopback1
R 192.168.1.0/24 [120/1] via 192.168.12.13, 00:00:25, Serial1/0
R 192.168.2.0/24 [120/1] via 192.168.12.13, 00:00:25, Serial1/0
S* 0.0.0.0/0 [1/0] via 212.212.212.14

3. Bước 3 : Cau hinh ISP Route

sh run
Building configuration...

```
Current configuration : 1424 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname ISP
!
boot-start-marker
```

```
no ip address
shutdown
serial restart-delay 0
--More-- □□□□□□□□□    □□□□□□□□□!
interface Serial1/3
no ip address
shutdown
serial restart-delay 0
!
interface Serial1/4
no ip address
shutdown
serial restart-delay 0
!
interface Serial1/5
no ip address
shutdown
serial restart-delay 0
!
interface Serial1/6
no ip address
shutdown
serial restart-delay 0
!
interface Serial1/7
no ip address
--More-- □□□□□□□□□    □□□□□□□□□ shutdown
serial restart-delay 0
!
ip classless
ip route 0.0.0.0 0.0.0.0 212.212.212.13
!
no ip http server
no ip http secure-server
!
!
!
!
!
control-plane
!
!
!
!
!
!
gatekeeper
shutdown
--More-- □□□□□□□□□    □□□□□□□□□!
!
line con 0
exec-timeout 0 0
password 7 00121D161654
logging synchronous
```

```
login  
stopbits 1  
line aux 0  
stopbits 1  
line vty 0 4  
password 7 07192F5C5C06  
login  
!  
!  
end
```

ISP#

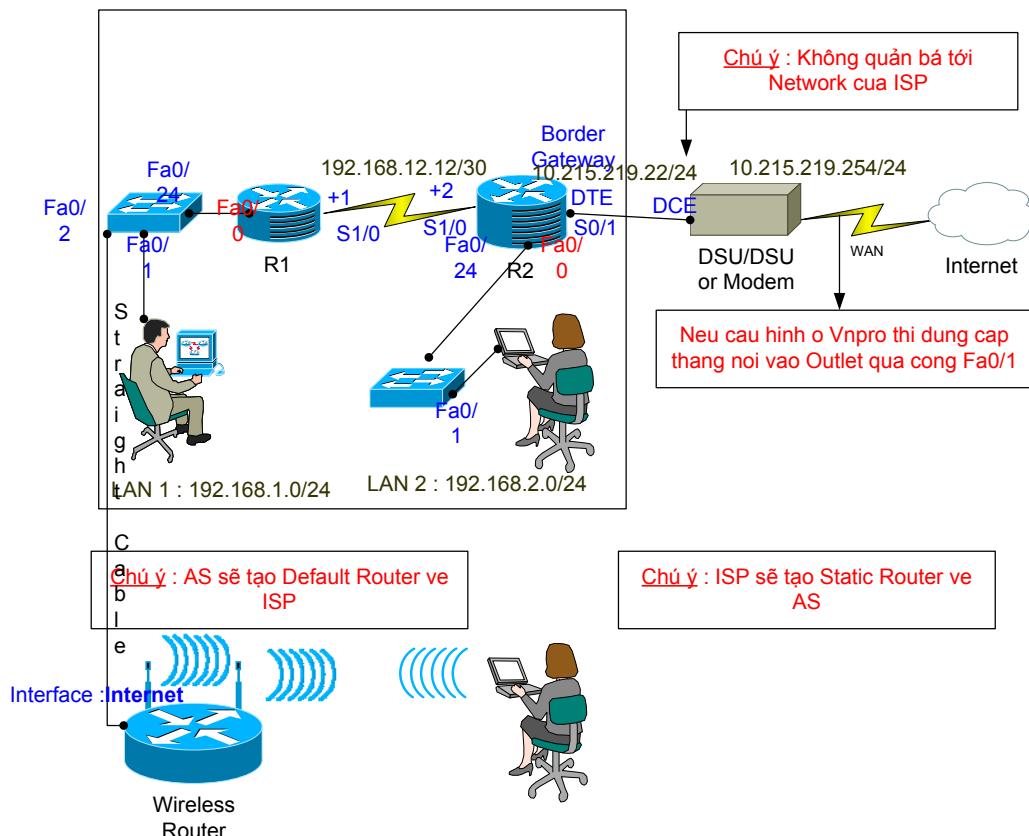
```
R1#telnet 1.1.1.1  
Trying 1.1.1.1 ... Open
```

User Access Verification

Password:
ISP>

==> Qua trinh ket noi da thanh cong !!!

CAU HINH MOT HE THONG THUC TE



-Bước 1: kiểm tra DTE hay DCE

+Gắn Cáp Serial vào 2 cổng Serial của Router, kiểm tra trạng thái xem có UP-UP chưa

+Nếu UP-UP thì kiểm tra

R1#sh controllers s1/0

→ Kiểm tra đầu cáp V35 loại nào đang kết nối tới cổng serial của mình (DTE- DCE)

+ Nếu là DCE ----> thi cấp xung

Trong trường hợp này R2 là DCE

```
R2(config)#int s1/0
R2(config-if)#clock rate 64000
```

----> tắt 10s rồi no shut lại

-Bước 2 : Đặt IP cho cổng Serial cho 2 Router

- + R1: 192.168.12.13 255.255.255.252
- + R2: 192.168.12.14 255.255.252.252

Ping kiểm tra kết nối giữa 2 Router bằng cổng Serial

-Bước 3 : Cấu hình SDM của R1

- + DHCP : Cấp 2 pool 192.168.1.0/24 và 192.168.2.0/24
- + DNS1: 210.245.31.130
- DNS2: 203.113.188.1

*******Chu y** : R2 ko can cau hinh vi R1 se cau hinh 2 Pool cap dia chi IP cho ca 2 LAN

-Buoc 4 : Cau hinh RIP

+ R1

```
R1(config-router)#network 192.168.1.0  
R1(config-router)#network 192.168.12.0
```

+R2 Default Route toi Internet (ISP)

```
R2(config-router)#network 192.168.12.0
```

```
R2(config-router)#netwok 192.168.2.0
```

Dat IP cho cong Fa0/1 cua Router R2

```
#10.215.219.22 255.255.255.0
```

```
R2(config)#ip route 0.0.0.0 0.0.0.0 10.215.219.254
```

=====→ Kiem tra ket noi tu LAN1 sang LAN2: ping 10.215.219.22

ping 10.215.219.254 khong the duoc vi ta chua NAT(o buoc sau)

- Buoc 5 : Muon ben LAN2(Router R2) nhan IP Dynamic cho ca Client trong LAN2 (binh thuong ko cap duoc vi khac Subnet)

R2(config)# int fa0/0 -----> Vao Interface tren Router R2 noi voi Switch.

R2(config-if)# ip helper-address <IP cua Router lam DHCP server> ---> Bat ki IP nao ket noi truc tiep tren Router dong vai tro lam DHCP.

Example: (config-if)# ip helper-address 192.168.12.13

- Buoc 6:

Router Border gateway khong tu dong quang ba Default Route ma no co cho cac Router ben trong cung AS voi no.Muong cho Router Border Gateway quang ba default Router cho cac Router ben trong cung AS ta phai thuc hien cau lenh

R2(config)#router rip

R2(config-router)#default-information originate

- Buoc 7 : Kiem tra co dong bo thoi gian giua 2 ben thoi gian ko????

R1#sh clock detail

*11:41:02.623 UTC Thu Nov 8 2007

Time source is hardware calendar

Nguyen ly dong bo thoi gian :

R1#conf ter

Enter configuration commands, one per line. End with CNTL/Z.

R1(config)#hostname R1 --> nham kiem tra qua trinh dong bo thoi gian

R1(config)#^Z ----> Bam Ctr + Z

R1#

*Nov 8 11:44:12.387: %SYS-5-CONFIG_I: Configured from console by console -----> Log Message (chua dong bo voi R2)

R1#

-Buoc 1: xac dinh 1 thiet bi lam NTP Master(Network Time Protocol) trong he thong la thiet bi dong vai tro lam moc thoi gian chuan

+Trong vi du nay ta chon R2

+Cau hinh thoi gian chuan trong thiet bi

R2#clock set <hh:mm:ss> <Month:3 ky tu> <Day:2 so> <Year: 4 so>

exp: R2#clock set 11:49:20 Nov 08 2007

+ xac dinh vai tro NTP Master

R2(config)#NTP master

-Buoc 2: Cac thiet bi con lai trong he thong se cau hinh dong bo thoi gian voi NTP master

- + Chi dinh dia chi Ip cua NTP Master
R1(config)#ntp server 192.168.12.14
- + cap nhat lai dong ho thiet bi cua minh
R1(config)#ntp update-calendar

Kiem tra giuong nhau chua

R1#sh clock detail

12:06:19.617 UTC Thu Nov 8 2007

Time source is NTP

-----> Da dong bo thoi gian.

- Buoc 8 : NAT(Network Address Translation)

-Chuyen doi nhung IP cua nguoi dung trong LAN thanh ra nhung dia chi IP Public de giup cho nguoi dung co the giao tiep Internet

+ Inside Local: La nhung day dia chi cua nguoi dung trong mang LAN

+ Inside Global: La 1 hoac nhieu dia chi Ip(no thuong la Public) cho cac day dia chi Inside Local giao tiep voi Internet.

-Khi nguoi dung trong LAN giao tiep voi Internet. Source IP cua nguoi dung se duoc chuyen doi Inside Global (10.215.219.22)

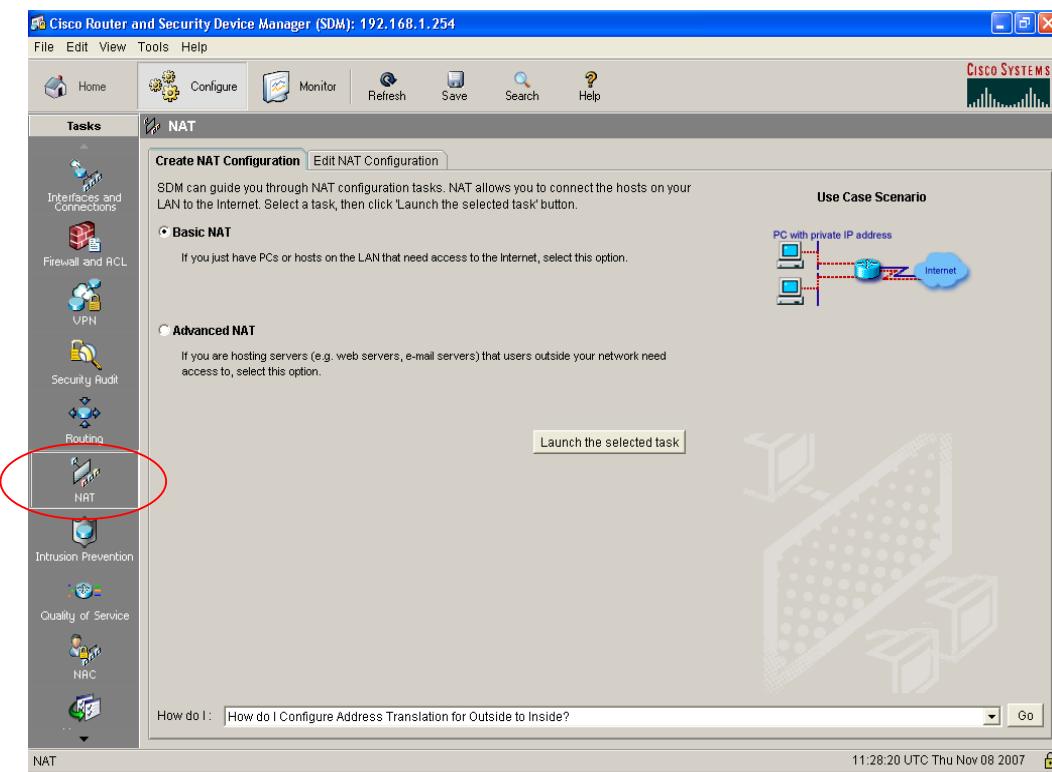
-Co che anh xa nhieu Inside Local sang 1 Inside Global thi phai kem theo gia tri Source Port (> 1024) goi la Port Address Translation (PAT) hay NAT Overloading

*** Chu y: nhieu Inside Local sang nhieu Inside Global goi la Dynamic NAT

Cach lam: Cac buoc trien khai PAT tren Router Border Gateway (R2) bang SDM

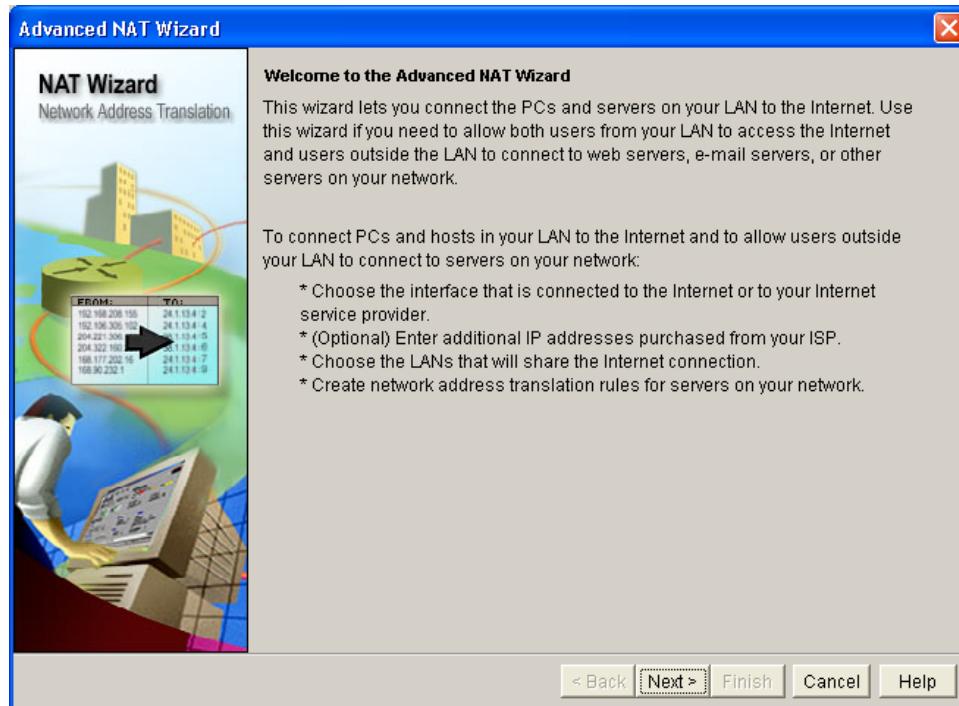
*** Vao giao dien SDM

-Buoc 1: a>Chon NAT

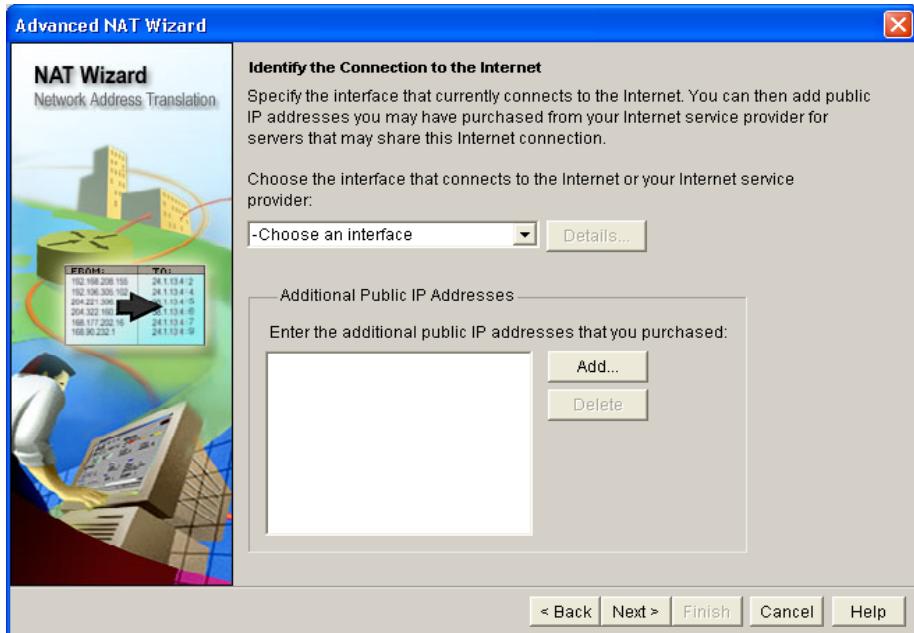


- +Basic NAT chỉ NAT trên 1 LAN kết nối trực tiếp
- +Chọn Advanced NAT (theo yêu cầu để bài tập có 2 Inside Local: 2 LAN)

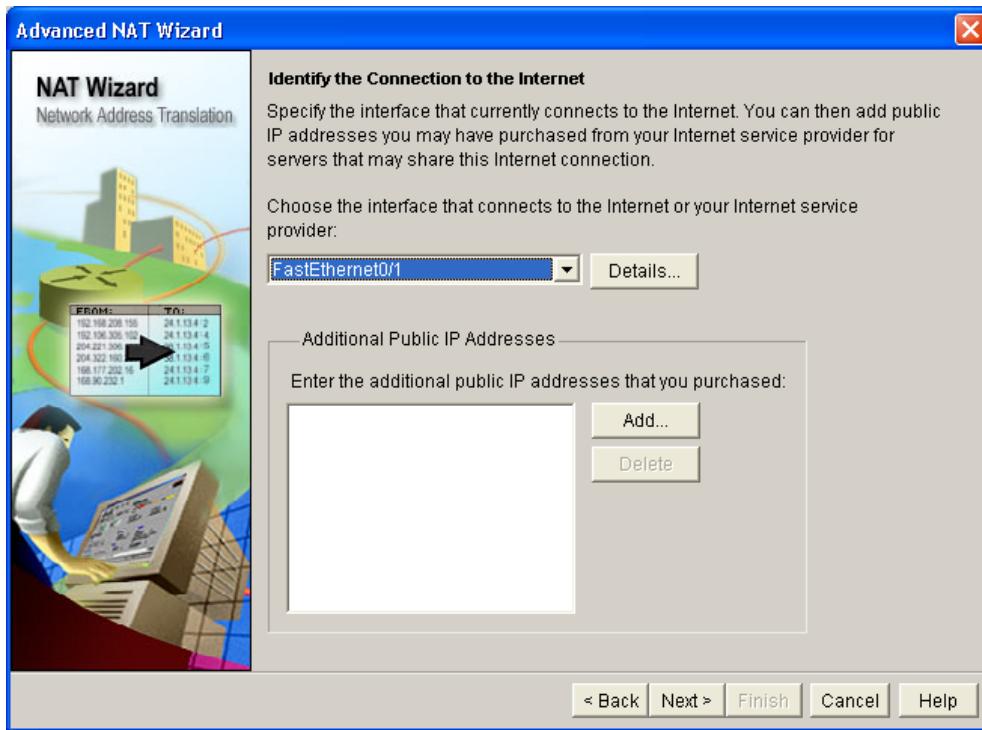
b> Tiếp theo chọn Button Launch the selected task



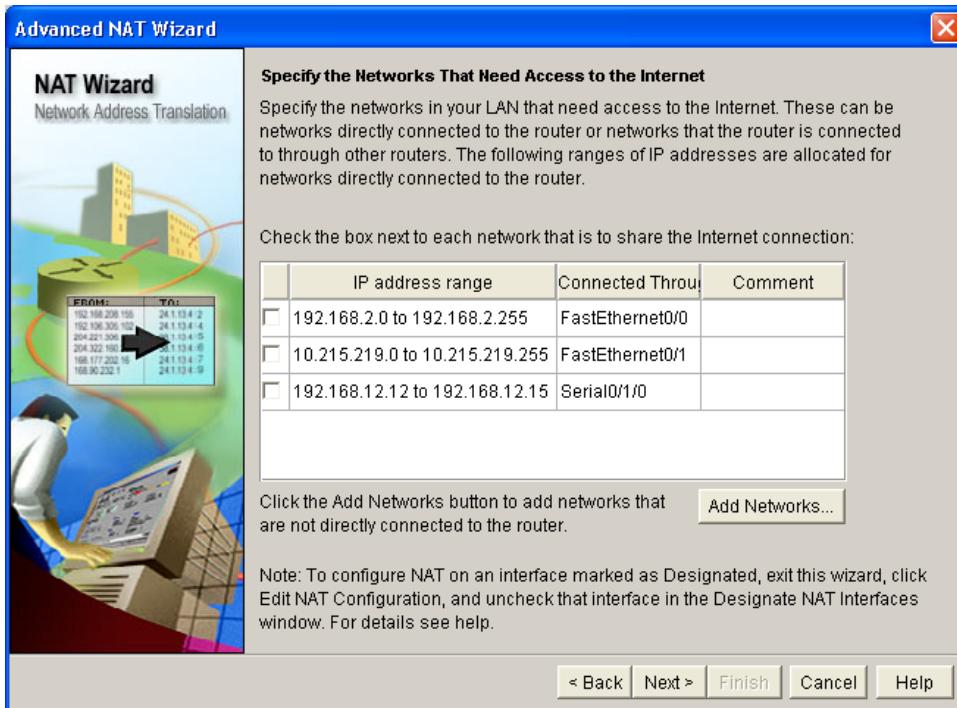
C> Bam Next



d> Chon Interface ra Internet, trong truong hop nay la Fa0/1(xem tren hinh ve) Day la Interface giao tiep voi Internet (trong truong hop o Vnpro la Interface giao tiep voi Outlet)



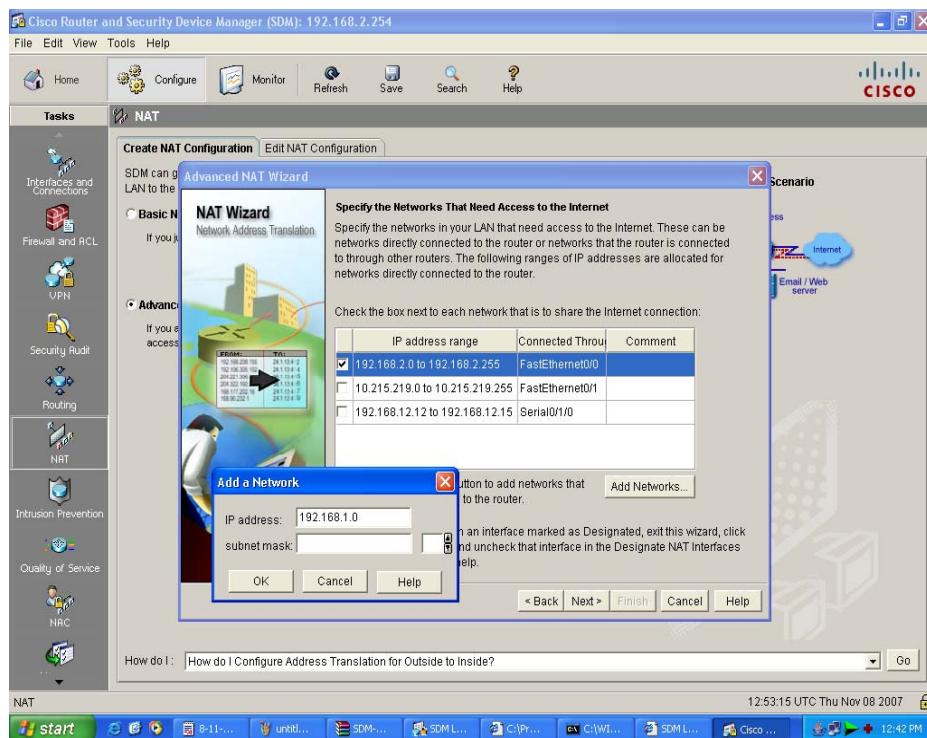
e > Bam Next



f> Xác định day Inside Local

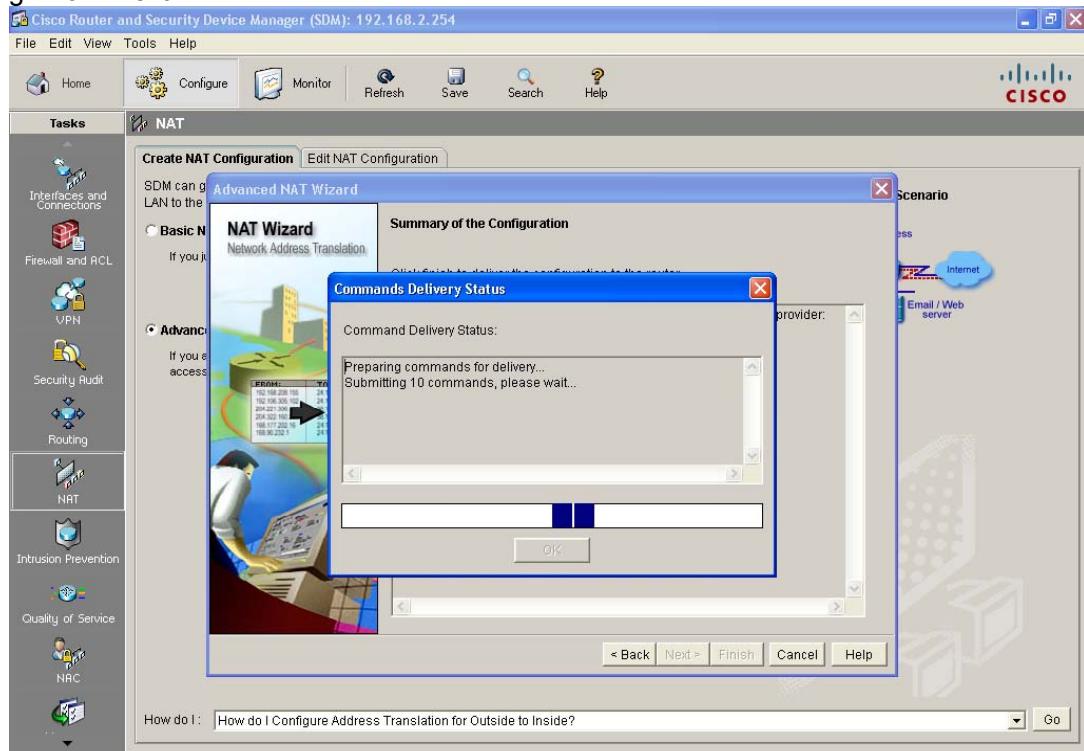
Chon cac dia chi ra Internet (192.168.2.0)

Vi ta con cac dia chi LAN 1 cung can ra Internet nen ta fai Add them 1 Network nua
Bam vao Add Networks...



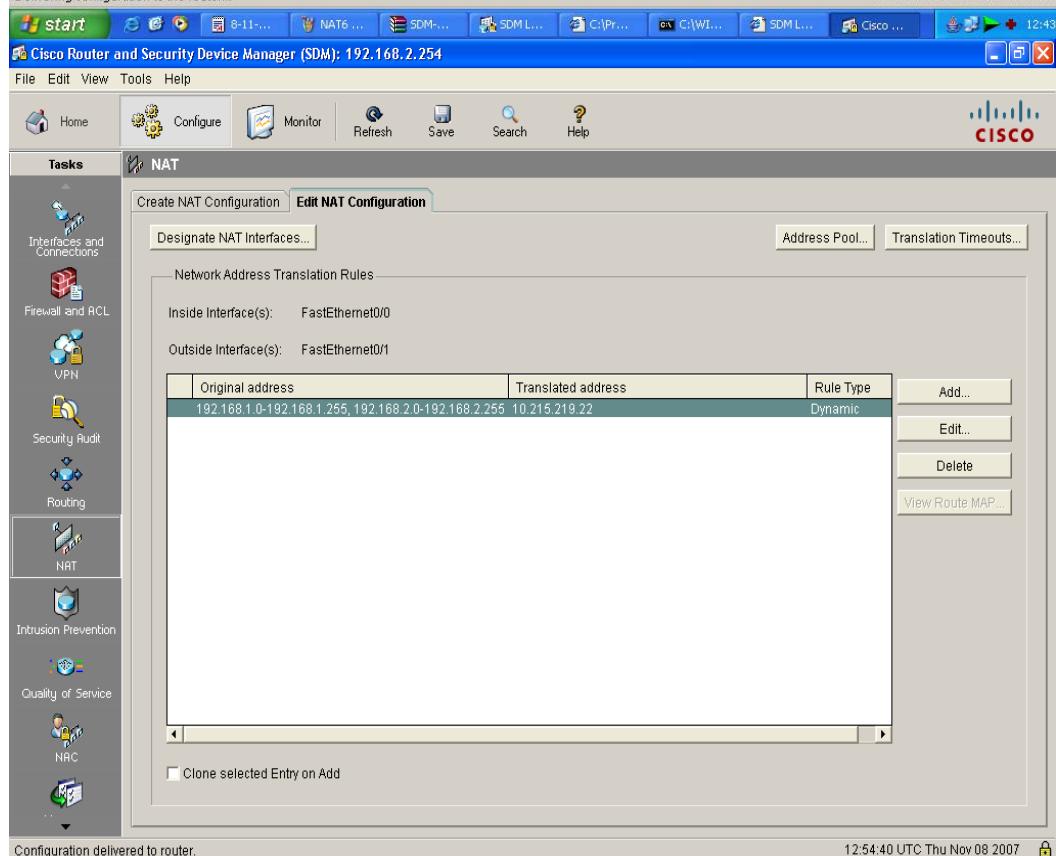
Nhap IP: 192.168.1.0 va Subnet Mask: 255.255.255.0

g> Bấm Next



How do I: How do I Configure Address Translation for Outside to Inside?

12:54:06 UTC Thu Nov 08 2007

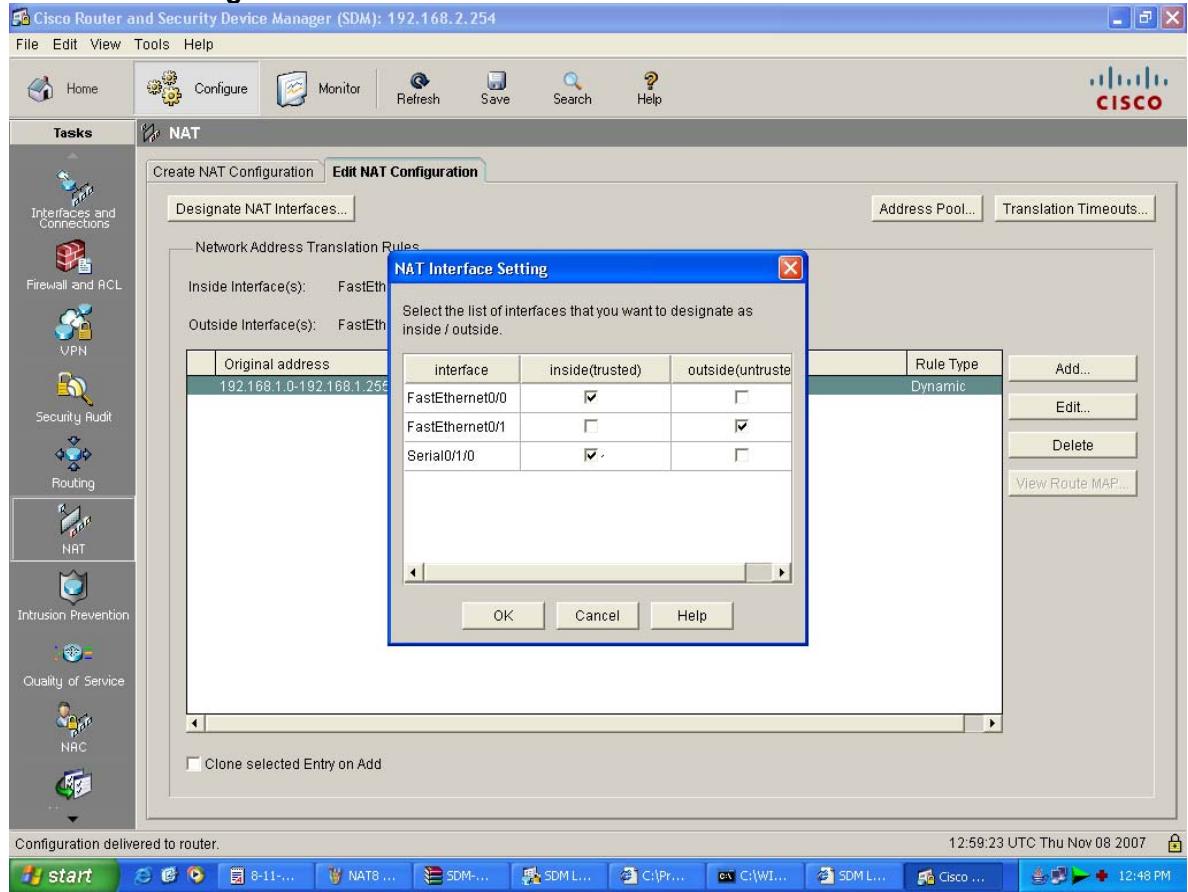


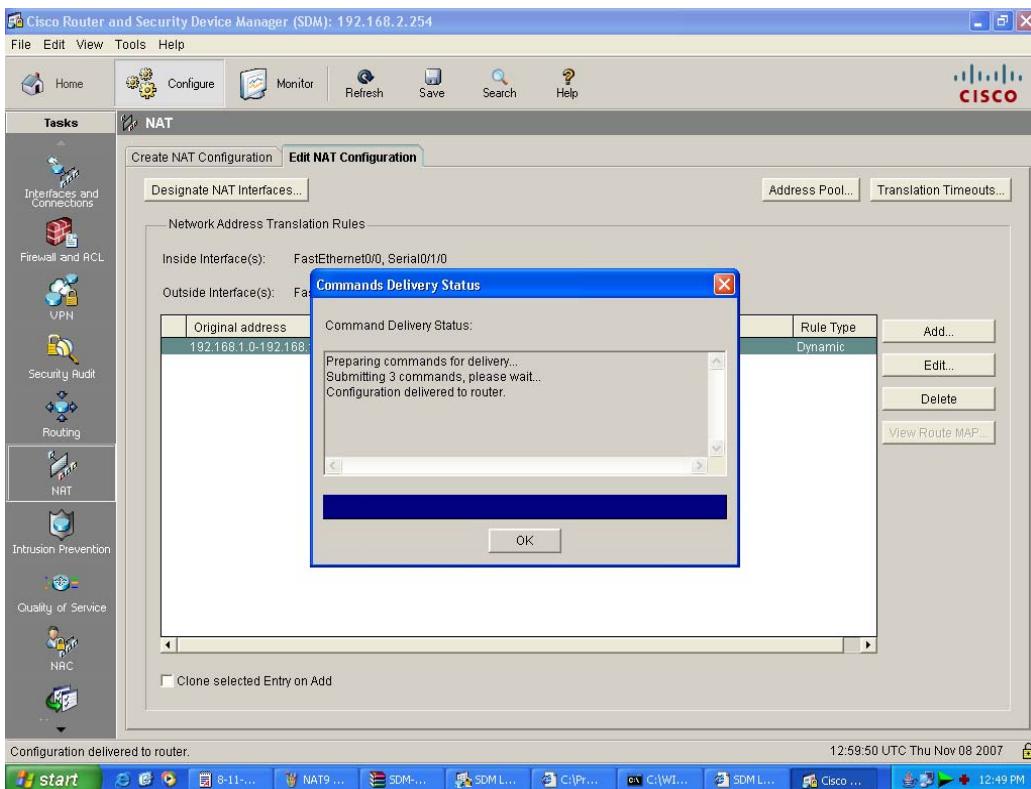
Configuration delivered to router.

12:54:40 UTC Thu Nov 08 2007

h> Xác định các Interface Inside và OutSide

Chọn button **Designate NAT Interfaces ...**





i> Nhan Ok de ket thuc
j> Nhan Button Save de luu lai cau hinh

- Buoc 9:

R1#ping 66.94.234.13 (YAHOO)

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 66.94.234.13, timeout is 2 seconds:

!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 668/685/724 ms
R1#

- Buoc 10 : Xem Bang NAT :

R2#sh ip NAT translations

| Pro | Inside global | Inside local | Outside local | Outside global |
|-----|--------------------|--------------------|--------------------|--------------------|
| udp | 10.215.219.22:1031 | 192.168.1.100:1031 | 210.245.31.130:53 | 210.245.31.130:53 |
| tcp | 10.215.219.22:1156 | 192.168.1.100:1156 | 207.46.193.254:80 | 207.46.193.254:80 |
| tcp | 10.215.219.22:1157 | 192.168.1.100:1157 | 211.206.123.219:80 | 211.206.123.219:80 |
| tcp | 10.215.219.22:1158 | 192.168.1.100:1158 | 210.245.31.22:80 | 210.245.31.22:80 |
| tcp | 10.215.219.22:1159 | 192.168.1.100:1159 | 210.245.31.22:80 | 210.245.31.22:80 |
| udp | 10.215.219.22:1041 | 192.168.2.2:1041 | 210.245.31.130:53 | 210.245.31.130:53 |
| tcp | 10.215.219.22:1186 | 192.168.2.2:1186 | 64.233.189.104:80 | 64.233.189.104:80 |
| tcp | 10.215.219.22:1187 | 192.168.2.2:1187 | 209.191.93.150:443 | 209.191.93.150:443 |
| tcp | 10.215.219.22:1188 | 192.168.2.2:1188 | 68.180.207.182:80 | 68.180.207.182:80 |

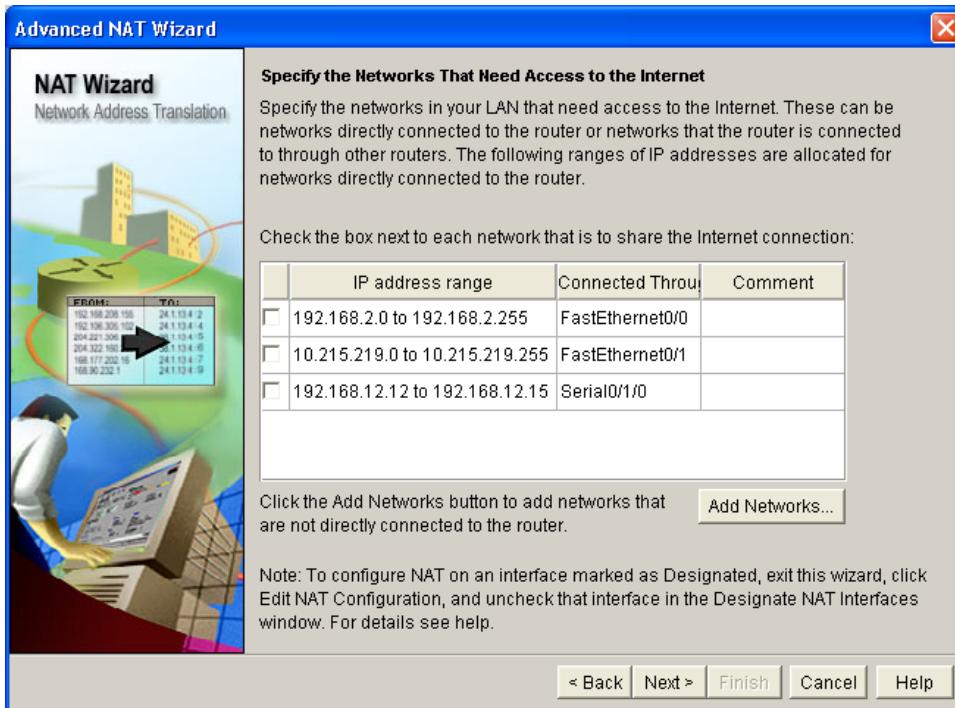
R2#debug ip NAT

IP NAT debugging is on

R2#terminal monitor (Vi đang ở Router 1 Telnet tới R2)

```
Nov 8 13:10:49.739: NAT: s=192.168.1.100->10.215.219.22, d=210.245.31.130 [4195]
-> 192.168.1.100: (Inside Local), 10.215.219.22(Inside Global), 210.245.31.130: Out Global
Nov 8 13:10:49.759: NAT: s=210.245.31.130, d=10.215.219.22->192.168.1.100 [16417]
Nov 8 13:10:49.795: NAT*: s=192.168.1.100->10.215.219.22, d=207.46.19.254 [4196]
Nov 8 13:10:49.803: NAT*: s=207.46.19.254, d=10.215.219.22->192.168.1.100 [0]
Nov 8 13:10:49.815: NAT*: s=192.168.1.100->10.215.219.22, d=207.46.19.254 [4198]
Nov 8 13:10:49.851: NAT*: s=192.168.1.100->10.215.219.22, d=207.46.19.254 [4199]
Nov 8 13:10:49.859: NAT*: s=207.46.19.254, d=10.215.219.22->192.168.1.100 [34337]
Nov 8 13:10:50.279: NAT*: s=207.46.19.254, d=10.215.219.22->192.168.1.100 [34338]
Nov 8 13:10:50.383: NAT: s=192.168.1.100->10.215.219.22, d=210.245.31.130 [4201]
Nov 8 13:10:50.399: NAT: s=210.245.31.130, d=10.215.219.22->192.168.1.100 [17653]
Nov 8 13:10:50.431: NAT*: s=192.168.1.100->10.215.219.22, d=211.206.123.219 [4202]
Nov 8 13:10:50.531: NAT*: s=192.168.1.100->10.215.219.22, d=207.46.19.254 [4204]
Nov 8 13:10:59.035: NAT: expiring 10.215.219.22 (192.168.2.2) tcp 1196 (1196)
Nov 8 13:11:01.683: NAT*: s=192.168.2.2->10.215.219.22, d=60.254.131.177 [2851]
Nov 8 13:11:01.683: NAT*: s=192.168.2.2->10.215.219.22, d=60.254.131.177 [2853]
Nov 8 13:11:04.667: NAT: expiring 10.215.219.22 (192.168.2.2) tcp 1199 (1199)
Nov 8 13:11:04.667: NAT: expiring 10.215.219.22 (192.168.2.2) tcp 1198 (1198)
Nov 8 13:11:04.687: NAT*: s=192.168.2.2->10.215.219.22, d=60.254.131.177 [2855]
Nov 8 13:11:04.687: NAT*: s=192.168.2.2->10.215.219.22, d=60.254.131.177 [2856]
Nov 8 13:11:07.707: NAT*: s=60.254.131.177, d=10.215.219.22->192.168.2.2 [0]
Nov 8 13:11:07.707: NAT*: s=60.254.131.177, d=10.215.219.22->192.168.2.2 [0]
All possible debugging has been turned off
R2#u all
All possible debugging has been turned off
```

- Bước 11: Trong trường hợp thêm thiết bị phát sóng Wireless thì khi làm NAT phải them Interface Wireless tại bước này.



INTERSITE WAN LINK

Mo hinh ket noi:

R1 (s0/1/0) (+1) ----- 212.212.212.12/30-----R2 (+2) (Serial0/2/0)

- Cau hinh Router R1:

- +B1: Cam cap V35 (chua cau hinh IP Address)
- +B2: Kiem tra DTE-DCE

R1#sh control s0/1/0

+B3: Neu la DCE Cap xung
R1(config)# clock rate 64000

```
-----  
R1(config)#  
R1#sh ip int bri  
Interface          IP-Address      OK? Method Status       Prot  
  ocol  
FastEthernet0/0    unassigned     YES unset  administratively down down  
FastEthernet0/1    unassigned     YES unset  administratively down down  
Serial0/1/0        212.212.212.13 YES manual up           up  
Serial0/3/0        unassigned     YES unset  down            dow
```

R1#ping 212.212.212.14

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 212.212.212.14, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 28/28/28 ms

- Cau hinh Router R2 :

```
R2#sh ip int bri
Interface          IP-Address      OK? Method Status        Prot
ocel
FastEthernet0/0    192.168.2.254  YES manual up           down
FastEthernet0/1    unassigned     YES unset administratively down down
Serial0/1/0        unassigned     YES unset administratively down down
Serial0/2/0        212.212.212.14 YES manual up           up
Serial0/3/0        unassigned     YES unset administratively down dow
```

**** Cac ky thuật Internet WAN ****

- DSL
- Cable Modem

1. Point To Point: Lease Line

-Kết nối dạng Full Mesh, Công Thức tính số kết nối
n là số Route : $n \cdot (n-1)/2$

-Chuẩn đồng bộ Layer 2 trong kết nối Inter Site WAN Link dạng Point-To-Point:
+ HDLC (High Level Datalink Control) là chuẩn đồng bộ Layer 2 mặc định trên tất cả các thiết bị Cisco
+ PPP (Point to Point Protocol)

Kiem tra:

```
R1#sh int s0/1/0
Serial0/1/0 is up, line protocol is up
Hardware is GT96K Serial
Internet address is 212.212.212.13/30
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
  Reliability 255/255, txload 1/255, rxload 1/255
Encapsulation HDLC, loopback not set
Keepalive set (10 sec)
Last input 00:00:07, output 00:00:00, output hang never
Last clearing of "show interface" counters 00:39:07
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 1158 kilobits/sec
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
 295 packets input, 20119 bytes, 0 no buffer
 Received 231 broadcasts, 0 runts, 0 giants, 0 throttles
 1 input errors, 1 CRC, 1 frame, 1 overrun, 0 ignored, 0 abort
 317 packets output, 20251 bytes, 0 underruns
 0 output errors, 0 collisions, 9 interface resets
 0 output buffer failures, 0 output buffers swapped out
 4 carrier transitions
 DCD=up DSR=up DTR=up RTS=up CTS=up

2. Point to Multi Point

-Cong nghe Frame Relay, X25(cong nghe lau doi).....

-Cong nghe khac chuan dong goi se khac

+ Trong LAN la 802.3

+ Ngoai WAN

====> Doi hoi phai co su tuong thich ve chuan dong goi Layer 2 giua 2 dau ket noi thi mach moi hoat dong (**UP - UP**)

R1 (HDLC) -----Internet-----R2 (HDLC)

R1 (PPP) -----Internet-----R2 (PPP)

----> UP UP

R1 (HDLC) Cisco -----Internet-----R2 (PPP) Juniper

----> UP DOWN

Kiem tra:

R1 (HDLC) Cisco -----Internet-----R2 (PPP) Juniper

vi du :

-B1:

```
R1(config)#int s0/1/0
R1(config-if)#encapsulation ppp
R1(config-if)#
-B2:
```

```
R1(config-if)#do sh ip int bri
Interface          IP-Address   OK? Method Status      Prot
ocol
FastEthernet0/0    unassigned    YES unset administratively down down
FastEthernet0/1    unassigned    YES unset administratively down down
Serial0/1/0        212.212.212.13 YES manual up           down
--> Chuan dong goi khac nhau nen se bi UP-DOWN
```

```
Serial0/3/0        unassigned    YES unset down           down
```

-B3:

```
R1(config-if)#do sh int s0/1/0
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
```

reliability 255/255, txload 1/255, rxload 1/255

Encapsulation PPP, LCP Open

Open: CDPCP, IPCP, loopback not set

Keepalive set (10 sec)

Last input 00:00:01, output 00:00:00, output hang never

Last clearing of "show interface" counters 00:02:48

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 1158 kilobits/sec

5 minute input rate 0 bits/sec, 0 packets/sec

5 minute output rate 0 bits/sec, 0 packets/sec

 25 packets input, 502 bytes, 0 no buffer

 Received 0 broadcasts, 0 runts, 0 giants, 0 throttles

 0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort

 46 packets output, 636 bytes, 0 underruns

 0 output errors, 0 collisions, 8 interface resets

--More--

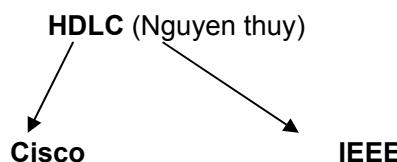
*Nov 10 03:55:21.303: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/
0, changed state to up

-----> **Luc nay mach dang hoat dong**

R1 (PPP) -----Internet----- R2 (PPP)

HDLC (NGUYEN THUY)

- Truyền chậm
- Tin hiệu Analog
- Cò che phát triển và khác phục lỗi kém
- Chỉ hỗ trợ truyền dữ liệu kiểu Asynchronous (bat động bo)



| HDLC (của Cisco) | PPP |
|--|--|
| <ul style="list-style-type: none"> + Truyền nhanh + Truyền tin hiệu Analog, Digital + Cò che phát triển và khác phục lỗi mạnh mẽ + Hỗ trợ truyền dữ liệu theo kiểu | <ul style="list-style-type: none"> + Cung cấp tính năng tương tự HDLC + Hỗ trợ nhiều Layer 3 khác nhau: IP, IPX, Apple + Hỗ trợ tính năng tùy chọn mở rộng bao gồm: |

| | |
|---|--|
| Asynchronous, Synchronous
+ Ho tro chuan Layer 3 la IP | .Authentication
.Multilink
.Compress
.Call Back |
|---|--|

1. FRAMING

La co che (hoac luat) trong WAN: qui dinh giua 2 dau ket noi de thong nhat ve co che dong goi Frame, dieu khien qua trinh truyen nhan Frame.

2. SYNCHRONOUS

- Doi hoi phai co su dong bo ve xung nhip giua 2 thiet bi CSU/DSU giua 2 dau cua mach ket noi
- Tin hieu truyen la Digital
- Data truyen duoi dang la 1 Block cac Byte nen toc do nhanh hon.

3. ASYNCHRONOUS

- Khong doi hoi su ap dat su dong bo xung nhip giua 2 thiet bi dieu che giua 2 dau cua mach ket noi.
- Tin hieu truyen di la dang Analog
- Du lieu goi tung Byte

4. PPP (Layer 2)

1> Nhung thanh phan cua PPP:

- HDLC: La thanh phan giao tiep voi Layer 1, se qui dinh ra hinh thuc dong goi Frame phu hop tuy thuoc vao co che truyen thong (Asyn, Syn).
- LCP (Link Control Protocol):
 - +Co nhiem vu thiet lap, duy tri va ket thuc kenh truyen
 - +Kiem tra chat luong duong truyen
 - +Phat hien va khac phuc loi cua du lieu
 - +Thuc hien nhien vu thuong luong cac tuy chon trong qua trinh thiet lap kenh truyen
 - + Authentication
 - + Multilink
 - + Compress
 - + Call Back
- NCP (Network Control Protocol): co nhiem vu quy dinh hinh thuc dong goi Frame khac nhau tuy thuoc vao giao thuc Layer 3 khac nhau.

Kiem tra :

R2(config-if)#no encapsulation ppp

R1(config-if)# shut
R1(config-if)# no shut

Serial0/1/0 is up, line protocol is down
Hardware is GT96K Serial
Internet address is 212.212.212.13/30
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
reliability 255/255, txload 1/255, rxload 1/255

Encapsulation PPP, LCP REQsent, loopback not set
Keepalive set (10 sec)
Last input 00:00:02, output 00:00:00, output hang never
Last clearing of "show interface" counters 00:00:12
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 1158 kilobits/sec
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
 1 packets input, 24 bytes, 0 no buffer
 Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
 0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
 7 packets output, 98 bytes, 0 underruns
 0 output errors, 0 collisions, 0 interface resets
 0 output buffer failures, 0 output buffers swapped out

R1#sh int s0/1/0

Serial0/1/0 is up, line protocol is down
Hardware is GT96K Serial
Internet address is 212.212.212.13/30
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
 reliability 255/255, txload 1/255, rxload 1/255
Encapsulation PPP, LCP Listen, loopback not set
Keepalive set (10 sec)
Last input 00:00:05, output 00:00:18, output hang never
Last clearing of "show interface" counters 00:00:36
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 1158 kilobits/sec
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
 4 packets input, 86 bytes, 0 no buffer
 Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
 0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
 10 packets output, 140 bytes, 0 underruns
 0 output errors, 0 collisions, 2 interface resets
 0 output buffer failures, 0 output buffers swapped out
--More--

Kiem tra:

R1#sh int s0/1/0
Serial0/1/0 is up, line protocol is up
Hardware is GT96K Serial
Internet address is 212.212.212.13/30
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
 reliability 255/255, txload 1/255, rxload 1/255
Encapsulation PPP, LCP Open ----> LCP Open thi NCP moi Open (CDPCP, IPCP)

thanh phan cua NCP

Open: CDPCP, IPCP, loopback not set

Keepalive set (10 sec)

Last input 00:00:39, output 00:00:07, output hang never

Last clearing of "show interface" counters 00:05:35

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 0/2/256 (active/max active/max total)

 Reserved Conversations 0/0 (allocated/max allocated)

 Available Bandwidth 1158 kilobits/sec

5 minute input rate 0 bits/sec, 0 packets/sec

5 minute output rate 0 bits/sec, 0 packets/sec

 70 packets input, 3698 bytes, 0 no buffer

 Received 0 broadcasts, 0 runts, 0 giants, 0 throttles

 0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort

 72 packets output, 3176 bytes, 0 underruns

 0 output errors, 0 collisions, 4 interface resets

5. PPP FRAME FORMAT

-Flag: goi 1 truong co **01111110** bao bat dau gui Frame va ket thuc Frame

-Address:

-Control:

-Protocol:

 0021(Hex): Internet Pro

 0029(Hex): AppleTalk

 002B (Hex): Novell IPX

 8021: Internet Protocol Control Protocol

 8029: Appletalk Control Protocol

 802B: Novell IPX Control Protocol

 C021: Link Control Protocol

 C023: Authentication Protocol

-Data:

-FCS:

Khi mach khong co trao doi du lieu trong 1 khoang thoi gian thi mach se trao doi voi nhau nhung **Idle Frames** (La nhung bit 0, 1 roi rac)

De tranh truong hop nham voi Data nguoi ta se them mot bit 0 vao sau bit thu 5 tinh tu ben phai qua

01111110.11011110.01111110

WIRELESS LAN

1. Gioi thieu:

-Cung cap tinh co dong (Flexibility) uyen chuyen cho nguoi dung.

- Mo rong cua LAN

-Moi truong truy xuat CSMA/CA (Carrier Sense Multiple Access/Collision Avoidance)

2. Service Set Area: WLAN (giong Broadcast Domain trong LAN) : la tap trung tat ca cac

thiết bị không dây cung cấp hoạt động chung dưới 1 số quản trị nào đó. Sử dụng chung 1 Network

3. Các thiết bị Wireless:

- Wireless NIC
- Acess Point(giống HUB LAN): là thiết bị phát sóng radio và nó tạo ra 1 vùng hoạt động Service Set Area cho các máy tính sử dụng Wireless kết nối.
 - + Một Access Point thường có 2 Interface chính.
 - * Interface Ethernet : để kết nối với LAN để trở thành 1 phần mở rộng của LAN
 - * Interface Radio (Anten): phát sóng radio để tạo môi trường truy xuất cho người dùng không dây.
 - + Đối với Access Point các Interface sử dụng cùng Network (Subnetwork)
 - + Định danh và chuyên định dạng Frame

4. Wireless Router :

- Chức năng giống như AP
- Hai Interface Radio và Ethernet thuộc 2 Network/Subnetwork khác nhau
- Cung cấp khả năng định tuyến.

***Lưu ý: Giao tiếp giữa các thiết bị không dây trong cùng 1 Service Set Area đòi hỏi về sự tương thích giữa các chuẩn không dây

5. Các chuẩn WLAN:

- **802.11b :**

- + Là chuẩn Wireless phát ra sóng radio được điều chế theo kỹ thuật DSSS(Direct Sequence Spread Spectrum: trai pho chuỗi trực tiếp)
- + Tần số 2,4 Ghz, phát ra 11 kênh khác nhau (1-> 11) với tốc độ tối đa 11Mbps
- + Mỗi thiết bị phát sóng 802.11b nếu cùng phát ra 2 kênh giống nhau hoặc gần nhau thì tin hiệu sẽ nhiều và trì延 tiê lan nhau.
- Do đó nếu ta thiết lập 1 Service Set Area có nhiều hơn 1 thiết bị phát sóng chuẩn 802.11b thì các thiết bị phải đảm bảo cùng phát ra sóng Radio với kênh truyền cách nhau là 5.Ta có thể tạo 1 Service Set Area sử dụng chuẩn 802.11b với tốc độ tối đa 3 thiết bị phát sóng.(Thiết bị có kênh 1,Thiết bị có kênh 6,Thiết bị có kênh 11)

- **802.11a:**

- + Là chuẩn Wireless phát ra sóng radio được điều chế theo kỹ thuật OFDM(Orthogonal Frequency Division Multiplexing Gộp kênh phân chia tần số trực tiếp):
- + Tần số 5Ghz
- + Phát ra 23 kênh(1-23) với tốc độ tối đa là 54 Mbps
- Do đó ta có thể tạo tối đa 1 Service Set Area sử dụng chuẩn 802.11a thì các thiết bị phải đảm bảo cùng phát ra sóng Radio với kênh truyền cách nhau là 2 với tần số là 12 thiết bị phát sóng.

- **802.11g:**

- + Là chuẩn Wireless phát ra sóng radio được điều chế theo kỹ thuật
 - . DSSS: 11Mbps
 - . OFDM: 54Mbps

6. Một số mô hình mạng không dây cơ bản:

- **Adhoc (Independent Basic Service Set IBSS):**

Một mô hình Wireless LAN cơ bản bao gồm 2 máy tính có card mạng Wireless giao tiếp với nhau.

- **Basic Service Set (BSS)** : là 1 mô hình Wireless LAN bao gồm có 1 thiết bị phát sóng

Radio(AP,WR) và các PC có card Wireless

Truyền thông giao tiếp giữa các PC trong Service Set Area sẽ gửi đến AP, WR

Sau đó AP,WR mới gửi dữ liệu đến dịch vụ

7. Extensible Service Set (ESS):

- Là 1 mô hình Wireless LAN bao gồm nhiều hơn 1 thiết bị phát sóng Radio(Các thiết bị phát sóng này phải phát ra kênh tần số không bị nhiều và tách biệt nhau)
- Người dùng khi ở gần thiết bị phát sóng nào thì sẽ kết nối với thiết bị phát sóng đó, khi người dùng di chuyển ra khỏi tầm phủ sóng của 1 thiết bị phát sóng nào đó thì máy tính người dùng sẽ kết nối với thiết bị phát sóng khác
- Điều chỉnh vùng phủ sóng của người dùng không bị mất kết nối với thiết bị phát sóng do đó khoảng cách 10-15%

8. Một số tính chất của Wireless LAN:

- Truyền thông Half Duplex
- Tín hiệu sóng Radio phát đi ra ngoài không khi sẽ bị ảnh hưởng bởi nhiều yếu tố
 - + Radio bị hấp thụ vật cản ---> suy yếu tín hiệu
 - + Phản xạ, nhiều vật cản ---> Sóng bị lệch pha, tách biệt lan nhau.
 - + Ảnh hưởng của các thiết bị phát sóng khác: Cordless Phone, Viba, TV.....
- *** Một số yếu tố cần nhắc khi thiết kế mạng không dây:
 - Thiết bị phát sóng sử dụng Anten loại nào, công suất ra sao.
 - + Đèn báo
 - + Đèn báo
 - + Với Anten có công suất cao, phát ra tần số cao, tầm cao phải cảng hẹp

**** Thực hiện công việc : Site Survey(Router:Aironet AP phát sóng 300m)

9. Bảo mật:

- Chung thực
 - Hỗ trợ mã hóa địa điểm
 - bảng phương thức
 - + PSK(Preshared Key)
 - . Key tĩnh
 - . có thể bị Crack để đăng nhập
 - + WPA
 - . Hình thức chung là bắt buộc
 - . Thuật toán mã hóa phức tạp
 - . Key động, thay đổi liên tục
- Gom 2 loại:
- * Personal : CSDL chung thực người dùng được lưu trữ trên thiết bị phát sóng
 - * Enterprise: CSDL chung thực User được lưu trên 1 máy chủ chung riêng.

Khi User muốn kết nối với AP thì User sẽ được yêu cầu chung thực. Thông tin chung thực User được gửi từ User sẽ được AP chuyển đến Server để chung thực.

Thông tin chung thực trao đổi giữa Server và AP được mã hóa mạnh mẽ

CÁCH THỰC TRIỂN KHAI MỘT WIRELESS LAN

- 1.Thực hiện công việc Site Survey
2. Lựa chọn các thiết bị phát sóng phù hợp
 - Tầm phủ sóng
 - Mật độ bao phủ
 - Số lượng người dùng → Một thiết bị phát sóng hỗ trợ tốt khoảng 30 User Wireless.
 - Loại Anten
 - Công suất Anten

- Cac chuan Wireless phu hop
- 3. Cau hinh co ban cho 1 thiet bi phat song
- Cau hinh Static IP
- Cau hinh dich vu DHCP de cap IP dong cho gnuoi su dung Wireless
- Thong so : SSID (Service Set Identification): ten cua Service Set Area.Phai dong nhat tren tat ca cac thiet bi phat song trong cung 1 Service Set Area.
- 4.Cau hinh kieu chung thuc.
- 5. Cau hinh kieu ma hoa.

BT:

TIEN TRINH THIET LAP KET NOI

1.Cac thiet bi phat song Radio (AP,WR)

AP sau khi cau hinh mac dinh no se Broadcast ra Service Set Area cua no bao gom cac thong tin.

- + SSID
- + Tan so
- + Kenh
- + Authentication
- + Encryption
- + DHCP

2. Wireless User: PC, Laptop su dung Windows mac dinh se phat hien thong tin Broadcast tu AP voi cong cu: Zero Configuration Utility (ZCF) duoc tinh hop ben trong he dieu hanh Windows se giup cho cac Wireless User se tu dong ket noi AP.

Neu Access Point ko cau hinh chung thuc hoac no se dua 1 Wizard de giup user nhap password neu nhu Access Point yeu cau chung thuc.

3. Mot so cach khac phuc diem yeu cua Web:

- Diable tinh nang cua AP(SSID Cloaking)
- Loc ra MAC Filter: dinh nghia ra cac MAC cho he thong ket noi toi AP

WR LINKSYS

Cac Interface:

1. Internet
2. Radio (Wireless)

PHẦN 2: CCNA

CCNA

Virtual Lan (Vlan)

1. Khai niem:

- La ki thuat chia nho broadcast domain vao ly thanh nhieu **Virtual Broadcast Domain**
- Mỗi VLAN sẽ sử dụng 1 Network hoặc 1 Subnetwork

2. Loi ich:

- Tăng hiệu suất mạng
- Để dễ triển khai các tính năng bảo mật
- Tiết kiệm chi phí
- Tăng tính uyên chuyển trong việc thiết kế hệ thống.
- Cho phép nhóm người dùng cùng chức năng trong một tổ chức vào chung 1 Broadcast Domain mà không phải thuộc vào vị trí địa lý.
- Các user trong cùng VLAN có thể giao tiếp với nhau dễ dàng, các User thuộc về các VLAN khác nhau muốn giao tiếp với nhau thì phải có sự xuất hiện của thiết bị Layer 3(Router).
- Thông tin VLAN được tạo trên Switch và có thể lan truyền sang các Switch khác kết nối trong cùng 1 hệ thống thông qua đường kết nối **Trunk** và Interface VLAN1 (thông tin VLAN không được truyền qua mạng khác).

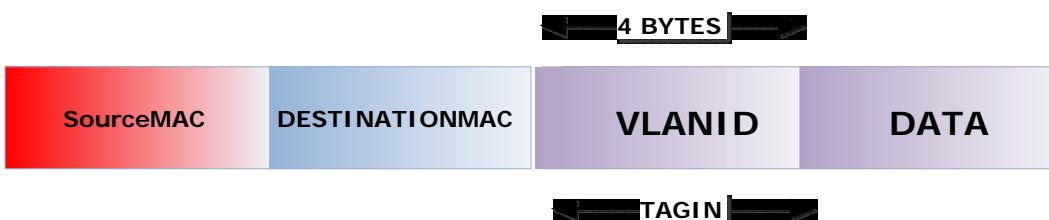
*** **Trunk Link:** là kết nối giữa các Switch với Switch hoặc Switch với Router trong cơ sở hạ tầng để triển khai VLAN. Kết nối này cho phép lưu thông của tất cả VLAN đi qua nó

- Data của người dùng thuộc VLAN nào khi len đường Trunk sẽ được Switch đóng gói(encapsulation) thông tin **VLANID** vào Frame để đánh dấu DATA trên thuộc về VLAN nào.

- Có 2 hình thức đóng gói VLANID:

+ **802.1q(dot1q):** Là hình thức đóng gói thông tin về VLAN cho các Frame thuộc về các VLAN khác nhau với độ lớn là **4bytes**.

Thông tin VLANID sẽ được đóng gói sau trường Destination MAC (**Tagin**). Tính toán (CRC) kiểm tra tính toán ven của Frame.

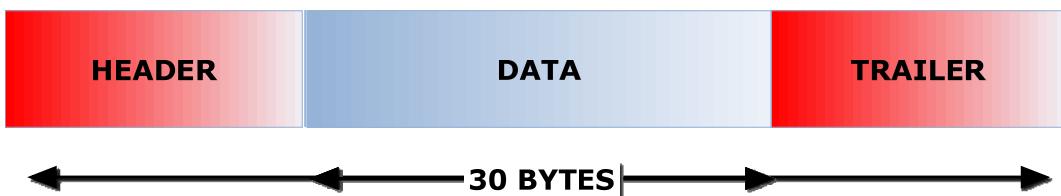


Hình 1: Cấu trúc **802.1q (dot1q)**

+ **ISL (Inter Switch Link):** chỉ có trên các SW Cisco
Là hình thức đóng gói VLANID vào các Frame thuộc VLAN khác nhau

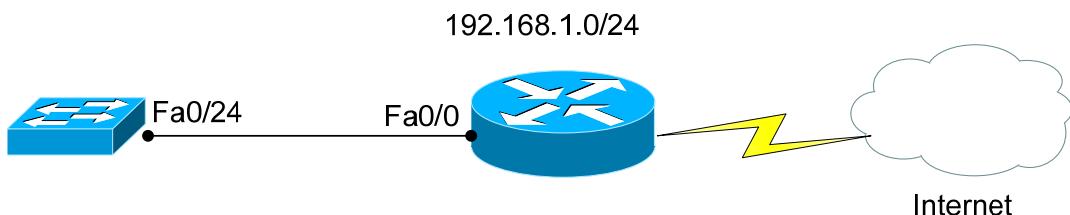
Thông tin về VLANID sẽ được đóng gói dưới dạng
26bytes: Header

4bytes: Trailer
vao Frame nguyen thuỷ



Hình 2: Cấu trúc ISL

CÁCH TẠO THÔNG TIN VLAN TREN CISCO CATALYST SWITCH



1. Bước 1 : Tao thong tin VLAN, dat ten cho VLAN(Optional)

Co duong mang 192.168.1.0/24 -> can 4 VLAN

VLAN10: Giám Đốc: port 1-5

VLAN20: Nhân Viên: port 6-16

VLAN30: Tapat Vu: port 17,19,21

VLAN1: => port 18, 20,22,23,24(nối với Router). Các port này để dành cho các quản trị.

Subnet 0 : 192.168.1.0/26(VLAN1) DG: 192.168.1.62

Subnet 1 : 192.168.1.64/26(VLAN10) DG: 192.168.1.126

Subnet 2 : 192.168.1.128/26(VLAN20) DG: 192.168.1.190

Subnet 3 : 192.168.1.192/26(VLAN30) DG: 192.168.1.254

```
SWHDD(config)#vlan 10
SWHDD(config-vlan)#name GIAMDOC
SWHDD(config-vlan)#exit
SWHDD(config)#vlan 20
SWHDD(config-vlan)#name NHANVIEN
SWHDD(config-vlan)#exit
SWHDD(config)#vlan 30
SWHDD(config-vlan)#name TAPVU
```

```
SWHDD#sh vlan
hoặc SWHDD#sh vlan brief
```

```
SWHDD#sh vlan
```

| VLAN Name | Status | Ports |
|-----------|--------|----------------------------|
| 1 default | active | Fa0/1, Fa0/2, Fa0/3, Fa0/4 |

| |
|-----------------------------------|
| Fa0/5, Fa0/6, Fa0/7, Fa0/8 |
| Fa0/9, Fa0/10, Fa0/11, Fa0/12 |
| Fa0/13, Fa0/14, Fa0/15, Fa0/16 |
| Fa0/17, Fa0/18, Fa0/19, Fa0/20 |
| Fa0/21, Fa0/22, Fa0/23, Fa0/24 |
| 10 GIAMDOC active |
| 20 NHANVIEN active |
| 30 TAPVU active |
| 1002 fddi-default act/unsup |
| 1003 token-ring-default act/unsup |
| 1004 fddinet-default act/unsup |
| 1005 trnet-default act/unsup |

| VLAN | Type | SAID | MTU | Parent | RingNo | BridgeNo | Stp | BrdgMode | Trans1 | Trans2 |
|------|------|--------|------|--------|--------|----------|-----|----------|--------|--------|
| 1 | enet | 100001 | 1500 | - | - | - | - | 0 | 0 | |
| 10 | enet | 100010 | 1500 | - | - | - | - | 0 | 0 | |
| 20 | enet | 100020 | 1500 | - | - | - | - | 0 | 0 | |
| 30 | enet | 100030 | 1500 | - | - | - | - | 0 | 0 | |

| VLAN | Type | SAID | MTU | Parent | RingNo | BridgeNo | Stp | BrdgMode | Trans1 | Trans2 |
|------|-------|--------|------|--------|--------|----------|------|----------|--------|--------|
| 1002 | fddi | 101002 | 1500 | - | - | - | - | 0 | 0 | |
| 1003 | tr | 101003 | 1500 | - | - | - | - | 0 | 0 | |
| 1004 | fdnet | 101004 | 1500 | - | - | - | ieee | - | 0 | 0 |
| 1005 | trnet | 101005 | 1500 | - | - | - | ibm | - | 0 | 0 |

Remote SPAN VLANs

| Primary | Secondary | Type | Ports |
|---------|-----------|------|-------|
|---------|-----------|------|-------|

=====

SWHDD#sh vlan bri

| VLAN Name | Status | Ports |
|-------------------------|-----------|---|
| 1 default | active | Fa0/1, Fa0/2, Fa0/3, Fa0/4
Fa0/5, Fa0/6, Fa0/7, Fa0/8
Fa0/9, Fa0/10, Fa0/11, Fa0/12
Fa0/13, Fa0/14, Fa0/15, Fa0/16
Fa0/17, Fa0/18, Fa0/19, Fa0/20
Fa0/21, Fa0/22, Fa0/23, Fa0/24 |
| 10 GIAMDOC | active | |
| 20 NHANVIEN | active | |
| 30 TAPVU | active | |
| 1002 fddi-default | act/unsup | |
| 1003 token-ring-default | act/unsup | |
| 1004 fddinet-default | act/unsup | |
| 1005 trnet-default | act/unsup | |

====> được lưu trong File VLAN.dat

2. **Buoc 2** : Mac dinh tat ca cac port cua SW thuoc ve Broadcast Domain la VLAN1
Do do sau khi tao thong tin ve VLAN ta phai thuc hien viec gan port tren SW vao cac VLAN
vua tao ra theo y muon

***** Luu y :** Viec gan port tren SW vao VLAN duoc thuc hien ko nhat thiet phai giong nhau
tren tat ca cac SW trong he thong.

- VLAN 10:

```
SWHDD(config)#int range fa0/1 -5
SWHDD(config-if-range)#switchport mode access
SWHDD(config-if-range)#switchport access vlan 10
```

- VLAN 20:

```
SWHDD(config)#int range fa0/6 -16
SWHDD(config-if-range)#switchport mode access
SWHDD(config-if-range)#switchport access vlan 20
```

- VLAN 30:

```
SWHDD(config)#int range fa0/17 , fa0/19 , fa0/21
SWHDD(config-if-range)#switchport mode access
SWHDD(config-if-range)#switchport access vlan 30
```

***** Kiem tra:**

```
SWHDD#sh vlan brief
```

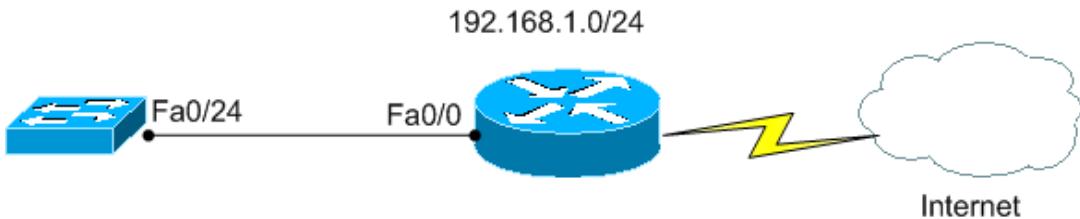
| VLAN Name | Status | Ports |
|-------------------------|-----------|--|
| 1 default | active | Fa0/18, Fa0/20, Fa0/22, Fa0/23
Fa0/24 |
| 10 GIAMDOC | active | Fa0/1, Fa0/2, Fa0/3, Fa0/4
Fa0/5 |
| 20 NHANVIEN | active | Fa0/6, Fa0/7, Fa0/8, Fa0/9
Fa0/10, Fa0/11, Fa0/12, Fa0/13
Fa0/14, Fa0/15, Fa0/16 |
| 30 TAPVU | active | Fa0/17, Fa0/19, Fa0/21 |
| 1002 fddi-default | act/unsup | |
| 1003 token-ring-default | act/unsup | |
| 1004 fddinet-default | act/unsup | |
| 1005 trnet-default | act/unsup | |

***** Ket luan:** ta da tao ra tren Switch 4 Broadcast domain khac nhau, 1 broadcast domain su dung 1 Network/Subnet

ROUTING INTER-VLAN (Router on a Stick Network)

1. Ly thuyet:

Mo hinh LAB:



- De cau hinh dinh tuyen cho VLAN ta can phai co thiet bi Layer 3 ket noi toi SW
- Duong ket noi nay phai co toc do ≥ 100 Mbps (Router phai co cong Fast Ethernet tro len) va phai duoc cau hinh la duong Trunk de cho phep luu thong cua tat ca cac VLAN di qua.
- Thiet bi router cau hinh de dinh tuyen cho cac VLAN de dung mot cong vat ly Fast Ethernet tro len ket noi toi SW co chia VLAN. Cong vat ly nay cua Router se duoc chia thanh nhieu Interface luan ly co ten goi la Subinterface. Moi Subinterface se phu trach dinh tuyen cho tung VLAN.

2. Thuc hanh:

-Buoc 3 : Cau hinh port ket noi tu SW len Router la Port Trunk

> **Doi voi SW2950**: chi ho tro dong goi VLANID theo chuan 802.1q ma thoi.
SWHDD(config)#int fa0/24
SWHDD(config-if)#switchport mode trunk
> **Doi voi SW 3xxx**: Ho tro ca 2 kieu dong goi la **dot1q, ISL**
SWHDD(config-if)#switchport mode trunk encapsulation dot1q

-Buoc 4 :

Cau hinh chia Subinterface tren cong FastEthernet cua Router ket noi voi SW (ko duoc phep dat IP)

```
RouterHDD(config)#int fa0/0  
RouterHDD(config)#no shut
```

Tao 4 subinterface, moi subinterface cau hinh dong goi VLANID tuong thich voi SW.
Moi Subinterface se duoc dat IP Address. IP address tren moi subinterface se la Default Gateway cua nhung may tinh noi den cac port thuoc ve cac VLAN tuong ung.
RouterHDD(config)#int fa0/0.? <0-4294967295> FastEthernet interface number
RouterHDD(config-subif)#encapsulation dot1Q 1 -----> Subinterface se dinh tuyen cho VLAN1

If the interface doesn't support baby giant frames
maximum mtu of the interface has to be reduced by 4
bytes on both sides of the connection to properly
transmit or receive large packets. Please refer to
documentation on configuring IEEE 802.1Q vLANs.

```
-----  
RouterHDD(config)#int fa0/0.1 -----> tao ra 1 Subinterface co ten la Fa0/0.1  
RouterHDD(config-subif)#encapsulation dot1Q 1  
RouterHDD(config)#ip add 192.168.1.62 255.255.255.192 → Default Gateway
```

```
int fa0/0.10  
encapsulation dot1Q 10  
ip add 192.168.1.126 255.255.255.192
```

```
int fa0/0.20
encapsulation dot1Q 20

ip add 192.168.1.190 255.255.255.192

int fa0/0.30
encapsulation dot1Q 30
ip add 192.168.1.254 255.255.255.192
=====
#sh run
!
interface FastEthernet0/0.1
  encapsulation dot1Q 1 native
  ip address 192.168.1.62 255.255.255.192
  no snmp trap link-status
!
interface FastEthernet0/0.10
  encapsulation dot1Q 10
  ip address 192.168.1.126 255.255.255.192
  no snmp trap link-status
!
interface FastEthernet0/0.20
  encapsulation dot1Q 20
  ip address 192.168.1.190 255.255.255.192
  no snmp trap link-status
!
interface FastEthernet0/0.30
  encapsulation dot1Q 30
  ip address 192.168.1.254 255.255.255.192
  no snmp trap link-status
!
RouterHDD#sh ip int bri
Interface          IP-Address      OK? Method Status        Protocol
FastEthernet0/0     unassigned     YES unset up           up
FastEthernet0/0.1   192.168.1.62   YES manual up        up
FastEthernet0/0.10  192.168.1.126  YES manual up        up
FastEthernet0/0.20  192.168.1.190  YES manual up        up
FastEthernet0/0.30  192.168.1.254  YES manual up        up
FastEthernet0/1     unassigned     YES unset administratively down down
Serial0/1/0         unassigned     YES unset administratively down dow
```

*** Chu ý :

- Doi voi kieu dong goi 802.1q co 1 khai niem goi la **Native VLAN** (nghia la data xuat phat tu VLAN nay khi len duong Trunk se ko dong goi VLANID). Mac dinh Native VLAN la Vlan1
- Interface VLAN1 gan cho SW se duoc dat IP thuoc Subnet/Network duoc gan cho nguoi dung thuoc VLAN1

```
SWHDD(config)#int vlan 1  
SWHDD(config-if)#ip add 192.168.1.1 255.255.255.192  
SWHDD(config-if)#no shut
```

Default Gateway cua SW co chia VLAN se la dia chi IP thuoc Subinterface tren Router ma Subinterface nay duoc cau hinh dinh tuyen cho VLAN 1

```
SWHDD(config)#ip default-gateway 192.168.1.62
```

```
SWHDD#ping 192.168.1.62 ----> VLAN 10
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.1.162, timeout is 2 seconds:
!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/203/1004 ms

```
SWHDD#ping 192.168.1.126 ----> VLAN 20
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.1.126, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/203/1004 ms

```
SWHDD#ping 192.168.1.190 ----> VLAN 30
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.1.190, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/203/1004 ms

CO CHE THIET LAP KET NOI TRUNK GIUA CAC SWITCH

I - Duoc quan ly boi giao thuc DTP(Dynamic Trunk Protocol)

```
SW1 (Fa0/24) ----- SW2 (Fa0/24)
```

```
SW1#sh int trunk
```

| Port | Mode | Encapsulation | Status | Native vlan |
|--------|-----------|---------------|----------|-------------|
| Fa0/24 | desirable | 802.1q | trunking | 1 |

| Port | Vlans allowed on trunk |
|--------|------------------------|
| Fa0/24 | 1-4094 |

| Port | Vlans allowed and active in management domain |
|--------|---|
| Fa0/24 | 1 |

| Port | Vlans in spanning tree forwarding state and not pruned |
|------|--|
|------|--|

Fa0/24 1

----> SW noi SW tu dong Trunking , con noi Router va SW thi phai tao Trunking

SW1#sh int fa0/24 switchport

Name: Fa0/24

Switchport: Enabled

Administrative Mode: dynamic desirable --> Mac dinh Port SW hoat dong o Mode **dynamic desirable** (ham muon)

<1>*** Dynamic Desirable: port hoat dong o trang thai trunk va chu dong thuong luong 'ru re' dau kia ket noi thiet lap duong trunk

Desirable - Desirable ----> Trunk

Operational Mode: trunk

Administrative Trunking Encapsulation: dot1q

Operational Trunking Encapsulation: dot1q

Negotiation of Trunking: On

Access Mode VLAN: 1 (default)

Trunking Native Mode VLAN: 1 (default)

Voice VLAN: none

Administrative private-vlan host-association: none

Administrative private-vlan mapping: none

Administrative private-vlan trunk native VLAN: none

Administrative private-vlan trunk encapsulation: dot1q

Administrative private-vlan trunk normal VLANs: none

Administrative private-vlan trunk private VLANs: none

Operational private-vlan: none

Trunking VLANs Enabled: ALL

Pruning VLANs Enabled: 2-1001

Capture Mode Disabled

Capture VLANs Allowed: ALL

Protected: false

Appliance trust: none

- Bước 1: Vào interface fa0/24

SW1(config)#int fa0/24

SW1(config-if)#sw mode trunk

SW1#sh int trunk

| Port | Mode | Encapsulation | Status | Native vlan |
|--------|------|---------------|----------|-------------|
| Fa0/24 | on | 802.1q | trunking | 1 |

Port Vlans allowed on trunk

Fa0/24 1-4094

Port Vlans allowed and active in management domain

Fa0/24 1

Port Vlans in spanning tree forwarding state and not pruned

Fa0/24 1

<2>*** Trunk (ON): port hoat dong o trang thai trunk va chu dong thuong luong 'ru re' dau kia

ket noi thiet lap duong trunk

Trunk - Desirable ----> Trunk

<3>***Auto : port hoạt động ở trạng thái trunk, tuy nhiên nó bị đóng và chỉ thiết lập kết nối khi được 'ru re'

Auto - Desirable ----> Trunk

```
SW1(config)#int fa0/24
SW1(config-if)#switchport mode dynamic ?
    auto      Set trunking mode dynamic negotiation parameter to AUTO
    desirable Set trunking mode dynamic negotiation parameter to DESIRABLE
SW1(config-if)#switchport mode dynamic auto
```

SW1#sh int trunk

| Port | Mode | Encapsulation | Status | Native vlan |
|--------|------|---------------|----------|-------------|
| Fa0/24 | auto | 802.1q | trunking | 1 |

Port Vlans allowed on trunk
Fa0/24 1-4094

Port Vlans allowed and active in management domain
Fa0/24 1

Port Vlans in spanning tree forwarding state and not pruned
Fa0/24 1

<4> Desirable - Access ----> Ket noi bi pha huy

SW1#sh int trunk ----> ko thay gi

<5>*** Auto - Auto ----> Ket noi bi pha huy

```
SW1(config-if)#switchport mode dynamic auto ----> lam ben SW1
SW2(config-if)#switchport mode dynamic auto ----> lam ben SW2
```

SW1#sh int trunk ----> ko thay gi

```
SW1#sh int fa0/24 switchport
Name: Fa0/24
Switchport: Enabled
Administrative Mode: dynamic auto
Operational Mode: static access
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: native
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
```

Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk private VLANs: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Protected: false
Appliance trust: none

******* Chu ý : +Mode Access ko Trunk voi moi hinh thuc**

+Nen cau hinh port Trunk bang tay.

Tóm tắt:

Auto - Desirable

Auto - Trunk

====> Trunk

Auto - Auto

Auto - Access

====> khong trunk

Trunk - Trunk

Trunk - Desirable

====> Trunk

Trunk - Auto

Trunk - Access

====> khong trunk

Desirable - Desirable

Desirable - Trunk

====> trunk

Desirable - Auto

Desirable - Access

====> Khong trunk

II – Thay doi Native VLAN :

Mac dinh Native VLAN la VLAN1

Ta co the cau hinh thay doi Native VLAN. Luu y khi thay doi Native VLAN, ta phai cau hinh thay doi dong nhat tren **TAT CA** cac port ket noi giua SW va SW, giua SW va Router va cau hinh tren Subinterface cua Router dinh tuyen cho VLAN ma ta chi dinh lam Native VLAN

1/ Cau hinh thay doi Native VLAN tren cac port ket noi cua SW

```
SW1(config)#int fa0/24
SW1(config-if)#switchport trunk native vlan 10 ---> Native VLAN 10
SW1(config-if)#shut
SW1(config-if)#no shut
00:41:36: %LINK-3-UPDOWN: Interface FastEthernet0/24, changed state to down
00:41:37: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, chan-
ged state to down
00:41:39: %LINK-3-UPDOWN: Interface FastEthernet0/24, changed state to up
00:41:41: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
FastEt
hernet0/24 (10), with SW2 FastEthernet0/24 (1).
00:41:41: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
FastEt
hernet0/24 (10), with SW2 FastEthernet0/24 (1).
00:41:41: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
FastEt
hernet0/24 (10), with SW2 FastEthernet0/24 (1).
00:41:41: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, chan-
ged state to up
00:41:42: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on
FastEt
hernet0/24 (10), with SW2 FastEthernet0/24 (1).
```

```
SW2(config-if)#switchport trunk native vlan 10 ---> Native VLAN 10
SW2(config-if)#shut
SW2(config-if)#no shut
```

```
SW1(config-if)#do sh int trunk
```

| Port | Mode | Encapsulation | Status | Native vlan |
|--------|------|---------------|----------|-------------|
| Fa0/24 | on | 802.1q | trunking | 10 |

| Port | Vlans allowed on trunk |
|--------|------------------------|
| Fa0/24 | 1-4094 |

| Port | Vlans allowed and active in management domain |
|--------|---|
| Fa0/24 | 1 |

| Port | Vlans in spanning tree forwarding state and not pruned |
|--------|--|
| Fa0/24 | 1 |

2/ Cau hinh thay doi Native VLAN tren Router

Vao SubInterface duoc cau hinh dinh tuyen cho VLAN ma ta se chi dinh la Native VLAN

```
Router(config)#int fa0/0.10
Router(config-subif)#encapsulation dot1q 10 native
```

DHCP BANG COMMAND LINE

Subnet 0 : 192.168.1.0/26(VLAN1) DG: 192.168.1.62
Subnet 1 : 192.168.1.64/26(VLAN10) DG: 192.168.1.126
Subnet 2 : 192.168.1.128/26(VLAN20) DG: 192.168.1.190
Subnet 3 : 192.168.1.192/26(VLAN30) DG: 192.168.1.254

Buoc 1 : Bat dich vu DHCP tren Router

(config)#service dhcp

Buoc 2: Tao ra cac pool dia chi de cap dong cho nguoi dung chi tiet cua cac pool nay bao gom

- + Ten Pool
- + Day IP se cap cho User(IP/SM)
- + DG
- + DNS
- + Lease Time (neu can)

Vi du : Tao 1 pool co ten **VLAN1** de cap cho user thuoc VLAN1

Router(config)#ip dhcp pool VLAN1 --> Phan biet hoa thuong, ko co khoang trang

Router(DHCP-config)#network 192.168.1.0 255.255.255.192 --> Qui dinh IP va SM

Router (DHCP-config)#default-router 192.168.1.62

Router (DHCP-config)#dns-server 210.245.31.130 203.113.188.1 210.245.31.10

Router (DHCP-config)#lease 5 -----> Thoi gian song cua IP la 5 ngay

```
ip dhcp pool VLAN1
network 192.168.1.0 255.255.255.192
default-router 192.168.1.62
dns-server 210.245.31.130 203.113.188.1 210.245.31.10
lease 5
```

```
ip dhcp pool VLAN10 network 192.168.1.64 255.255.255.192
default-router 192.168.1.126
dns-server 210.245.31.130 203.113.188.1 210.245.31.10
lease 5
```

```
ip dhcp pool VLAN20
network 192.168.1.128 255.255.255.192
default-router 192.168.1.190
dns-server 210.245.31.130 203.113.188.1 210.245.31.10
lease 5
```

```
ip dhcp pool VLAN30
network 192.168.1.192 255.255.255.192
default-router 192.168.1.254
dns-server 210.245.31.130 203.113.188.1 210.245.31.10
lease 5
```

* Mo rong :

Router(config)#ip dhcp pool VLAN1

Router(dhcp-config)#?

DHCP pool configuration commands:

| | |
|-------------------|-------------------------------------|
| accounting | Send Accounting Start/Stop messages |
| bootfile | Boot file name |
| class | Specify a DHCP class |
| client-identifier | Client identifier |
| client-name | Client name |
| default-router | Default routers |
| dns-server | DNS servers |
| domain-name | Domain name |

```
exit          Exit from DHCP pool configuration mode
hardware-address Client hardware address
host           Client IP address and mask
import          Programmatically importing DHCP option parameters
lease           Address lease time
netbios-name-server NetBIOS (WINS) name servers
netbios-node-type NetBIOS node type
network         Network number and mask
next-server     Next server in boot process
no              Negate a command or set its defaults
option          Raw DHCP options
origin          Configure the origin of the pool
relay           Function as a DHCP relay
subnet          Subnet allocation commands
update          Dynamic updates
utilization    Configure various utilization parameters
vrf             Associate this pool with a VRF
```

Router(dhcp-config)#

-Buoc3: Xac dinh cac IP loai tru

Cac IP nay da duoc gan lam DG hoac Int Vlan1 hoac da duoc gan tinh cho cac may chu trong he thong

VD : Loai tru IP 192.168.1.1 khong cap cho User cua VLAN1

(config)#ip dhcp excluded-address 192.168.1.1

VD: Loai tru day IP tu 192.168.1.66 - 192.168.1.76 khong cap cho user VLAN10
(config)#ip dhcp excluded-address 192.168.1.66 192.168.1.76

```
ip dhcp excluded-address 192.168.1.1
ip dhcp excluded-address 192.168.1.62
ip dhcp excluded-address 192.168.1.126
ip dhcp excluded-address 192.168.1.190
ip dhcp excluded-address 192.168.1.254
```

#sh ip dhcp binding -----> xem IP cap cho cac may trong mang

Router#sh ip dhcp binding

Bindings from all pools not associated with VRF:

| IP address | Client-ID/
Hardware address/
User name | Lease expiration | Type |
|------------|--|------------------|------|
|------------|--|------------------|------|

| | | | |
|---------------|-------------------|----------------------|-----------|
| 192.168.1.65 | 0100.15f2.7b0b.25 | Dec 02 2007 10:53 AM | Automatic |
| 192.168.1.129 | 0100.e04d.0129.78 | Dec 02 2007 10:27 AM | Automatic |

Router#sh run
Building configuration...

Current configuration : 2448 bytes

```
!
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
```

```
boot-start-marker
boot-end-marker
!
enable secret 5 $1$J2.5$pnlCzDtCVlcGxpYNba7YR0
enable password cisco
!
no aaa new-model
!
resource policy
!
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip subnet-zero
ip cef
!
!
no ip dhcp use vrf connected
ip dhcp excluded-address 192.168.1.1
ip dhcp excluded-address 192.168.1.126
ip dhcp excluded-address 192.168.1.190
ip dhcp excluded-address 192.168.1.254
ip dhcp excluded-address 192.168.1.62
!
ip dhcp pool VLAN1
  network 192.168.1.0 255.255.255.192
  default-router 192.168.1.62
  dns-server 210.245.31.130 203.113.188.1 210.245.31.10
  lease 5
!
ip dhcp pool VLAN10
  network 192.168.1.64 255.255.255.192
  default-router 192.168.1.126
  dns-server 210.245.31.130 203.113.188.1 210.245.31.10
  lease 5
!
ip dhcp pool VLAN20
  network 192.168.1.128 255.255.255.192
  default-router 192.168.1.190
  dns-server 210.245.31.130 203.113.188.1 210.245.31.10
  lease 5
!
ip dhcp pool VLAN30
  network 192.168.1.192 255.255.255.192
  default-router 192.168.1.254
  dns-server 210.245.31.130 203.113.188.1 210.245.31.10
  lease 5
!
!
no ip domain lookup
no ip ips deny-action ips-interface
!
no ftp-server write-enable
!
!
!
```

VTP (VLAN TRUNKING PROTOCOL)



1-Xay dung he thong cac SW ket noi voi nhau thong qua duong Trunk

2- Cac SW nay duoc cau hinh hoat dong trong cung 1 VTP Domain

- + Mac dinh, SW thuoc VTP Domain la NULL

- + SW dong vai tro mac dinh la : VTP mode Server

3- Cac SW trong cung 1 VTP Domain se chia se thong tin VLAN dong nhat

SW1#sh VTP Status

```

VTP Version      : 2
Configuration Revision : 0
Maximum VLANs supported locally: 128 --> so VLAN co the ho tro
Number of existing VLANs   : 5     --> so VLAN hien co
VTP Operating Mode   : Server
VTP Domain Name     :
VTP Pruning Mode    : Disabled
VTP V2 Mode          : Disabled
VTP Traps Generation : Disabled
MD5 digest          : 0x57 0xCD 0x40 0x65 0x63 0x59 0x47 0xBD
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 192.168.1.2 on interface VI1 (lowest numbered VLAN interface
found)
  
```

SW1#sh vlan

| VLAN Name | Status | Ports |
|-------------------------|-----------|---|
| 1 default | active | Fa0/1, Fa0/2, Fa0/3, Fa0/4
Fa0/5, Fa0/6, Fa0/7, Fa0/8
Fa0/9, Fa0/10, Fa0/11, Fa0/12
Fa0/13, Fa0/14, Fa0/15, Fa0/16
Fa0/17, Fa0/18, Fa0/19, Fa0/20
Fa0/21, Fa0/22, Fa0/23 |
| 1002 fddi-default | act/unsup | --> VLAN he thong |
| 1003 token-ring-default | act/unsup | --> VLAN he thong |
| 1004 fddinet-default | act/unsup | --> VLAN he thong |
| 1005 trnet-default | act/unsup | --> VLAN he thong |

| VLAN | Type | SAID | MTU | Parent | RingNo | BridgeNo | Stp | BrdgMode | Trans1 | Trans2 |
|------|-------|--------|------|--------|--------|----------|-----|----------|--------|--------|
| 1 | enet | 100001 | 1500 | - | - | - | - | 0 | 0 | |
| 1002 | fddi | 101002 | 1500 | - | - | - | - | 0 | 0 | |
| 1003 | tr | 101003 | 1500 | - | - | - | - | 0 | 0 | |
| 1004 | fdnet | 101004 | 1500 | - | - | ieee | - | 0 | 0 | |
| 1005 | trnet | 101005 | 1500 | - | - | ibm | - | 0 | 0 | |

Remote SPAN VLANs

| Primary | Secondary | Type | Ports |
|---------|-----------|------|-------|
|---------|-----------|------|-------|

SW1(config)#no vlan 1002
Default VLAN 1002 may not be deleted. ----> VLAN he thong ko xoa duoc

4- Thong tin VLAN lan truyen qua cac SW thong qua ket noi Trunk va Int VLAN 1

SW1(config)#vtp domain vnpro ---> Phan biet hoa thuong,ko khoang trang
Domain name already set to vnpro.

```
SW1#sh vtp status
VTP Version                 : 2
Configuration Revision    : 0
Maximum VLANs supported locally: 128
Number of existing VLANs   : 5
VTP Operating Mode        : Server
VTP Domain Name           : vnpro
VTP Pruning Mode          : Disabled
VTP V2 Mode               : Disabled
VTP Traps Generation     : Disabled
MD5 digest                : 0x57 0xCD 0x40 0x65 0x63 0x59 0x47 0xBD
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 192.168.1.1 on interface VI1 (lowest numbered VLAN interface
found)
```

5- Cau hinh Mode Trunk

SW1(config)#int fa0/24
SW1(config-if)#switchport mode trunk

SW1#sh int trunk

| Port | Mode | Encapsulation | Status | Native vlan |
|--------|------|---------------|----------|-------------|
| Fa0/24 | on | 802.1q | trunking | 1 |

Port Vlans allowed on trunk
Fa0/24 1-4094

Port Vlans allowed and active in management domain
Fa0/24 1

Port Vlans in spanning tree forwarding state and not pruned
Fa0/24 1

1.> VTP MODE SERVER: la mode mac dinh tren tat cac SW. SW hoat dong o Mode Server co khach nang :

+ Tao,xoa, sua thong tin ve VLAN

- Luu thong tin ve VLAN trong Flash: VLAN.dat

 + Cap nhat dong bo thong tin ve VLAN tu SW khac trong he thong neu nhu thong tin ve VLAN do co so Revision Number cao hon

 + Lan truyen, quang ba thong tin cho ca SW khac trong cung VTP Domain

* **Revision Number = Configuration**

La thong so the hien su cap nhat cua thong tin ve VLAN trong VTP Domain

Khi SW o VTP Mode Server thay doi thong tin ve VLAN thi thong so nay se tang dan 1

So Revision Number cang lon thi thong tin VLAN cang update

Exp: Tao VLAN tren SW1, SW2 ko tao

VLAN10: GIAM DOC
VLAN20: BAOVE
VLAN30: NHANVIEN

SW1#sh vtp status

```
VTP Version      : 2
Configuration Revision   : 3
Maximum VLANs supported locally: 128
Number of existing VLANs    : 8
VTP Operating Mode       : Server
VTP Domain Name        : vnpro
VTP Pruning Mode        : Disabled
VTP V2 Mode             : Disabled
VTP Traps Generation    : Disabled
MD5 digest              : 0x57 0x51 0x5F 0xBB 0xE2 0xBF 0x49 0x2F
Configuration last modified by 192.168.1.1 at 3-1-93 00:44:31
Local update ID is 192.168.1.1 on interface VI1 (lowest numbered VLAN interface
found)
```

-----> SW2 se hoc duoc VLAN tu SW1

SW2#sh vtp status

```
VTP Version      : 2
Configuration Revision   : 3
Maximum VLANs supported locally: 128
Number of existing VLANs    : 8
VTP Operating Mode       : Server
VTP Domain Name        : vnpro
VTP Pruning Mode        : Disabled
VTP V2 Mode             : Disabled
VTP Traps Generation    : Disabled
MD5 digest              : 0x57 0x51 0x5F 0xBB 0xE2 0xBF 0x49 0x2F
Configuration last modified by 192.168.1.1 at 3-1-93 00:44:31
Local update ID is 192.168.1.2 on interface VI1 (lowest numbered VLAN interface
found)
```

- Tao VLAN4 tren SW2

-----> SW1 se hoc duoc VLAN4 tu SW1; do do so Revision tang len la 4

SW1#sh vtp status

```
VTP Version      : 2
Configuration Revision   : 4
Maximum VLANs supported locally : 128
Number of existing VLANs    : 9
VTP Operating Mode       : Server
VTP Domain Name        : vnpro
VTP Pruning Mode        : Disabled
VTP V2 Mode             : Disabled
VTP Traps Generation    : Disabled
MD5 digest              : 0xDB 0x5A 0xD4 0x83 0xAB 0x48 0x28 0x08
Configuration last modified by 192.168.1.2 at 3-1-93 00:46:38
Local update ID is 192.168.1.1 on interface VI1 (lowest numbered VLAN interface
found)
```

Ket luan :

-Khi co su thay doi thong tin ve VLAN thi ngay lap tuc SW se quang ba cho cac SW con lai trong cung VTP Domain

-Neu nhu ko co su thay doi nao ca thi giua cac SW se co co che Refresh.Trao doi thong VLAN lan

nhau sau moi 300s.

- Viec dong bo thong tin tren VLAN tren tat ca SW trong cung 1 VTP Domain nham muc dich :

+ Giup cho SW co CSDL ve VLAN dong nhat de co thong tin dong goi VLANID cho cac du lieu thuoc ve cac VLAN khac nhau khi gui len duong Trunk

+ Giup cho SW nhan dien va hieu duoc thong tin data tu VLAN gui den tu SW khac thong qua duong Trunk la can thiet. Viec gan port tren cac SW khac nhau la tuy y ngau nhien ko nhat thiet phai giuong nhau tren tat ca cac SW

2> VTP Mode Client :

- SW hoat dong o Mode nay se ko co quyen tao xoa sua thong tin ve VLAN trong he thong

- Chi hoc thong tin VLAN tu SW khac gui den va luu o Flash: VLAN.DAT

- Forward thong tin ve VLAN cho cac SW khac trong cung VTP Domain

VIDU : SW2 lam Client.

```
(config)#VTP mode client
SW2#sh vtp status
VTP Version          : 2
Configuration Revision : 4
Maximum VLANs supported locally : 128
Number of existing VLANs   : 9
VTP Operating Mode      : Client
VTP Domain Name       : vnpro
VTP Pruning Mode      : Disabled
VTP V2 Mode            : Disabled
VTP Traps Generation  : Disabled
MD5 digest             : 0xDB 0x5A 0xD4 0x83 0xAB 0x48 0x28 0x08
Configuration last modified by 192.168.1.2 at 3-1-93 00:46:38 --> Mat dong Local Update
```

SW2(config)#VLAN 50 --> Client ko tao duoc VLAN

VTP VLAN configuration not allowed when device is in CLIENT mode.

3> VTP Mode Transparent :

La Mode dac biet, Switch o mode nay se:

* Co quyen tao xoa, sua thong tin ve vlan. Tuy nhien cac thong tin vlan nay chi luu cuc bo (local) tren Switch do ma thoi ma khong anh huong hay lan truyen sang Switch khac trong cung VTP Domain.

* Switch o Mode nay khong cap nhat thong tin ve vlan cua cac Switch trong cung VTP DOMAIN gui cho no ngay ca khi thong tin do co so Revision Number cao hon.

* Forward thong tin ve vlan nhan duoc tu mot Switch den Switch khac trong cung vtp domain.

* La mot hinh thuc thiet ke nham xay dung mot so vlan rieng biet lam tang tinh bao mat.

Luu y:

Nen dat Switch Mode Transparent o node cuoi cung cua he thong Switch,

Nen cau hinh chuyen Transparent sau khi da o mode server hoac client da hoc day du thong tin ve VLAN trong he thong.

4> VTP Password :

La thong tin duoc dinh kem trong thong tin quang ba (advertise) ve VLAN lan truyen giua cac Switch trong cung mot vtp Domain.

+ Neu nhu Switch co cau hinh vtp password no se kiem tra thong tin quang cao ve VLAN nhan duoc tu Switch khac.

+ Neu thong tin do co kem them password dung, so trung, thi Switch se cho la thong tin do hop le ve se cap nhat hoac forward den thong tin do den cac Switch khac.

SW2(config)#vtp password cisco

Vidu: SW2 tao pass VTP

tao VLAN 70 TAOLAO
SW1 --> Sh vlan ko hoc duoc
SW1 dat pass VTP la cisco
tao VLAN 60
Vi SW2 co dat password la cisco nen
se hoc duoc

SW1#sh vtp password ---> xem pass VTP
VTP Password: cisco

5> VTP Pruning :

```
SW1#sh vtp status
VTP Version          : 2
Configuration Revision      : 6
Maximum VLANs supported locally: 128
Number of existing VLANs     : 11
VTP Operating Mode        : Server
VTP Domain Name           : vnpro
VTP Pruning Mode        : Disabled
VTP V2 Mode               : Disabled
VTP Traps Generation      : Disabled
MD5 digest                : 0x45 0x4A 0xDD 0x9E 0x32 0x81 0x36 0xF1
Configuration last modified by 192.168.1.1 at 3-1-93 01:45:14
Local updater ID is 192.168.1.1 on interface VI1 (lowest numbered VLAN interface
found)
```

Mục đích Ngan ngua Sw Forward cac Frame ko can thiet(broadcast) tu VLAN nay sang VLAN khac
Muon cau hinh VTP Pruning ta phai cau hinh o SW dong vai tro VTP Mode Server ma thoi.

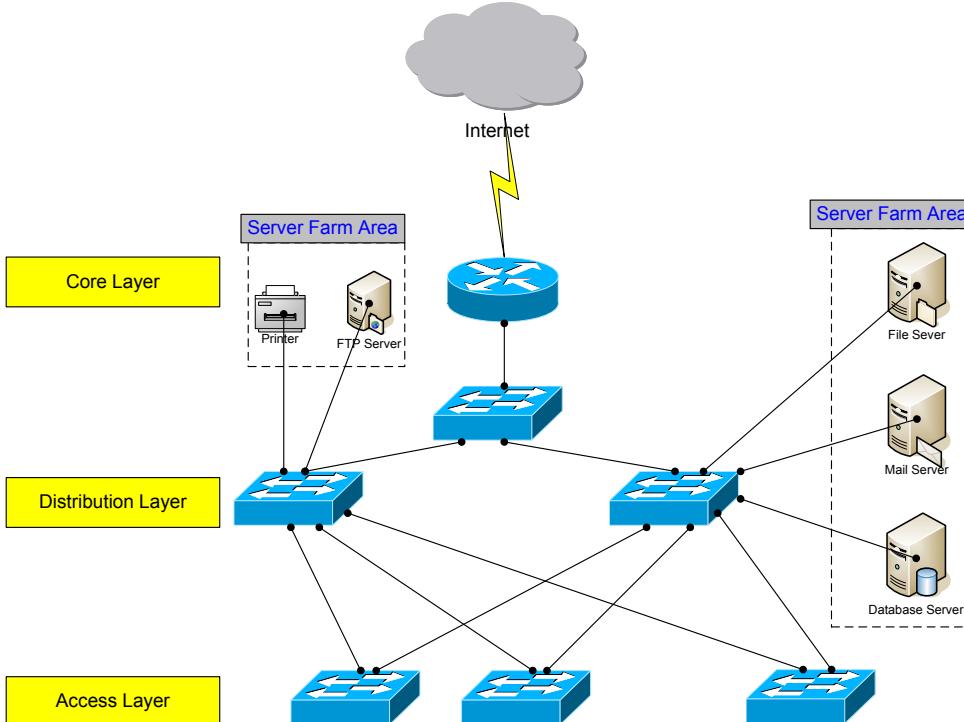
SW1(config)#vtp pruning
Pruning switched on

```
SW2#sh vtp status
VTP Version          : 2
Configuration Revision      : 7
Maximum VLANs supported locally : 128
Number of existing VLANs     : 11
VTP Operating Mode        : Client
VTP Domain Name           : vnpro
VTP Pruning Mode        : Enabled
VTP V2 Mode               : Disabled
VTP Traps Generation      : Disabled
MD5 digest                : 0xE5 0xFE 0xA3 0x2D 0x76 0xC2 0x27 0x94
Configuration last modified by 192.168.1.1 at 3-1-93 01:54:09
```

LAN CAMPUS

I> Lý thuyết :

1. Tổng quan :



-Cisco đưa ra 1 mô hình mạng tiêu chuẩn:

+Core Layer: Giao tiếp với bên ngoài LAN (Internet hay với Site khác).

+Distribution Layer: Là nơi tập trung các tài nguyên chia sẻ (printer, server...). Có một cụm Server kết nối với Switch gọi là Sever farm.

*** **Chú ý:** Nên dành các Port 1 Gb để uplink kết nối với SW khác hay các layer khác.

+AccessLayer: bao gồm những Switch kết nối với người dùng đầu cuối.(End user)

➔ Mô hình trên gọi là **One Point of Failure**. Vì nếu SW tại Distribution Layer chết thì cả mạng cũng chết.

-Có sơ đồ mạng mang tính dự phòng (Redundancy):

+Các SW kết nối với nhau tạo thành một mạch khép kín.

+Sơ đồ thiết kế LAN mang tính dự phòng là 1 sơ đồ đảm bảo tính sống còn của LAN bằng cách thiết lập những đường đi dự phòng hỗ trợ việc giao tiếp xuyên suốt giữa các Layer với nhau.

+Sơ đồ này thiết lập ra mạch kết nối giữa các SW là khép kín.

+Nó giải quyết được hiện tượng **One Point of Failure**
Tuy nhiên sơ đồ này cũng có những vấn đề cần quan tâm nếu ta sử dụng các SW “Low end”.

2. Hiện tượng:

- Broadcast Storm (Switching Loop, Bridging Loop):

Có một máy tính trong mạng, muốn truy suất đến server của hệ thống, ở gói tin đầu tiên đảm bảo Source IP và Destination IP chính xác, gửi ARP request: có Destination MAC là 12 chữ F, SW sẽ đưa tín hiệu đó ra các port, và tín hiệu Broadcast đó sẽ chạy vòng trong mạng, lưu thông Broadcast đó chiếm tất cả các lưu thông trong mạng.

- Multiple Frame Copy:

Là hiện tượng có nhiều phiên bản của frame được gửi đi trong hệ thống.
ARP request: gửi đến server, server nhận 1 lần qua 1 đường đi. Sẽ có nhiều frame đến server, server phải ARP Response liên tục.

- MAC Database Instability:

Sự mất ổn định của các địa chỉ MAC trong bảng MAC table.

*** **Lưu ý** một port của SW được quyền có nhiều MAC Address, nhưng một MAC chỉ xuất hiện tại một port duy nhất mà thôi, nên SW sẽ xoá MAC cũ và cập nhật Entry mới.

GIAO THỨC SPANNING TREE (STP)

1. Khái niệm :

- Được quy định trong chuẩn 802.1d
- Là một giao thức hoạt động trong suốt ngay sau khi các SW có kết nối với nhau.
- Mục đích của Spanning Tree sẽ tìm cách phá vỡ (break) mạch khép kín kết nối giữa các SW trong thiết kế mạng tính dự phòng nhằm tránh các hiện tượng xấu (3 hiện tượng trên). Nhưng vẫn đảm bảo tính dự phòng trong hệ thống.

2. Tiến trình Spanning Tree: trải qua 3 bước:

- Bước 1: Bầu chọn **Root Bridge**

- + Ngay sau khi các SW kết nối với nhau, chúng sẽ gửi ra các gói **BPDUs** (**Bridge Protocol Data Unit**) mạng thông tin:

*BridgeID bao gồm thông số:

- Priority: 32768 gồm 16 bit (default),
- MAC address của SW gồm 48 bit (không bao giờ thay đổi).

* Root ID:

Bridge ID của SW đóng vai trò làm Root Bridge sẽ gửi ra và trao đổi lẫn nhau để bầu chọn SW đóng vai trò làm Root Bridge. Lúc ban đầu SW tự cho mình làm Root Bridge.

- + Sau khi trao đổi BPDU hoàn tất thì SW đóng vai trò làm **Root Bridge** là SW

có Bridge ID nhỏ nhất.

- Các SW còn lại sẽ đóng vai trò là **Non Root Bridge**, lúc này chỉ có Root Bridge mới được quyền gửi BPDU mà thôi.
- Các Non Root Bridge khi nhận được BPDU từ Root Bridge tại các port có kết nối của nó, sẽ thay đổi thông số **Sender Bridge ID** và Forward đến các SW khác trong hệ thống.

Lúc này chỉ có RootBridge được gửi BPDU với chu kỳ là **2s**.

- Bước 2 : Bầu chọn **Root Port**

+ Từ những **non Root Bridge** tìm đường đi xuất phát từ port nào đến Root Bridge mà có chi phí (**path cost**) thấp nhất.

Pathcost là một thông số dựa vào băng thông của đường truyền và giá trị path cost sẽ được cộng dồn khi qua mỗi kết nối.

| BANDWIDTH | PATH COST |
|-----------|-----------|
| 10Mbps | 100 |
| 100Mbps | 19 |
| 1Gbps | 4 |
| 10Gbps | 2 |

+ Trong trường hợp từ non Root Bridge có nhiều hơn một port đến Root Bridge mà có path cost thấp nhất và path cost bằng nhau thì port được chọn là Root Port là port có Port ID (fa0/0 – fa0/24) thấp nhất.

- Bước 3: Bầu chọn **Designated port**

+ Trên mỗi Segment liên kết giữa các SW sẽ bầu chọn ra port nào đóng vai trò Designated port là port có path cost đến Root Bridge thấp nhất. Port nằm trên Root Bridge luôn đóng vai trò là Designated port (path cost = 0)

+ Trong trường hợp tại một segment có 2 port có pathcost đến RootBridge bằng nhau thì việc bầu chọn Designated Port dựa vào

- Sender Bridge ID
- Nếu Sender Bridge ID bằng thì sẽ dựa vào Bridge ID mà port thuộc về.

3. Vai trò (Port Role) và trạng thái hoạt động (Status):

| ROLE | STATUS |
|----------------|------------|
| Designated | Forwarding |
| Non Designated | Blocking |

4. Tóm lại :

- Tiến trình Spanning tree sau khi hội tụ sẽ có 2 đặc điểm:

+ Từ những **non RootBridge** ta chỉ có một đường đi duy nhất với cost thấp nhất đến **RootBridge** mà thôi.

+ Trạng thái hoạt động của các port kết nối giữa các SW chỉ có thể là Forwarding hay là Blocking.

- Tiến trình Spanning tree được tính toán khi các port của SW có kết nối và các port này sẽ có cơ chế chuyển đổi trạng thái như sau:

+ Listening (15s) : lắng nghe và gửi BPDU.

Nhưng tại trạng thái này nó không học địa chỉ MAC nhận được từ port mà cũng không Forward data.

+ Learning (15s) : Forward delay cũng gửi nhận BPDU và bắt đầu học địa chỉ MAC nhận được từ port nhưng vẫn không Forward dữ liệu.

+ Forwarding: gửi và nhận BPDU, học MAC và forward dữ liệu.

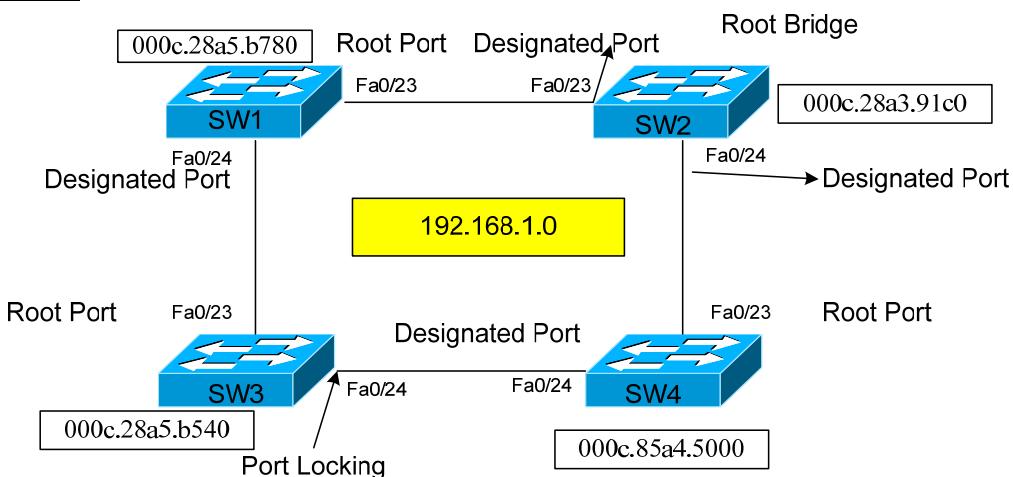
+ Blocking: sau khi tiến trình Spanning tree hoàn tất thì port này xuất hiện: port chỉ lắng nghe và nhận BPDU không học MAC và cũng không forward dữ liệu.

*** Nếu như port blocking không nhận được BPDU sau 10 chu kỳ (Maxage = 20s) thì lập tức port sẽ chuyển sang listening, learning và forwarding để đảm bảo thay thế đường đi chính đã bị hỏng

➔ đảm bảo tính dự phòng. (nhưng phải mất 50s để hội tụ).

II> Thực hành:

Mô hình :



💡 SW2#sh spanning-tree vlan 1

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 32769

Address 000c.28a3.91c0

This bridge is the root --> Root bridge

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 000c.28a3.91c0
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300

| Interface | Role | Sts | Cost | Prio. | Nbr | Type |
|-----------|------|-----|------|--------|-----|------|
| Fa0/1 | Desg | FWD | 19 | 128.1 | P2p | |
| Fa0/23 | Desg | FWD | 19 | 128.23 | P2p | |
| Fa0/24 | Desg | FWD | 19 | 128.24 | P2p | |

✚ SW1#sh spanning-tree vlan 1

VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 000c.28a3.91c0
Cost 19
Port 23 (FastEthernet0/23)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 000c.28a5.b780
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300

| Interface | Role | Sts | Cost | Prio. | Nbr | Type |
|-----------|------|-----|------|--------|-----|------|
| Fa0/23 | Root | FWD | 19 | 128.23 | P2p | |
| Fa0/24 | Desg | FWD | 19 | 128.24 | P2p | |

✚ SW3#sh spanning-tree vlan 1

VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 000c.28a3.91c0
Cost 38
Port 23 (FastEthernet0/23)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 000c.28a5.b540
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300

| Interface | Role | Sts | Cost | Prio. | Nbr | Type |
|-----------|------|-----|------|--------|-----|------|
| Fa0/23 | Root | FWD | 19 | 128.23 | P2p | |
| Fa0/24 | Altn | BLK | 19 | 128.24 | P2p | |

✚ SW4#sh spanning-tree vlan 1

VLAN0001

Spanning tree enabled protocol ieee

Root ID

| | |
|---------------|-----------------------|
| Cost | 19 |
| Port | 23 (FastEthernet0/23) |
| Hello Time | 2 sec |
| Max Age | 20 sec |
| Forward Delay | 15 sec |

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)

Address 000c.85a4.5000

| | |
|---------------|--------|
| Hello Time | 2 sec |
| Max Age | 20 sec |
| Forward Delay | 15 sec |
| Aging Time | 15 |

| Interface | Role | Sts | Cost | Prio. | Nbr | Type |
|-----------|------|-----|------|--------|-----|------|
| Fa0/1 | Desg | FWD | 19 | 128.1 | P2p | |
| Fa0/23 | Root | FWD | 19 | 128.23 | P2p | |
| Fa0/24 | Desg | FWD | 19 | 128.24 | P2p | |

SPANNING TREE PORT FAST

-Cau hinh cac port ket noi voi "End User" tiet kiem thoi gian 30s de chuyen sang trang thai Forwarding (bo qua Listening , Learning).

**** Luu y ko duoc cau hinh tinh nang nay tren cac Port ket noi giua cac SW va SW

```
SW2(config)#int range Fa0/1 -22
SW2(config-if-range)#switchport mode access
SW2(config-if-range)#spanning-tree portfast
```

%Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast will be configured in 5 interfaces due to the range command
but will only have effect when the interfaces are in a non-trunking mode.

SPANNING TREE (cont.)

1. Cach thuc can thiеп vào quá trình bầu chọn ROOT BRIDGE

- Nham muc dich chi dinh ra SW dong vai tro lam Root Bridge
- + Chu dong trong viec thiet ke
- + Toi uu duong di trong he thong
- + Dam bao hieu suat he thong

- Co 2 cach lam:

* **Cach 1** : Chi dinh SW dong vai tro lam Root Bridge. Ngoai ra ta con co the chi dinh SW dong vai tro lam Root Bridge du phong nham muc dich

- + Chu dong trong viec bau chon Root Bridge
- + Tiet kiem thoi gian bau chon Root Bridge

VD: Cau hinh SW1 lam Rootbridge cua VLAN1 va SW2 lam Root Bridge du phong cho VLAN1

```
SW1(config)#spanning-tree vlan 1 root primary
```

```
SW1#sh spanning-tree vlan 1
```

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 24577 --> priority trong BridgeID SW1 se la nho nhat so voi cac SW khac trong VLAN 1

Address 000c.85a4.1100
This bridge is the root
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 24577 (priority 24576 sys-id-ext 1)

Address 000c.85a4.1100
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 300

| Interface | Role | Sts | Cost | Prio.Nbr | Type |
|-----------|------|-----|------|----------|------|
| Fa0/22 | Desg | FWD | 19 | 128.22 | P2p |
| Fa0/23 | Desg | FWD | 19 | 128.23 | P2p |
| Fa0/24 | Desg | FWD | 19 | 128.24 | P2p |

```
SW2(config)#spanning-tree vlan 1 root secondary
```

```
SW2#sh spanning-tree vlan 1
```

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 24577

Address 000c.85a4.1100
Cost 19
Port 23 (FastEthernet0/23)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 28673 (priority 28672 sys-id-ext 1) --> priority trong Bridge ID SW1 se la nho thu 2 so voi ca SW khac trong VLAN 1

Address 000c.28a3.91c0
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Aging Time 300

| Interface | Role | Sts | Cost | Prio.Nbr | Type |
|-----------|------|-----|------|----------|------|
| Fa0/23 | Root | FWD | 19 | 128.23 | P2p |
| Fa0/24 | Desg | FWD | 19 | 128.24 | P2p] |

*** Cach 2: can thiếp thang vào Priority việc cấu hình thay đổi thông số Priority trong Bridge ID của SW mà ta muốn chỉ định làm Root Bridge hoặc Secondary Root Bridge của VLAN nào đó

VD: Cấu hình SW1 làm Root Bridge của VLAN 1 và SW2 làm Secondary du phong

SW1(config)#spanning-tree vlan 1 priority ?

<0-61440> bridge priority in increments of 4096 --> Priority phải là bội số của 4096

++++ Trường hợp nhập sai priority sẽ có thông báo

SW1(config)#spanning-tree vlan 1 priority 656

% Bridge Priority must be in increments of 4096.

% Allowed values are:

0 4096 8192 12288 16384 20480 24576 28672
32768 36864 40960 45056 49152 53248 57344 61440

SW2(config)#spanning-tree vlan 1 priority 8192

SW2#sh spanning-tree vlan 1

VLAN0001

Spanning tree enabled protocol ieee

Root ID Priority 1

Address 000c.85a4.1100

Cost 19

Port 23 (FastEthernet0/23)

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 4097 (priority 4096 sys-id-ext 1) --> Cộng thêm 1 với sys-id-ext 1

Address 000c.28a3.91c0

Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Aging Time 300

| Interface | Role | Sts | Cost | Prio.Nbr | Type |
|-----------|------|-----|------|----------|------|
| Fa0/23 | Root | FWD | 19 | 128.23 | P2p |
| Fa0/24 | Desg | FWD | 19 | 128.24 | P2p] |

2. STP: 802.1d

Cay STP khi hoi tu ma su thay doi xay ra o duong di chinh thi se mat :

20s(Maxage)

30s(Lis + Lean)

Mat tat ca 50s de cay STP hoi tu.

3. RAPID STP: 802.1w IEEE

- Là 1 tiến trình STP chạy trên 1 Broadcast Domain duy nhất

- Tiến trình bầu chọn Root bridge, Root Port, Designated Port của RSTP không có gì khác so với STP

- Mục đích:

+ Cải thiện thời gian hoi tu lại khi cay STP bị thay doi

MAXAGE: 6s (3 chu kỳ gửi BPDU)

Bo qua 30s Listening + Learning

4. Switch cua Cisco ket hop

-STP: 802.1d va giao thuc **PVST +** (Per VLAN STP) cua Cisco qui dinh

PVST+ qui dinh ra tung tien trinh STP khac nhau cho moi VLAN duoc trien khai trong he thong SW

Current configuration : 2800 bytes

```
!
version 12.1
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname SW2
!
!
ip subnet-zero
!
no ip domain-lookup
ip ssh time-out 120
ip ssh authentication-retries 3
!
!
spanning-tree mode pvst
no spanning-tree optimize bpdu transmission
spanning-tree extend system-id
spanning-tree vlan 1 priority 4096
--More--
```

**** Muc dich :

- Ngan ngua truong hop khi chi co 1 tien trinh STP cua VLAN 1 block 1port nao do ma port do lai la port co duong di tot nhat thuoc ve 1 VLAN nao do khi he thong trien khai VLAN

-Ta co the qui dinh ra cac SW dong vai tro lam Root Bridge cho 1 va nhieu VLAN, tang tinh uyен chuyen trong viec thiet ke VLAN, toi uu hoa duong di cua cac VLAN ho tro kha nang can bang tai tren cac SW, tang hieu suat he thong.

-
VD : Cau hinh SW1 lam Root Bridge cua VLAN 1 va VLAN 10
Cau hinh SW2 lam Root Bridge cua VLAN 20 va VLAN 30
SW1(config)#int range VLAN1 , VLAN10
SW1(config)#spanning-tree vlan 1 root primary

SW2(config)#int range VLAN20 , VLAN30
SW2(config)#spanning-tree vlan 1 root secondary

5. TINH NANG SPANNING TREE BPDU GUARD

BPDU Guard là hai phương pháp nhằm ngăn chặn gói BPDU lọt đi vào mạng. Nói rõ hơn khi có Switch lọt cắm vào mạng thì Switch này không thể trao đổi với các Switch khác trong mạng nếu như có bật tính năng này lên. Các tính năng này chỉ có tác dụng trên cổng, có nghĩa là bạn phải cấu hình trên từng cổng. Nếu bạn cấu hình trên cổng f0/1 mà lại lọt cắm Switch lọt vào cổng f0/2 thì Switch mới này vẫn có thể trao đổi thông tin với mạng một cách bình thường.

-Cau hinh tren cac Port ket noi voi End User

-Khi cac port nay nhan duoc bat ky goi BPDU nao do do 1 SW nao do goi den ngay lap tuc port se bi "SHUT DOW"

--> la 1 co che bao ve cay Spanning Tree

VD : Cau hinh tinh nang BPDUGuard tren port 1 → port 5 cua SW

```
SW1(config)#int range fa0/1 -5  
SW1(config-if-range)#switchport mode access  
SW1(config-if-range)#spanning-tree bpduenable
```

6. RAPID - PVST:

- Mode PVST hoi tu nhanh.

```
SW1(config)#spanning-tree mode rapid-pvst
```

```
SW1#sh spanning-tree
```

VLAN0001

Spanning tree enabled protocol rstp

```
Root ID Priority 1  
Address 000c.85a4.1100  
This bridge is the root  
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

```
Bridge ID Priority 1 (priority 0 sys-id-ext 1)  
Address 000c.85a4.1100  
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec  
Aging Time 300
```

| Interface | Role | Sts | Cost | Prio.Nbr | Type |
|-----------|------|-----|------|----------|---------------|
| Fa0/22 | Desg | FWD | 19 | 128.22 | P2p Peer(STP) |
| Fa0/23 | Desg | FWD | 19 | 128.23 | P2p Peer(STP) |
| Fa0/24 | Desg | FWD | 19 | 128.24 | P2p |

OPEN SHORTEST PATH FIRST (OSPF-RFC 2382)

| RIP v2 | OSPF |
|---|--|
| <ul style="list-style-type: none"> - Distance Vector : thuật toán Bellman - Các Router trao đổi thông tin định tuyến theo chu kỳ(30s) - Các Router không biết số đường quan hệ thông.(Network Topology) - Không mang tính mở rộng, bị giới hạn về số Router sử dụng trong AS(Max15) - Metric : Hop count (số router mà nó đi qua) - Đề cau hình - Có nguy cơ xảy ra Routing Loop - Hồi tu chậm, ít tiêu tốn tài nguyên Router - Tiêu tốn nhiều Bandwidth của kết nối WAN phục vụ cho việc trao đổi thông tin định tuyến giữa các Router. | <ul style="list-style-type: none"> - Link State : thuật toán Dijkstra - Không trao đổi thông tin định tuyến theo chu kỳ. Các Router chỉ cập nhật thông tin định tuyến theo có che Trigger Update - Biết hoàn toàn Network Topology - Mang tính mở rộng cao, không giới hạn số Router sử dụng trong 1 AS - Metric = $10^8 / \text{BW}$ (bps) - Không cau hình - Không bao giờ xảy ra Routing Loop - Hồi tu nhanh, tiêu tốn rất nhiều tài nguyên của Router (RAM, CPU) - Ít tiêu tốn Bandwidth của kết nối WAN phục vụ cho việc trao đổi thông tin định tuyến giữa các Router. |

CÁCH THỰC HỘAT ĐỘNG CỦA ROUTER SỬ DỤNG OSPF

I. Lý thuyết :

Router sử dụng OSPF là giao thức định tuyến để xây dựng bảng định tuyến thành công

Trải qua 3 bước :

- **Bước 1 :** Khi Router được cấu hình OSPF, đầu tiên nó sẽ gửi ra các gói tin “Hello” tại địa chỉ Multicast **224.0.0.5** (đối với RIP thì địa chỉ Multicast : 224.0.0.9) để bắt đầu quá trình thiết lập quan hệ Neighbor với các Router kết nối trực tiếp hoặc hoạt động trong cùng 1 **Area**

- **Area:** là khái niệm về phạm vi trao đổi thông tin định tuyến của các Router chạy OSPF. Các Router hoạt động trong cùng 1 Area sẽ có cùng CSDL Network.
OSPF cho phép thiết kế phân cấp 1 AS bao gồm nhiều Area khác nhau. Mỗi Area có 1 hoặc nhiều Router. Tuy nhiên phải đảm bảo việc các Area phải có ít nhất 1 kết nối tập trung về **Backbone Area chính là Area 0**.
- Một số thông tin trong gói tin ‘Hello’:

- AreaID : chỉ ra vùng hoạt động của Router
- RouterID : mặc định là địa chỉ IP **'cao nhất'** của bất kỳ Interface nào kết nối trực tiếp trên Router. Trong trường hợp có cấu hình Loopback (Logical Interface) thì Router sẽ ưu tiên chọn IP của Interface Loopback làm Router ID.
- Trong trường hợp Router được cấu hình nhiều Interface Loopback, thì nó sẽ chọn Interface Loopback có IP cao nhất làm Router ID

***** **Lưu ý** : RouterID ta có thể gán tĩnh cho Router.

- Hello/ Dead Interval:

- + Chu kỳ trao đổi gói tin Hello giữa các Router
- + Thời gian tối đa mà Router đợi để nhận gói tin Hello từ

Neighbor của nó Default = $x 4$ Hello Interval

Quá trình trao đổi Hello giữa các Router chạy OSPF ngoài việc phục vụ cho quá trình nhằm mục đích duy trì mối quan hệ Neighbor giữa chúng. Các gói tin Hello được trao đổi theo chu kỳ giữa các Router như sau:

| TWORK
TYPE | FIGURE | HELLO
INTERVAL | DEAD
INTERV |
|---|--------|-------------------|----------------|
| Point to
Point
(Serial
connection) | | 10s | 40s |
| broadcast
Multi Access
Ethernet/
FastEthernet
connection) | | 10s | 40s |
| Non
broadcast
Multi-
Access
(Frame
Relay) | | 30s | 120s |

- Authentication : Default = Null

- Stub Area Flag : (Course BSCI - CCNP)

De 2 Router chay OSPF co the thiet lap duoc quan he Neighbor thanh cong khi va chi khi cac thong so sau trong goi tin Hello trao doi giua chung la tuong thich Area ID (0), Hello/Dead Interval, thong so sau trong goi tin Hello trao doi giua chung la tuong thich

- + Area ID
- + Hello/Dead Interval
- + Authentication
- + Stub Area Flag

Sau khi thiet lap duoc quan he Neighbor thanh cong thi Router se luu thong tin cac Neighbor cua no vao 1 CSDL goi la **Neighbor Table** tren RAM cua Router.

-Buoc 2: Router bat dau trao doi cac goi tin LSA(Link State Advertisement) mang thong tin trang thai cac Network ma no dang co voi cac Neighbor hop le cua no. Qua trinh nay duoc goi la qua trinh thiet lap "**Adjacency**"

Sau khi Router hoan tat viec trao doi cac thong tin dinh tuyen voi cac Neighbor cua no, Router se luu thong tin tat ca cac trang thai duong link co so ha tang vao 1 CSDL goi la : "**Topology Database**" trong RAM (Router).

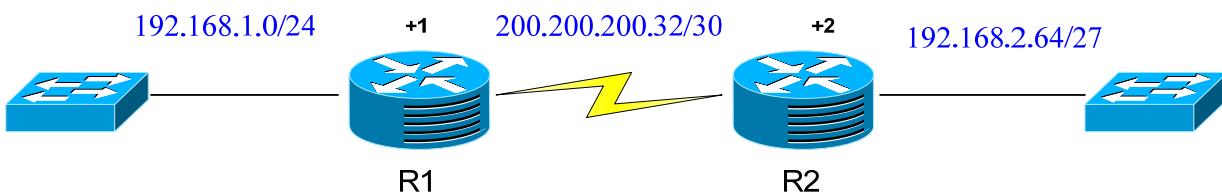
→ Router se co trang thai "**Adjacency**" la "**Full**" nghia la no da hoan tat viec trao doi thong tin dinh tuyen voi Neighbor cua no.

-Buoc 3 : Router su dung thuật toán Dijkstra(Shortest Path First) để tính toán đường đi tốt nhất đến tất cả các Network trong hệ thống. Các thông tin tốt nhất sẽ được lưu vào **Routing Table** lưu trong (RAM của Router).

*** **Lưu ý** : Thuật toán Dijkstra cung cấp nhiều công suất CPU của Router.

====> OSPF tốn nhiều tài nguyên của hệ thống Router : RAM + CPU

II. Thực hành :



R1(config)#router ospf 1

***Process ID** : chỉ ra tiến trình OSPF đang hoạt động trên Router. Có giá trị 1- 65535 và chỉ có ý nghĩa local trên mỗi Router.

- Mỗi Router có thể có nhiều tiến trình OSPF.
- Mỗi tiến trình OSPF thuộc 1 Area khác nhau
- Mỗi tiến trình OSPF tạo ra 1 CSDL OSPF riêng biệt.

```
R1(config)#router ospf 1  
R1(config-router)#network 192.168.1.0 0.0.0.255 area 0  
R1(config-router)#network 200.200.200.32 0.0.0.3 area 0
```

*Wildcard Mask: là dãy nhị phân gồm 32bit, được chia làm 4 octet, với mỗi bit 0 của Wildcard Mask sẽ dài đến cho phần bit mà ta cần quan tâm của địa chỉ IP/Network

Ví dụ:

***** Mẹo tinh nhanh :

Ta lấy local Broadcast 255.255.255.255 trừ đi cho Subnetmask của IP/Network mà ta quan tâm → **Wildcard Mask**

- Router R1

192.168.1.0/24 SM: 255.255.255.0
Wildcard bit : 00000000.00000000.00000000.11111111
-----→ 0.0.0.255

200.200.200.32/30
Wildcard bit: 00000000.00000000.00000000.00000011
-----→ 0.0.0.3

- Router R2

192.168.2.64/27 SM: 255.255.255.224
Wildcard Mask: 255.255.255.255
 255.255.255.224

0.0.0.31

R1:

```
router ospf 1  
network 192.168.1.0 0.0.0.255 area 0  
network 200.200.200.32 0.0.0.3 area 0
```

R2:

```
router ospf 1  
network 192.168.2.64 0.0.0.31 area 0  
network 200.200.200.32 0.0.0.0.3 area 0
```

R1#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, * - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

200.200.200.0/30 is subnetted, 1 subnets

C 200.200.200.32 is directly connected, Serial0/2/0

C 192.168.1.0/24 is directly connected, FastEthernet0/0

192.168.2.0/27 is subnetted, 1 subnets

O 192.168.2.64 [110/65] via 200.200.200.34, 00:00:26, Serial0/2/0

R1#sh ip ospf neighbor

| Neighbor ID | Pri | State | Dead Time | Address | Interface |
|----------------|-----|---------|-----------|----------------|-------------|
| 200.200.200.34 | 0 | FULL/ - | 00:00:36 | 200.200.200.34 | Serial0/2/0 |

Router lang gieng (IP cao nhat cua cong vat ly)

R1#sh ip ospf interface

FastEthernet0/0 is up, line protocol is up

Internet Address 192.168.1.254/24, Area 0

Process ID 1, Router ID 200.200.200.33, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 200.200.200.33, Interface address 192.168.1.254

No backup designated router on this network

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

oob-resync timeout 40

Hello due in 00:00:03

Supports Link-local Signaling (LLS)

Index 2/2, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 0, maximum is 0

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 0, Adjacent neighbor count is 0

Suppress hello for 0 neighbor(s)

Serial0/2/0 is up, line protocol is up

Internet Address 200.200.200.33/30, Area 0

Process ID 1, Router ID 200.200.200.33, Network Type POINT_TO_POINT, Cost:

Transmit Delay is 1 sec, State POINT_TO_POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
oob-resync timeout 40
Hello due in 00:00:00

Supports Link-local Signaling (LLS)
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 200.200.200.34
Suppress hello for 0 neighbor(s)

=====→ Chú ý: Cong serial BW là $1,544 \times 10^6$ bps

COST : $10^8 / 1.544 \times 10^6 = 64$

R1#sh ip protocols
Routing Protocol is "ospf 1"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Router ID 200.200.200.33
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Maximum path: 4

Routing for Networks:

192.168.1.0 0.0.0.255 area 0
200.200.200.32 0.0.0.3 area 0

Routing Information Sources:

| Gateway | Distance | Last Update |
|----------------|----------|-------------|
| 200.200.200.33 | 110 | 00:08:52 |
| 200.200.200.34 | 110 | 00:08:52 |

Distance: (default is 110)

R1#sh ip ospf int s0/2/0
serial0/2/0 is up, line protocol is up
internet address 200.200.200.33/30, area 0
process id 1, router id 200.200.200.33, network type point_to_point, cost: 64
transmit delay is 1 sec, state point_to_point,
timer intervals configured, hello 10, dead 40, wait 40, retransmit 5
oob-resync timeout 40
hello due in 00:00:07
supports link-local signaling (lls)
index 1/1, flood queue length 0
next 0x0(0)/0x0(0)
last flood scan length is 1, maximum is 1

last flood scan time is 0 msec, maximum is 0 msec
neighbor count is 1, adjacent neighbor count is 1
adjacent with neighbor 200.200.200.34
suppress hello for 0 neighbor(s)

R1#sh ip ospf database

OSPF Router with ID (200.200.200.33) (Process ID 1)

Router Link States (Area 0)

| Link ID | ADV Router | Age | Seq# | Checksum | Link count |
|----------------|----------------|-----|------------|----------|------------|
| 200.200.200.33 | 200.200.200.33 | 762 | 0x80000003 | 0x003987 | 3 |
| 200.200.200.34 | 200.200.200.34 | 678 | 0x80000006 | 0x001D7C | 3 |

=> thông tin trạng thái đường Link

R1#sh ip route ospf

192.168.2.0/27 is subnetted, 1 subnets
O 192.168.2.64 [110/65] via 200.200.200.34, 00:12:09, Serial0/2/0
Cost(Metric) qua Serial 64 + cong Fast la 1
AD

III. Bài tập :

Border Gateway trong Router trong OSPF

- Cấu hình Default Router
- Không được quảng bá Network kết nối với ISP vào OSPF
- Quảng bá Default Router tự động cho các Router khác trong cùng AS như sau:

```
(config)#router ospf 1
(config-router)#default-information originate
```

- Vào tiến trình OSPF trên Router thực hiện câu lệnh nhu trên
- NAT

CAU HINH THAY DOI ROUTER ID

- Viec thay doi cach thuc chon RouterID mac dinh yeu cau Router chay OSPF la chon cong vat ly co IP cao nhat nham muc dich duy tri tinh on dinh cua tien trinh OSPF tren Router.

R1 (212.212.212.13/30) ----- R2 (212.212.212.14/30)

Có 2 cách :

- Cách 1 : Cấu hình int Loopback trên Router

Ví dụ : cấu hình int Loopback trên mỗi Router như sau

R1:L1 222.222.222.222/32

R2:L1 223.223.223.223/32

```
R2(config)#int Lo1
R2(config-if)#ip add 223.223.223.223 255.255.255.252
R2#reload
```

**** Lưu cấu hình và Reload để Router ID có tác dụng.

```
R2#sh ip ospf int
```

Enter configuration mode

Internet Address 212.212.212.14/30, Area 0

Process ID 1, Router ID 223.223.223.223, Network Type POINT_TO_POINT, Cost: 64

Transmit Delay is 1 sec, State POINT_TO_POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

oob-resync timeout 40

Hello due in 00:00:04

Supports Link-local Signaling (LLS)

Index 3/3, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 222.222.222.222

Suppress hello for 0 neighbor(s)

FastEthernet0/1 is up, line protocol is up

Internet Address 192.168.20.222/27, Area 0

Process ID 1, Router ID 223.223.223.223, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 223.223.223.223, Interface address 192.168.20.222

No backup designated router on this network

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

oob-resync timeout 40

- Cách 2 : Gán RouterID tĩnh vào tệp cấu hình OSPF trên RouterID. Nếu ta sử dụng cách này thì sẽ có mục ưu tiên cao nhất trong việc Router chọn thông số RouterID

Ví dụ : Tạo cấu hình

R1: 1.1.1.1

R2: 2.2.2.2

=====

B1: Vào dụng tinh OSPF trên Router

```
R2(config)#router ospf 1
```

B2 : cấu hình Router ID bằng câu lệnh

```
R2(config-Router)#router-id 1.1.1.1
```

B3 : Cho Router khởi động lại tinh OSPF bằng cách

```
R2#clear ip ospf process
```

--> chọn Yes.

```
R2#clear ip ospf process
```

```
Reset ALL OSPF processes? [no]:Yes
```

```
R2#sh ip ospf interface E1 - OSPF external
```

Serial0/1/0 is up, line protocol is up

Internet Address 212.212.212.14/30, Area 0

Process ID 1, Router ID 2.2.2.2, Network Type POINT_TO_POINT, Cost: 64

Transmit Delay is 1 sec, State POINT_TO_POINT,

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

oob-resync timeout 40

Hello due in 00:00:03

Supports Link-local Signaling (LLS)

Index 3/3, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 1.1.1.1

Suppress hello for 0 neighbor(s)

FastEthernet0/1 is up, line protocol is up

Internet Address 192.168.20.222/27, Area 0

Process ID 1, **Router ID 2.2.2.2**, Network Type BROADCAST, Cost: 1

Transmit Delay is 1 sec, State WAITING, Priority 1

No designated router on this network

No backup designated router on this network

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

oob-resync timeout 40

```
R2#debug ip ospf events
```

OSPF events debugging is on

```
R2#
```

```
*Dec 15 10:21:00.303: OSPF: Rcv hello from 1.1.1.1 area 0 from Serial0/1/0 212.212.212.13
```

```
*Dec 15 10:21:00.303: OSPF: End of hello processing
```

```
*Dec 15 10:21:01.083: OSPF: Send hello to 224.0.0.5 area 0 on FastEthernet0/1 from 192.168.20.222
```

```
*Dec 15 10:21:01.083: OSPF: Send hello to 224.0.0.5 area 0 on FastEthernet0/0 from 192.168.2.142
```

```
*Dec 15 10:21:01.083: OSPF: Send hello to 224.0.0.5 area 0 on Serial0/1/0 from 212.212.212.14
```

```
R2#
```

```
*Dec 15 10:21:10.303: OSPF: Rcv hello from 1.1.1.1 area 0 from Serial0/1/0 212.212.212.13
```

```
*Dec 15 10:21:10.303: OSPF: End of hello processing
```

```
*Dec 15 10:21:11.083: OSPF: Send hello to 224.0.0.5 area 0 on FastEthernet0/1 from 192.168.20.222
```

```
*Dec 15 10:21:11.083: OSPF: Send hello to 224.0.0.5 area 0 on FastEthernet0
```

CAU HINH THAY DOI THONG SO HELLO/DEAD INTERVAL

Nham kiem tra qua trinh thiet lap Neighbor giua cac Router

- + Area ID
- + Hello/Dead Interval
- + Authentication
- + Stub Area Flag

VD:

-- Thay doi Hello-Interval cua R2 la 15 giay.

```
R2(config)#int s0/1/0
R2(config-if)#ip ospf hello-interval 15
```

R2#sh ip ospf neighbor ---> Mat Neighbor/Mat Ip router

```
R2#
*Dec 15 10:29:20.263: OSPF: Rcv hello from 1.1.1.1 area 0 from Serial0/1/0 212.2
12.212.13
*Dec 15 10:29:20.263: OSPF: Mismatched hello parameters from 212.212.212.13
*Dec 15 10:29:20.263: OSPF: Dead R 40 C 60, Hello R 10 C 15
*Dec 15 10:29:21.083: OSPF: Send hello to 224.0.0.5 area 0 on FastEthernet0/1 fr
om 192.168.20.222
*Dec 15 10:29:21.083: OSPF: Send hello to 224.0.0.5 area 0 on FastEthernet0/0 fr
om 192.168.2.142
```

-- Thay doi Hello-interval cua R1 la 15s. Thay doi DeadInterval 40 giay

```
R1(config)#int s0/2/0
R1(config-if)#ip ospf hello-interval 15
```

R1(config-if)#ip ospf dead-interval 40

```
R1#
*Dec 15 23:39:47.507: OSPF: Rcv hello from 2.2.2.2 area 0 from Serial0/2/0 212.212.212.14
*Dec 15 23:39:47.507: OSPF: Mismatched hello parameters from 212.212.212.14
*Dec 15 23:39:47.507: OSPF: Dead R 60 C 40, Hello R 15 C 15
*Dec 15 23:39:52.815: OSPF: Send hello to 224.0.0.5 area 0 on FastEthernet0/1 from
192.168.10.174
*Dec 15 23:39:52.815: OSPF: Send hello to 224.0.0.5 area 0 on FastEthernet0/0 from 192.168.1.78
*Dec 15 23:39:54.019: OSPF: Send hello to 224.0.0.5 area 0 on Serial0/2/0 from 212.212.212.13
*Dec 15 23:40:02.507: OSPF: Rcv hello from 2.2.2.2 area 0 from Serial0/2/0 212.212.212.14
*Dec 15 23:40:02.507: OSPF: Mismatched hello parameters from 212.212.212.14
*Dec 15 23:40:02.507: OSPF: Dead R 60 C 40, Hello R 15 C 15
*Dec 15 23:40:02.815: OSPF: Send hello to 224.0.0.5 area 0 on FastEthernet0/1 from
192.168.10.174
```

OSPF AUTHENTICATION

La 1 tuy chon duoc cau hinh tren cac Router chay OSPF .Thong tin chung thuc duoc cau hinh tren Router mac dinh la "**NULL**". Sau khi duoc cau hinh thi thong so chung thuc thi Router se dua vao thong so nay de kiem tra tinh dung dang cua cac thong tin trao doi voi cac Router khac trong cung Area.Neu router nhan duoc bat ki goi tin nao cua Router khac trong cung Area goi den no se kiem tra thong so chung thuc. Neu thong so chung thuc duoc dinh kem trong goi tin gui den trung khop voi thong so chung thuc duoc cau hinh tren Router thi no se xem do la goi tin hop le va nguoc lai.

Có 2 cách cau hinh chung thuc trong OSPF

- + Plain Text (CCNA - 640-802)
- + MD5 (MSCI - CCNP)

CAU HINH OSPF PLAINTEXT AUTHENTICATION

Có 2 bước :

- B1: Cau hinh mat ma (authentication): la thong so chung thuc tren tung Interface cua Router chay OSPF. Khi Interface duoc cau hinh mat ma, no se su dung mat ma nay de lam thong tin kiem chung cho cac goi tin trao doi voi cac Neighbor cua no

Ta co the cau hinh nhieu mat ma khac nhau tren cac Interface khac nhau cua Router tuy nhien phai dam bao su dong nhat ve mat ma giua cac Router Neighbor voi nhau tren tung Network. Ta vao Interface tren router cau hinh nhu sau:

```
R2(config)#int s0/1/0
R2(config-if)#ip ospf authentication-key cisco ---> key phan biet hoa thuong, ko khoan trang, nhieu nhat la 8 ki tu. Neu nhieu hon 8 ki tu thi chi co 8 ki tu dau ma thoi.
```

- B2 : Có 2 cách :

- +Cach 1: Dung tai Interface da cau hinh mat ma o tren thuc hien cau lenh.
(config-if)#ip ospf authentication
- +Cach 2: Vao tien trinh OSPF tren Router thuc hien cau lenh.
(config)#router ospf 1
(config-router)#area 0 authentication

VD : Doi key sang Cisco1 se co thong bao nhu sau;

R2#

```
*Dec 15 11:39:51.231: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial0/1/0 from FULL to DOWN, Neighbor Down: Dead timer expired
```

TRANG THAI THIET LAP NEIGHBOR GIUA CAC ROUTER CHAY OSPF

****** TIP :**

Khi ta cau hinh quang ba cac Network, hoac la Subnetwork thuoc ve Interface nao tren Router cua minh bang cau lenh :

(config-router)#network ... trong OSPF thi co nghia la da "enable" tien trinh OSPF chay tren Int do.

- **DOWN** : Khi Int cua Router chua duoc Enable tien trinh OSPF
- **INIT (initial)**: Router bat dau goi goi tin "hello" ra Int da duoc kich hoat OSPF va bat dau tien trinh thiet lap quan he Neighbor
- **2WAY**: Router da nhan duoc goi tin Hello tu lang gieng nao do thong qua cac Interface cua no.Router thuc hien viec kiem tra thong tin chua trong goi hello nhan duoc de xet dieu kien thiet lap quan he neighbor.

Neu nhu cac dieu kien trong goi tin hello nhan duoc thoa dieu kien thi Router se xay dung Neighbor Table chua danh sach Neighbor hop le.

- **Exstart:** Router bat dau trao doi cac goi LSA mang thong tin trang thai cac duong Link ma no so huu voi cac Neighbor hop le cua no.(nham thiet lap Adjacency).

- **FULL :** Router da hoan tat tien trinh trao doi LSA voi cac Neighbor cua no. Tien trinh thiet lap Adjacency da hoan tat.

TIEN TRINH BAU CHON DESIGNATED ROUTER (DR) & BACKUP DESIGNATED ROUTER (BDR).

TRONG MO HINH MANG Broadcast, Non Broadcast Multi-access.

- Trong mo hinh dang Broadcast hoac Non Broadcast Multi Access nham han che viec Router phai thiet lap Adjacency lan nhau theo co che Full Mesh. Khien cho luu thong cua he thong mang bi chiem rat nhieu tai thoi diem phuc vu cho viec trao doi thong tin dinh tuyen cua cac Router.

- Nham han che van de tren OSPF qui dinh ra viec bau chon Router dong vai tro lam DR va router dong vai tro lam BDR trong network nay ma thoi.Cac Router con lai dong vai tro lam DROTHER .Trong Network dang Broadcast hoac Non Broadcast Multiaccess cac DROTHER chi thiet lap Adjacency voi DR va BDR ma thoi.Cac DROTHER con lai giao tiep voi DR o dia chi **224.0.0.6**, DBR voi **224.0.0.5**. Router DR se giao tiep voi cac Router con lai thong qua dia chi 224.0.0.5

- Cac DROHER se nhan duoc CSDL tap trung tat ca cac trang thai duong link tu DR gui xuong va khi co su thay doi ve Network tren DROTHER nao, no se bao cho DR ma thoi thong qua co che Trigger Update va sau do DR se cap nhat su thay doi va thong bao cho cac Router con lai.

- Tieu chi bau chon Router dong vai tro lam DR va BDR trong Network Broadcast/Non Broadcast Multi Access.

+ Router dong vai tro lam DR la Router co 'Priority' cua Int ket noi vao Network Broadcast/Non Broadcast Multi Access **CAONHAT** so voi cac Router con lai. Router co Priority cua Int ket noi vao Broadcast/Non Broadcast Multi Access cao thu 2 se bau chon lam BDR (la du phong cua DR trong truong hop DR bi Fail).

+ Trong truong hop Priority bang nhau (default = 1) thi Router duoc bau chon lam DR la Router co RouterID CAO NHAT, Router co RouterID cao thu 2 se duoc bau la BDR.

R1#sh ip ospf neighbor

| Neighbor ID | Pri | State | Dead Time | Address | Interface |
|-------------|-----|-----------------|-----------|---------------|-----------------|
| 2.2.2.2 | 1 | FULL/BDR | 00:00:30 | 192.168.100.2 | FastEthernet0/0 |
| 3.3.3.3 | 1 | 2WAY/DROTHER | 00:00:36 | 192.168.100.3 | FastEthernet0/0 |
| 5.5.5.5 | 1 | FULL/DR | 00:00:31 | 192.168.100.5 | FastEthernet0/0 |

R5#sh ip ospf neighbor

| Neighbor ID | Pri | State | Dead Time | Address | Interface |
|-------------|-----|---------------------|-----------|---------------|-----------------|
| 1.1.1.1 | 1 | FULL/DROTHER | 00:00:37 | 192.168.100.1 | FastEthernet0/0 |

```
0  
2.2.2.2      1  INIT/DROTHER  00:00:34  192.168.100.2  FastEthernet0/  
0  
3.3.3.3      1  FULL/BDR    00:00:37  192.168.100.3  FastEthernet0/  
0
```

R5#sh ip ospf int fa0/0
FastEthernet0/0 is up, line protocol is up
 Internet Address 192.168.100.5/29, Area 0
 Process ID 1, Router ID 5.5.5.5, Network Type BROADCAST, Cost: 1
 Transmit Delay is 1 sec, State DR, Priority 1
 Designated Router (ID) 5.5.5.5, Interface address 192.168.100.5
 Backup Designated router (ID) 3.3.3.3, Interface address 192.168.100.3
 Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
 oob-resync timeout 40
 Hello due in 00:00:06
 Supports Link-local Signaling (LLS)
 Index 1/1, flood queue length 0
 Next 0x0(0)/0x0(0)
 Last flood scan length is 1, maximum is 2
 Last flood scan time is 0 msec, maximum is 0 msec
 Neighbor Count is 3, Adjacent neighbor count is 3
 Adjacent with neighbor 1.1.1.1
 Adjacent with neighbor 2.2.2.2
 Adjacent with neighbor 3.3.3.3 (Backup Designated Router)
 Suppress hello for 0 neighbor(s)
 Simple password authentication enabled

R3#sh ip ospf int fa0/0
FastEthernet0/0 is up, line protocol is up
 Internet Address 192.168.100.3/29, Area 0
 Process ID 1, Router ID 3.3.3.3, Network Type BROADCAST, Cost: 1
 Transmit Delay is 1 sec, State BDR, Priority 1
 Designated Router (ID) 5.5.5.5, Interface address 192.168.100.5
 Backup Designated router (ID) 3.3.3.3, Interface address 192.168.100.3
 Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
 oob-resync timeout 40
 Hello due in 00:00:01
 Supports Link-local Signaling (LLS)
 Index 3/3, flood queue length 0
 Next 0x0(0)/0x0(0)
 Last flood scan length is 0, maximum is 1
 Last flood scan time is 0 msec, maximum is 4 msec
 Neighbor Count is 3, Adjacent neighbor count is 3
 Adjacent with neighbor 1.1.1.1
 Adjacent with neighbor 2.2.2.2
 Adjacent with neighbor 5.5.5.5 (Designated Router)
 Suppress hello for 0 neighbor(s)
 Simple password authentication enabled

R1#sh ip ospf int fa0/0
FastEthernet0/0 is up, line protocol is up
 Internet Address 192.168.100.1/29, Area 0
 Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
 Transmit Delay is 1 sec, State DROTHER, Priority 1
 Designated Router (ID) 5.5.5.5, Interface address 192.168.100.5
 Backup Designated router (ID) 3.3.3.3, Interface address 192.168.100.3
 Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
 oob-resync timeout 40
 Hello due in 00:00:09

Supports Link-local Signaling (LLS)
Index 2/2, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 0, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 3, Adjacent neighbor count is 2
[Adjacent with neighbor 3.3.3.3 \(Backup Designated Router\)](#)
[Adjacent with neighbor 5.5.5.5 \(Designated Router\)](#)
Suppress hello for 0 neighbor(s)
Simple password authentication enabled

R1#sh ip ospf neighbor

| Neighbor ID | Pri | State | Dead Time | Address | Interface |
|-------------|-----|--------------|-----------|---------------|-----------------|
| 2.2.2.2 | 1 | 2WAY/DROTHER | 00:00:32 | 192.168.100.2 | FastEthernet0/0 |
| 3.3.3.3 | 1 | FULL/BDR | 00:00:39 | 192.168.100.3 | FastEthernet0/0 |
| 5.5.5.5 | 1 | FULL/DR | 00:00:34 | 192.168.100.5 | FastEthernet0/0 |

R3#sh ip ospf neighbor

| Neighbor ID | Pri | State | Dead Time | Address | Interface |
|-------------|-----|--------------|-----------|---------------|-----------------|
| 1.1.1.1 | 1 | FULL/DROTHER | 00:00:31 | 192.168.100.1 | FastEthernet0/0 |
| 2.2.2.2 | 1 | FULL/DROTHER | 00:00:30 | 192.168.100.2 | FastEthernet0/0 |
| 5.5.5.5 | 1 | FULL/DR | 00:00:32 | 192.168.100.5 | FastEthernet0/0 |
| 4.4.4.4 | 0 | FULL/ - | 00:00:31 | 192.168.34.34 | Serial0/2/0 |

CAU HINH CAN THIEP VAO QUA TRINH BAU CHON DR/BDR

Có 3 cách :

- **Cách 1** : chỉnh thông số Priority trên Int ket noi vao Network Broadcast hoặc là Non Broadcast Multi Access của Router muốn chỉ định làm DR sao cho nó có Priority CAO NHẤT so với Router còn lại.(Priority 1-255). Muốn BDR thì chỉnh Priority cao thứ 2

VD : Cấu hình R2 đóng vai trò làm DR

```
R2(config)#int fa0/0
R2(config-if)#ip ospf priority ?
 <0-255> Priority
R2(config-if)#ip ospf priority 10
```

```
R2#sh ip ospf int fa0/0
FastEthernet0/0 is up, line protocol is up
 Internet Address 192.168.100.2/29, Area 0
 Process ID 1, Router ID 2.2.2.2, Network Type BROADCAST, Cost: 1
 Transmit Delay is 1 sec, State DR, Priority 10
 Designated Router (ID) 2.2.2.2, Interface address 192.168.100.2
 Backup Designated router (ID) 5.5.5.5, Interface address 192.168.100.5
 Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
 oob-resync timeout 40
 Hello due in 00:00:05
 Supports Link-local Signaling (LLS)
```

Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 2
Last flood scan time is 0 msec, maximum is 4 msec
Neighbor Count is 3, Adjacent neighbor count is 3
 Adjacent with neighbor 1.1.1.1
 Adjacent with neighbor 3.3.3.3
 Adjacent with neighbor 5.5.5.5 (Backup Designated Router)
Suppress hello for 0 neighbor(s)
Simple password authentication enabled

- Cach 2 : Chinh RouterID

Chinh RouterID cua Router muon lam DR la cao nhat.

- Cach 3 :

- +Ta giu nguyen Priority cua Router duoc chi dinh lam DR
- + Cau hinh thay doi Priority cua cac Router con lai bang 0

⇒ Khi do Router se khong tham gia vao qua trinh bau chon DR va BDR. Khi do cac Router do chi dong vai tro lam DROTHER ma thoi

⇒

VD : Cau hinh thay doi Priority cua R5, R3 , R2 bang 0

R2#sh ip ospf neighbor

| Neighbor ID | Pri | State | Dead Time | Address | Interface |
|-------------|-----|--------------|-----------|---------------|-----------------|
| 1.1.1.1 | 1 | FULL/DR | 00:00:33 | 192.168.100.1 | FastEthernet0/0 |
| 3.3.3.3 | 0 | 2WAY/DROTHER | 00:00:36 | 192.168.100.3 | FastEthernet0/0 |
| 5.5.5.5 | 0 | 2WAY/DROTHER | 00:00:32 | 192.168.100.5 | FastEthernet0/0 |

ENHANCED INTERIOR GATEWAY ROUTING PROTOCOL(EIGRP)

I. Ly Thiet :

1. Tong quan :

- EIGRP là 1 phiên bản nâng cao nham thay the giao thức định tuyến IGRP cũ kỵ
- Chỉ hoạt động trên thiết bị Cisco Router.
- Hoạt động chủ yếu dựa trên nguyên tắc **Distance Vector** cộng thêm 1 số tính năng **Link State** gọi là **Hybrid Routing Protocol**
- Hỗ trợ nhiều giao thức Layer 3 khác nhau : IP, IPX, Apple Talk
- Các Router chạy EIGRP hoạt động trong cùng 1 AS (qui mô nhỏ hơn AS định tuyến cơ bản: tập hợp các thiết bị chịu sự quản trị chung của 1 nhà quản trị).
 - + Autonomous System (AS): 1- 65535; chỉ ra phạm vi hoạt động trao đổi định tuyến của các Router chạy EIGRP. Các Router hoạt động trong cùng 1 AS thì CSDL định tuyến đồng nhất
- Classless Routing Protocol
- Đã có hình thức OSPF
- Hồi ứng nhanh nhất

*** Chu ý : nếu là hệ thống toàn thiết bị Cisco nên dùng giao thức này vì mang tính ứng dụng nhanh nhất.

2. Cách thực hiện : xây dựng bảng định tuyến.

- **Bước 1 :** Đầu tiên Router chạy EIGRP sẽ gửi ra các gói tin **Hello** ra khỏi interface của nó nhằm mục đích thiết lập quan hệ Neighbor với các Router hoạt động trong cùng 1 AS.

+ Chu kỳ của gói tin Hello trong EIGRP như sau

| BW | HELLO INTERVAL | HOLD TIME |
|------------------|----------------|--------------------|
| > T2 (1544 Mbps) | 5S | Hello Interval x 3 |
| < = T1 | 60s | Hello Interval x 3 |

- + Trao đổi thông tin định tuyến tại địa chỉ : **224.0.0.10**
- + Hai Router chạy EIGRP thiết lập Neighbor thành công khi và chỉ khi các thông số trong gói tin Hello là tương thích
 - * AS Number
 - * Hello Interval / Holdtime
 - * Authentication
 - * Thông số K (K value) trong công thức tính Metric của EIGRP (BCSI - CCNP) trao đổi giữa các Router là thường xuyên.

$$EIGRPMetric = \left(k1 * \frac{10^7}{BW} + \frac{\left(k2 * \frac{10^7}{BW} \right)}{56 - Load} + k3 * \frac{Delay}{10} + \frac{k5}{Reliability + k4} \right) * 256$$

Default: K1 và K3 = 1
K2, K4, K5 = 0

Default Metric $EIGRP = \left(k1 * \frac{10^7}{BW} + k3 * \frac{Delay}{10} \right) * 256$

Voi : BW : bps
Load: tai cho phep tren duong truyen (1- 255)
Delay: do tre tren duong truyen (Ms)
Reliability: do tin cay cua duong truyen (1-255)

+ Router se luu thong tin cac Neighbor hop le cua no vao CSDL goi la Neighbor Table (tren RAM cua Router)

- **Buoc 2** : Cac Router se trao doi thong tin dinh tuyen ma no co voi cac Neighbor hop le cua no. Sau khi viec trao doi nay hoan tat Router se luu thong tin tat cac cac Network trong he thong vao CSDL goi la: **Topology Database** (RAM cua Router)

- **Buoc 3** : Router su dung thuat toan DUAL (Diffusing Updated Algorithm) : ket hop thong tin cua hai bang Neighbor Table va Topology Database de tinh toan ra duong di co Metric "**Tot nhat**" den tung network trong he thong. Sau do, Router luu thong tin cac duong di tot nhat vao Routing Table (RAM cua Router)

*** **Luu y** : doi voi moi giao thuc Layer 3 khac nhau moi Router se xay dung moi CSDL dinh tuyen EIGRP khac nhau.

3. Nhung thuat ngu EIGRP (EIGRP Terminology):

- **FD (Feasible Distance)**: la Metric do router tinh toan duoc de di den 1 Network nao do voi Metric la tot nhat
- **Successor**: la 1 Router ma thong qua no Router cua ta co the di den 1 Network nao do
- **Successor Router** : la thong tin dinh tuyen ve 1 network nao do voi Metric la FD va duoc luu tai 2 CSDL :

- + Topology Database
- + Routing Table

* **Feasible Successor**: la Router ma thong qua no Router cua ta co the di den 1 duong mang nao do trong he thong voi Metric kem tot hon (lon hon) Metric cua Successor nhung phai thoai dieu kien la :

RD cua Feasible Successor < FD

RD: Reported Distance = Advertised Distance (AD)

RD: la Matric bao lai cua Router Neighbor cho Router minh biet duoc Metric tu Router Neighbor di den 1 Network nao do trong he thong.

***** Ket luan:

- Router chay EIGRP co toi thieu 1 Successor cua tat cac network trong he thong.
- No co the la 1 hoac nhieu FS
- No cung co the khong co FS nao

* **Feasible Successor Router**: la Backup Route. Mac dinh duoc luu trong Topology Database ma thoii. Trong truong hop Successor Router bi mat ngay lap tuc Feasible Seccessor Router se duoc su dung ngay de thay the Successor Router ma khong can phai tinh toan lai CSDL dinh tuyen =====> hoi tu nhanh.

+ Trong truong hop Router ko co Feasible Successor cua Network X nao do trong he thong thi ngay lap tuc no se **SET** trang thai cua network do trong bang Topology Database thanh **ACTIVE** va **SET FD** cua network do thanh **gia tri am (-)**.

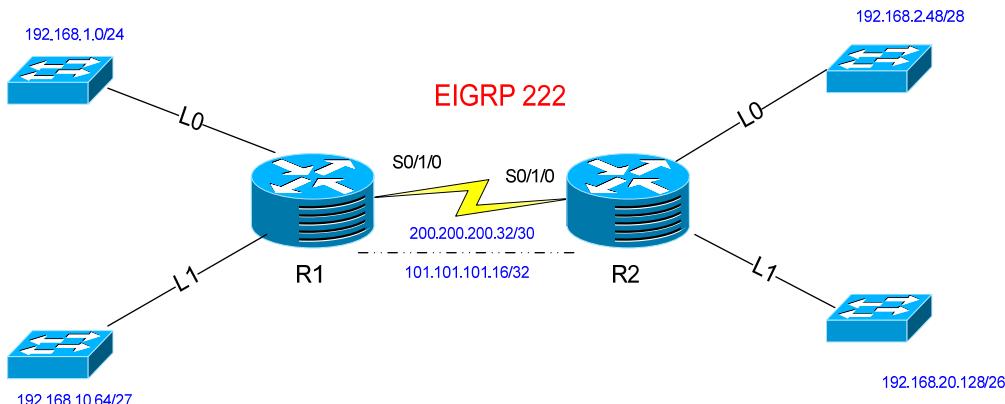
Sau do Router se gui ra goi tin **QUERY** den tat ca cac Neighbor con lai cua no nham truy van thong tin ve Network tren.

+ Goi tin Query trao doi giua cac Router chay EIGRP la dang goi tin duoc truyen theo co che **Connection Oriented** nghia la khi Router nhan duoc goi tin Query thi bat ky Neighbor nao cua no hoi ve 1 thong tin Network nao do thi Router se phai thuc hien co che phan hoi tuong minh de tra loi goi Query tren.

RTP (Reliable Transport Protocol)

- Là 1 giao thức Layer 4 đặc biệt sử dụng để quản lý truyền thông giữa các Router chạy EIGRP
- Quy định ra 2 cách truyền thông
 - + Connection Oriented (truyền có yêu cầu ACK)
 - + Connectionless (truyền không có yêu cầu ACK)
- * Một số gói tin EIGRP truyền thông theo kiểu Connection Oriented
 - + Update : cập nhật thông tin định tuyến
 - + Query
 - + Reply của Query
- * Một số gói tin EIGRP truyền thông theo kiểu Connectionless
 - + Hello
 - + ACK của ACK

II. THỰC HÀNH:



Có 2 cách cấu hình EIGRP:

- Cách 1 : Cấu hình giống RIPv2 chỉ quảng bá Major Network mà thôi

```
R1(config)#router eigrp 222
R1(config-router)#network 200.200.200.0
R1(config-router)#network 192.168.1.0
R1(config-router)#network 192.168.10.0
R1(config-router)#no auto-summary -----> vì giống với RIPv2
```

- Cách 2 : Cấu hình theo kiểu OSPF

Quảng bá Network chính xác + Wildcard Mask

```
R2(config)#router eigrp 222
R2(config-router)#network 200.200.200.32 0.0.0.3
R2(config-router)#network 192.168.2.48 0.0.0.15
R2(config-router)#network 192.168.20.128 0.0.0.63
R2(config-router)#no auto-summary
```

```
R1#wr
Building configuration...
```

*Dec 22 12:07:59.047: %SYS-5-CONFIG_I: Configured from console by console

*Dec 22 12:07:59.859: %DUAL-5-NBRCHANGE: IP-EIGRP (0) 222: Neighbor 200.200.200.3
4 (Serial0/1/0) is up: new adjacency [OK]

R1#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

200.200.200.0/30 is subnetted, 1 subnets
C 200.200.200.32 is directly connected, Serial0/1/0
192.168.10.0/27 is subnetted, 1 subnets
C 192.168.10.64 is directly connected, Loopback1
192.168.20.0/26 is subnetted, 1 subnets
D 192.168.20.128 [90/2297856] via 200.200.200.34, 00:00:41, Serial0/1/0
C 192.168.1.0/24 is directly connected, Loopback0
192.168.2.0/28 is subnetted, 1 subnets
D 192.168.2.48 [90/2297856] via 200.200.200.34, 00:00:41, Serial0/1/0

R1#sh ip route eigrp

192.168.20.0/26 is subnetted, 1 subnets
D 192.168.20.128 [90/2297856] via 200.200.200.34, 00:17:33, Serial0/1/0
192.168.2.0/28 is subnetted, 1 subnets
D 192.168.2.48 [90/2297856] via 200.200.200.34, 00:17:33, Serial0/1/0

R1#sh ip eigrp neighbors

IP-EIGRP neighbors for process 222

| H | Address | Interface | Hold | Uptime | SRTT | RTO | Q | Seq |
|---|----------------|-----------|-------|----------|------|------|---|-----|
| | | | (sec) | (ms) | Cnt | Num | | |
| 0 | 200.200.200.34 | Se0/1/0 | 10 | 00:18:34 | 870 | 5000 | 0 | 3 |

#debug ip packet --> de xem dia chi giao tiep thong tin dinh tuyen 224.0.0.10

Routing Protocol is "eigrp 222"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Default networks flagged in outgoing updates

Default networks accepted from incoming updates

EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0

EIGRP maximum hopcount 100 --> ho tro 100 Router

EIGRP maximum metric variance 1 -> ve mac dinh Router chi dua thong tin Successor Route vao bang dinh tuyen ma thoi

Redistributing: eigrp 222

EIGRP NSF-aware route hold timer is 240s

Automatic network summarization is not in effect

Maximum path: 4 --> Can bang tai la 4 duong (default)

Routing for Networks:

192.168.1.0

192.168.10.0

192.168.100.0

200.200.200.0

Routing Information Sources:

| Gateway | Distance | Last Update |
|---------|----------|-------------|
|---------|----------|-------------|

| | | |
|---------------|----|----------|
| (this router) | 90 | 00:21:58 |
|---------------|----|----------|

| | | |
|----------------|----|----------|
| 200.200.200.34 | 90 | 00:11:36 |
|----------------|----|----------|

Distance: internal 90 external 170

Routing Protocol is "ospf 222"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 192.168.10.94

Number of areas in this router is 0. 0 normal 0 stub 0 nssa

Maximum path: 4

Routing for Networks:

Routing Information Sources:

| Gateway | Distance | Last Update |
|---------|----------|-------------|
|---------|----------|-------------|

Distance: (default is 110)

R1#sh ip route eigrp

192.168.20.0/26 is subnetted, 1 subnets

D 192.168.20.128 [90/2297856] via 200.200.200.34, 00:24:44, Serial0/1/0

192.168.2.0/28 is subnetted, 1 subnets

D 192.168.2.48 [90/2297856] via 200.200.200.34, 00:24:44, Serial0/1/0

#sh int s0/1/0

Serial0/1/0 is up, line protocol is up

Hardware is GT96K Serial

Description: KET NOI VOI R2

Internet address is 200.200.200.33/30

MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,

reliability 255/255, txload 1/255, rxload 1/255

Encapsulation HDLC, loopback not set

Keepalive set (10 sec)

Last input 00:00:04, output 00:00:02, output hang never

Last clearing of "show interface" counters 01:06:16

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

1309 packets input, 79793 bytes, 0 no buffer

Received 390 broadcasts, 0 runts, 0 giants, 0 throttles

0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort

1293 packets output, 78584 bytes, 0 underruns

0 output errors, 0 collisions, 19 interface resets

0 output buffer failures, 0 output buffers swapped out

30 carrier transitions

DCD=up DSR=up DTR=up RTS=up CTS=up

R1#sh ip eigrp topology

IP-EIGRP Topology Table for AS(222)/ID(192.168.10.94)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,

r - reply Status, s - sia Status

P 192.168.100.0/24, 1 successors, FD is 28160
via Connected, FastEthernet0/0

P 192.168.10.64/27, 1 successors, FD is 128256
via Connected, Loopback1

P 192.168.2.48/28, 1 successors, FD is 2297856
via 200.200.200.34 (2297856/128256), Serial0/1/0

P 192.168.1.0/24, 1 successors, FD is 128256
via Connected, Loopback0

P 200.200.200.32/30, 1 successors, FD is 2169856

via Connected, Serial0/1/0
P 192.168.20.128/26, 1 successors, FD is 2297856
via 200.200.200.34 (2297856/128256), Serial0/1/0

(2297856/128256)

++++> 2297856: Successor
128256 : FD

Thêm vào đường mạng 101.101.101.16/30 (qua cổng fa0/1--fa0/0) nối 2 Router lại.

R1#sh ip eigrp neighbors
IP-EIGRP neighbors for process 222

| H | Address | Interface | Hold (sec) | Uptime (ms) | SRTT Cnt | RTO | Q Seq Num |
|---|----------------|-----------|------------|-------------|----------|-----|-----------|
| 1 | 101.101.101.18 | Fa0/1 | 10 | 00:00:13 | 1 200 | 0 | 8 |
| 0 | 200.200.200.34 | Se0/1/0 | 13 | 00:37:41 | 455 2730 | 0 | 9 |

R1#sh ip eigrp topology
IP-EIGRP Topology Table for AS(222)/ID(192.168.10.94)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
r - reply Status, s - sia Status

P 192.168.100.0/24, 1 successors, FD is 28160
via Connected, FastEthernet0/0
P 192.168.10.64/27, 1 successors, FD is 128256
via Connected, Loopback1
P 192.168.2.48/28, 1 successors, FD is 156160
via 101.101.101.18 (156160/128256), FastEthernet0/1
via 200.200.200.34 (2297856/128256), Serial0/1/0
P 192.168.1.0/24, 1 successors, FD is 128256
via Connected, Loopback0
P 101.101.101.16/30, 1 successors, FD is 28160
via Connected, FastEthernet0/1
P 200.200.200.32/30, 1 successors, FD is 2169856
via Connected, Serial0/1/0
P 192.168.20.128/26, 1 successors, FD is 156160
via 101.101.101.18 (156160/128256), FastEthernet0/1
via 200.200.200.34 (2297856/128256), Serial0/1/0

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

#sh ip route

Gateway of last resort is not set

200.200.200.0/30 is subnetted, 1 subnets
C 200.200.200.32 is directly connected, Serial0/1/0
101.0.0.0/30 is subnetted, 1 subnets
C 101.101.101.16 is directly connected, FastEthernet0/1
192.168.10.0/27 is subnetted, 1 subnets
C 192.168.10.64 is directly connected, Loopback1
192.168.20.0/26 is subnetted, 1 subnets

- D 192.168.20.128
[90/156160] via 101.101.101.18, 00:04:25, FastEthernet0/1
- C 192.168.1.0/24 is directly connected, Loopback0
192.168.2.0/28 is subnetted, 1 subnets
- D 192.168.2.48 [90/156160] via 101.101.101.18, 00:04:25, FastEthernet0/1
- C 192.168.100.0/24 is directly connected, FastEthernet0/0

Ta nhan thay voi ket noi cong FastEthernet thi FD la nho hon so voi cong Serial vi vay ket noi se sử dụng FD nay

***** Shut down fa0/1(bo duong mang 101.101.101.16/30)

Vi dang su dung duong mang nay la duong chinh.

Nen duong mang 200.200.200.0/30 hoat dong tro lai..

R1(config)#do sh ip rou

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

- 200.200.200.0/30 is subnetted, 1 subnets
- C 200.200.200.32 is directly connected, Serial0/1/0
192.168.10.0/27 is subnetted, 1 subnets
- C 192.168.10.64 is directly connected, Loopback1
192.168.20.0/26 is subnetted, 1 subnets
- D 192.168.20.128 [90/2297856] via 200.200.200.34, 00:00:23, Serial0/1/0
- C 192.168.1.0/24 is directly connected, Loopback0
192.168.2.0/28 is subnetted, 1 subnets
- D 192.168.2.48 [90/2297856] via 200.200.200.34, 00:00:23, Serial0/1/0
- C 192.168.100.0/24 is directly connected, FastEthernet0/0

CAU HINH THAY DOI HELLO INTERVAL/ HOLDTIME TREN ROUTER CHAY EIGRP

* Lưu ý: Thay doi Hello Interval trong EIGRP thi HoldTime van giu nguyen khong he thay doi(gap 3 lan) lan tuong ung(khac voi OSPF).

VD1 : Thay doi Hello Interval la 5s HoldTime 10s

```
R1(config)#int s0/1/0
R1(config-if)#ip hello-interval eigrp 222 5
R1(config-if)#ip hold-time eigrp 222 10
```

R1#clear ip eigrp neighbors

*Dec 23 09:48:51.663: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.3
4 (Serial0/1/0) is down: Interface **Goodbye received**

R1#clear ip eigrp neighbors

*Dec 23 09:48:52.963: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.3
4 (Serial0/1/0) is up: **new adjacency**

R1#sh ip eigrp neighbors

IP-EIGRP neighbors for process 222

| H | Address | Interface | Hold (sec) | Uptime (ms) | SRTT Cnt | RTO Num | Q Seq |
|---|----------------|-----------|------------|-------------|----------|---------|-------|
| 0 | 200.200.200.34 | Se0/1/0 | | 1 00:00:36 | 2 | 200 | 0 16 |

VD2 : Thay doi Hello Interval la 15s

```
R1(config-if)#  
*Dec 23 09:53:39.271: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.3  
4 (Serial0/1/0) is down: Interface Goodbye received  
R1(config-if)#  
*Dec 23 09:53:42.579: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.3  
4 (Serial0/1/0) is up: new adjacency  
  
R1#clear ip eigrp neighbors  
*Dec 23 09:55:44.791: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.3  
4 (Serial0/1/0) is down: holding time expired  
R1#  
*Dec 23 09:55:53.651: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.3  
4 (Serial0/1/0) is up: new adjacency  
*Dec 23 09:55:53.715: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.3  
4 (Serial0/1/0) is down: manually cleared  
R1#  
*Dec 23 09:56:07.651: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.3  
4 (Serial0/1/0) is up: new adjacency  
R1#  
*Dec 23 09:56:12.699: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.3  
4 (Serial0/1/0) is down: holding time expired  
R1#  
*Dec 23 09:56:21.327: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.3  
4 (Serial0/1/0) is up: new adjacency  
R1#  
*Dec 23 09:56:26.383: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.3  
4 (Serial0/1/0) is down: holding time expired  
*Dec 23 09:54:06.527: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.3  
4 (Serial0/1/0) is down: holding time expired -----> song 10s, chet 5s
```

*** Khi ta dieu chinh HelloInterval thi phai nho dieu chinh HoldTime tuong ung sao cho dam bao HoldTime tuong ung lon hon Hello Interval

VD2 : Thay doi R1 Hello Interval la 20s R2 Hello la 25s

R1 Hello Interval la 20s R2 Hello la 20s

EIGRP MD5 AUTHENTICATION

- La hinh thuc cau hinh thong so chung thuc ma hoa MD5 de dinh kem vao cac goi tin trao doi giua cac Router chay EIGRP.

Khi Router duoc cau hinh chung thuc thi no se dinh kem thong tin nay vao cac data dinh tuyen trao doi voi cac Router khac trong cung AS.

- Ngoai ra, khi no nhan bat ky thong so dinh tuyen tu cac Router khac thi no cung se kiem tra thong tin chung thuc trong cac data dinh tuyen nhan duoc.

- Cac data dinh tuyen nhan duoc Router cho la hop le khi va chi khi thong so chung thuc la trung khop.

1. Chung tuc MD5 trong EIGRP su dung ky thuat Moc Khoa (Key Chain):

- Ky thuat Key Chain qui dinh ra noi Router se su dung 1 hoac nhieu key chain de chung thuc thong

tin trao doi lan nhau.

Tuy nhiên ta phải đảm bảo các Router kết nối với nhau sử dụng các Key Chain tương thích với nhau trên mạng Network kết nối giữa chúng.

-Trong mỗi Keychain ta phải cấu hình các thông tin sau

+ Tên keychain : phân biệt hóa thương hiệu, không trống, chỉ có ý nghĩa cụ thể trên mạng Router

+ Số lượng Key có trong mạng Keychain: Số lượng Key phải tương thích trên mạng keychain thực của các Router.



+ Đối với các Key tạo ra, phải đảm bảo sự trùng khớp các thông tin trên mạng key Chain chung thực của các Router:

* KeyID : tên các khóa

* Key-string: mật khẩu của khóa

* Thời gian chấp nhận khóa : accept-lifetime (default = Infinite)

* Thời gian bắt đầu sử dụng khóa để tạo mật khẩu ; send-lifetime (default = Infinite)

2. Cấu hình chung thực MD5 trong EIGRP sử dụng Keychain có 1 key

- **Bước 1** : Tạo keychain trên mạng Router đặt tên cho các Key chain vừa tạo ra :

R1(config)#key chain mockhoaR1

R2(config)#key chain mockhoaR2

- **Bước 2** : tạo Key trên mạng mục khóa

R1(config-keychain)#key 10 ---> key ID

R2(config-keychain)#key 10 ---> key ID

- **Bước 3** : Cấu hình thông số cho Key vừa tạo

R1(config-keychain-key)#key string cisco ---> giọng nói là password

R2(config-keychain-key)#key string cisco ---> giọng nói là password

- **Bước 4** : Kích hoạt chung thực MD5 trên Interface chạy EIGRP kết nối với Neighbors của nó và chỉ định Keychain sử dụng để chung thực ở interface trên.

R1(config)#int s0/1/0

R1(config-if)#ip authentication mode eigrp 222 md5

R1(config-if)#ip authentication key-chain eigrp 222 mockhoaR1 ---> ten Keychain sử dụng

R1#debug eigrp packets

EIGRP Packets debugging is on

(UPDATE, REQUEST, QUERY, REPLY, HELLO, IPXSAP, PROBE, ACK, STUB, SIAQUERY, SIAREPLY)

R1#

*Dec 23 11:05:25.171: EIGRP: Sending HELLO on Serial0/1/0

*Dec 23 11:05:25.171: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0 iidbQ un/rely 0/0

R1#

*Dec 23 11:05:26.331: EIGRP: received packet with MD5 authentication, key id = 1

0

*Dec 23 11:05:26.331: EIGRP: Received HELLO on Serial0/1/0 nbr 200.200.200.34

*Dec 23 11:05:26.331: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0 iidbQ un/rely 0/0 peerQ un/rely 0/0

VD : Thay đổi Key string R2 : vnpro

```
R1#debug
*Dec 23 11:06:25.523: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.34
(Serial0/1/0) is down: Auth failure
R1#debug eigrp packets
EIGRP Packets debugging is on
    (UPDATE, REQUEST, QUERY, REPLY, HELLO, IPXSAP, PROBE, ACK, STUB, SIAQUERY,
SIAREPLY)
R1#
*Dec 23 11:06:39.055: EIGRP: pkt key id = 10, authentication mismatch
*Dec 23 11:06:39.055: EIGRP: Serial0/1/0: ignored packet from 200.200.200.34, opcode = 5 (invalid
authentication)
*Dec 23 11:06:39.675: EIGRP: Sending HELLO on Serial0/1/0
*Dec 23 11:06:39.675: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0 iedbQ un/rely 0/0
R1#
*Dec 23 11:06:40.363: EIGRP: Sending HELLO on Loopback0
*Dec 23 11:06:40.363: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0 iedbQ un/rely 0/0
*Dec 23 11:06:40.363: EIGRP: Received HELLO on Loopback0 nbr 192.168.1.254
*Dec 23 11:06:40.363: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0
*Dec 23 11:06:40.363: EIGRP: Packet from ourselves ignored
R1#
*Dec 23 11:06:41.379: EIGRP: Sending HELLO on Loopback1
*Dec 23 11:06:41.379: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0 iedbQ un/rely 0/0
*Dec 23 11:06:41.379: EIGRP: Received HELLO on Loopback1 nbr 192.168.10.94
*Dec 23 11:06:41.379: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0
*Dec 23 11:06:41.379: EIGRP: Packet from ourselves ignored
R1#
*Dec 23 11:06:43.483: EIGRP: pkt key id = 10, authentication mismatch
*Dec 23 11:06:43.483: EIGRP: Serial0/1/0: ignored packet from 200.200.200.34, opcode = 5 (invalid
authentication)
*Dec 23 11:06:43.947: EIGRP: Sending HELLO on Serial0/1/0
*Dec 23 11:06:43.947: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0 iedbQ un/rely 0/0
R1#
*Dec 23 11:06:45.231: EIGRP: Sending HELLO on Loopback0
*Dec 23 11:06:45.231: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0 iedbQ un/rely 0/0
*Dec 23 11:06:45.231: EIGRP: Received HELLO on Loopback0 nbr 192.168.1.254
*Dec 23 11:06:45.231: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0
*Dec 23 11:06:45.231: EIGRP: Packet from ourselves ignored
*Dec 23 11:06:45.831: EIGRP: Sending HELLO on Loopback1
*Dec 23 11:06:45.831: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0 iedbQ un/rely 0/0
*Dec 23 11:06:45.831: EIGRP: Received HELLO on Loopback1 nbr 192.168.10.94
*Dec 23 11:06:45.831: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0
*Dec 23 11:06:45.831: EIGRP: Packet from ourselves ignored
R1#
*Dec 23 11:06:47.891: EIGRP: pkt key id = 10, authentication mismatch
*Dec 23 11:06:47.891: EIGRP: Serial0/1/0: ignored packet from 200.200.200.34, opcode = 5 (invalid
authentication)
*Dec 23 11:06:48.311: EIGRP: Sending HELLO on Serial0/1/0
*Dec 23 11:06:48.311: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0 iedbQ un/rely 0/0
R1#u all
*Dec 23 11:06:49.943: EIGRP: Sending HELLO on Loopback0
*Dec 23 11:06:49.943: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0 iedbQ un/rely 0/0
*Dec 23 11:06:49.943: EIGRP: Received HELLO on Loopback0 nbr 192.168.1.254
*Dec 23 11:06:49.943: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0
*Dec 23 11:06:49.943: EIGRP: Packet from ourselves ignored
*Dec 23 11:06:50.519: EIGRP: Sending HELLO on Loopback1
*Dec 23 11:06:50.519: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0 iedbQ un/rely 0/0
*Dec 23 11:06:50.519: EIGRP: Received HELLO on Loopback1 nbr 192.168.10.94
*Dec 23 11:06:50.519: AS 222, Flags 0x0, Seq 0/0 idbQ 0/0
*Dec 23 11:06:50.519: EIGRP: Packet from ourselves ignored
R1#u all
```

Port Statistics for unclassified packets is not turned on.

All possible debugging has been turned off

R1#

3 . Cua hinh chung thuc MD5 trong EIGRP su dung KEYCHAIN co nhieu hon 1 khoa :

Trong moi keychain su dung de chung thuc MD5 trong EIGRP ta co the quy dinh ra nhieu khoa khac nhau de dung chung thuc tai tung thoi diem khac nhau giua cac Router.. Vi vay can co su dong bo thoi gian tren Router phai co cac thong so chi tiet la dong nhat.

- Buoc 1 :

R1 : Key chain R1chain

```
+   key 5
    key-string vnpro
    send-lifetime 11:35:00 DEC 23 2007 duration 120
        <start time>
    accept-lifetime 11:35:00 DEC 23 2007 11:37:00 DEC 23 2007
        <stop time>
+   key 6
    key-string abc
    send-life 11:37:01 DEC 23 2007 Infinite
        <start time>
    accept-lifetime 11:37:01 DEC 23 2007 Infinite
        <stop time>
```

R2 : Key chain R2chain

```
+   key 5
    key-string vnpro
    send-life 11:35:00 DEC 23 2007 duration 120
        <start time>
    accept-lifetime 11:35:00 DEC 23 2007 11:37:00 DEC 23 2007
        <stop time>
+   key 6
    key-string abc
    send-life 11:37:01 DEC 23 2007 Infinite
        <start time>
    accept-lifetime 11:37:01 DEC 23 2007 Infinite
        <stop time>
```

R1(config)#key chain R1chain

R1(config-keychain)#key 5

R1(config-keychain-key)#key-string vnpro

R1(config-keychain-key)#send-lifetime 12:05:00 DEC 23 2007 duration 120

R1(config-keychain-key) accept-lifetime 12:05:00 DEC 23 2007 12:07:00 DEC 23 2007

R1(config-keychain-key)#

R1(config-keychain-key)#key 6

R1(config-keychain-key)#key-string abc

R1(config-keychain-key)#send-lifetime 12:07:01 DEC 23 2007 Infinite

R1(config-keychain-key) accept-lifetime 12:07:01 DEC 23 2007 Infinite

R1(config-keychain-key) #

- Buoc 3 : Chi dinh key chain su dung interface tren Router

R1(config)#int s0/1/0

R1(config-if)#ip authentication mode eigrp 222 md5

R1(config-if)#ip authentication key-chain eigrp 222 R1chain

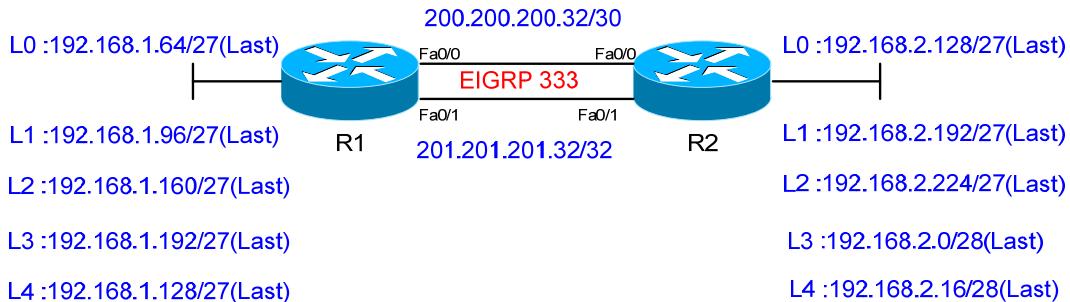
```
====> mat neighbor
      #debug eigrp packets
- Buoc4 :
#clear ip eigrp neighbor

1(config-if)#  

Dec 23 11:57:08.468: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.34
(Serial0/1/0) is up: new adjacency
Dec 23 11:57:08.800: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.34
(Serial0/1/0) is down: keychain changed

1#
Dec 23 11:58:03.532: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.34
(Serial0/1/0) is down: manually cleared
Dec 23 11:58:04.356: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 222: Neighbor 200.200.200.34
(Serial0/1/0) is up: new adjacency
```

LOAD BALANCING



1. Can bang tai dong deu:

```
R1#sh ip eigrp neighbors
IP-EIGRP neighbors for process 333
          H   Address           Interface      Hold Uptime  SRTT  RTO  Q  Seq
                           (sec)        (ms)      Cnt Num
1  201.201.201.34     Fa0/1            13 00:28:47  68  408  0  39
0  200.200.200.34     Fa0/0            13 00:29:02  1   200  0  38
```

```
R1#sh ip route eigrp
192.168.2.0/24 is variably subnetted, 5 subnets, 3 masks
D 192.168.2.0/28
  [90/156160] via 201.201.201.34, 00:04:32, FastEthernet0/1
  [90/156160] via 200.200.200.34, 00:04:32, FastEthernet0/0
D 192.168.2.16/28
  [90/156160] via 201.201.201.34, 00:04:32, FastEthernet0/1
  [90/156160] via 200.200.200.34, 00:04:32, FastEthernet0/0
D 192.168.2.224/27
  [90/156160] via 201.201.201.34, 00:04:32, FastEthernet0/1
  [90/156160] via 200.200.200.34, 00:04:32, FastEthernet0/0
D 192.168.2.192/27
  [90/156160] via 201.201.201.34, 00:04:32, FastEthernet0/1
  [90/156160] via 200.200.200.34, 00:04:32, FastEthernet0/0
D 192.168.2.128/26
  [90/156160] via 201.201.201.34, 00:04:32, FastEthernet0/1
```

[90/156160] via 200.200.200.34, 00:04:32, FastEthernet0/0

```
R1#sh ip route 192.168.2.0 255.255.255.240
Routing entry for 192.168.2.0/28
Known via "eigrp 333", distance 90, metric 156160, type internal
Redistributing via eigrp 333
Last update from 200.200.200.34 on FastEthernet0/0, 00:06:22 ago
Routing Descriptor Blocks:
* 201.201.201.34, from 201.201.201.34, 00:06:22 ago, via FastEthernet0/1
  Route metric is 156160, traffic share count is 1      ----> goi can bang tai
  Total delay is 5100 microseconds, minimum bandwidth is 100000 Kbit
  Reliability 255/255, minimum MTU 1500 bytes
  Loading 1/255, Hops 1
200.200.200.34, from 200.200.200.34, 00:06:22 ago, via FastEthernet0/0
  Route metric is 156160, traffic share count is 1
  Total delay is 5100 microseconds, minimum bandwidth is 100000 Kbit
  Reliability 255/255, minimum MTU 1500 bytes
  Loading 1/255, Hops 1
```

```
R1(config)#router eigrp 333
R1(config-router)#maximum-paths ?
<1-16> Number of paths      --> toi da 16 duong can bang tai
R1(config-router)#maximum-paths 1
```

#sh ip eigrp protocols

IP-EIGRP Topology Table for AS(333)/ID(192.168.1.94)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
r - reply Status, s - sia Status

```
P 192.168.1.96/27, 1 successors, FD is 128256
  via Connected, Loopback1
P 192.168.1.64/27, 1 successors, FD is 128256
  via Connected, Loopback0
P 192.168.2.0/28, 1 successors, FD is 156160
  via 200.200.200.34 (156160/128256), FastEthernet0/0
  via 201.201.201.34 (156160/128256), FastEthernet0/1
P 192.168.2.16/28, 1 successors, FD is 156160
  via 201.201.201.34 (156160/128256), FastEthernet0/1
  via 200.200.200.34 (156160/128256), FastEthernet0/0
P 192.168.2.224/27, 1 successors, FD is 156160
  via 201.201.201.34 (156160/128256), FastEthernet0/1
  via 200.200.200.34 (156160/128256), FastEthernet0/0
P 192.168.1.192/27, 1 successors, FD is 128256
  via Connected, Loopback3
P 192.168.2.192/27, 1 successors, FD is 156160
  via 200.200.200.34 (156160/128256), FastEthernet0/0
  via 201.201.201.34 (156160/128256), FastEthernet0/1
```

* Khi ta chinh maximum-paths=1 tuc la ta da disable tinh nang Loadbalancing
=====> con dung chi co 1 duong mang.

```
R1#sh ip route eigrp
192.168.2.0/24 is variably subnetted, 5 subnets, 3 masks
D  192.168.2.0/28
  [90/156160] via 200.200.200.34, 00:02:17, FastEthernet0/0
D  192.168.2.16/28
  [90/156160] via 201.201.201.34, 00:02:17, FastEthernet0/1
D  192.168.2.224/27
```

- [90/156160] via 201.201.201.34, 00:02:17, FastEthernet0/1
D 192.168.2.192/27
[90/156160] via 200.200.200.34, 00:02:17, FastEthernet0/0
D 192.168.2.128/26
[90/156160] via 200.200.200.34, 00:02:17, FastEthernet0/0

* Chinh maximum-paths lai la 4

- R1#sh ip route eigrp
192.168.2.0/24 is variably subnetted, 5 subnets, 3 masks
D 192.168.2.0/28
[90/156160] via 201.201.201.34, 00:00:17, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:00:17, FastEthernet0/0
D 192.168.2.16/28
[90/156160] via 201.201.201.34, 00:00:17, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:00:17, FastEthernet0/0
D 192.168.2.224/27
[90/156160] via 201.201.201.34, 00:00:17, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:00:17, FastEthernet0/0
D 192.168.2.192/27
[90/156160] via 201.201.201.34, 00:00:17, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:00:17, FastEthernet0/0
D 192.168.2.128/26
[90/156160] via 201.201.201.34, 00:00:17, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:00:17, FastEthernet0/0

R1#sh ip eigrp topology
IP-EIGRP Topology Table for AS(333)/ID(192.168.1.94)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
r - reply Status, s - sia Status

- P 192.168.1.96/27, 1 successors, FD is 128256
via Connected, Loopback1
P 192.168.1.64/27, 1 successors, FD is 128256
via Connected, Loopback0
P 192.168.2.0/28, 2 successors, FD is 156160
via 201.201.201.34 (156160/128256), FastEthernet0/1
via 200.200.200.34 (156160/128256), FastEthernet0/0
P 192.168.2.16/28, 2 successors, FD is 156160
via 200.200.200.34 (156160/128256), FastEthernet0/0
via 201.201.201.34 (156160/128256), FastEthernet0/1
P 192.168.2.224/27, 2 successors, FD is 156160
via 200.200.200.34 (156160/128256), FastEthernet0/0
via 201.201.201.34 (156160/128256), FastEthernet0/1
P 192.168.1.192/27, 1 successors, FD is 128256
via Connected, Loopback3
P 192.168.2.192/27, 2 successors, FD is 156160
via 201.201.201.34 (156160/128256), FastEthernet0/1
via 200.200.200.34 (156160/128256), FastEthernet0/0

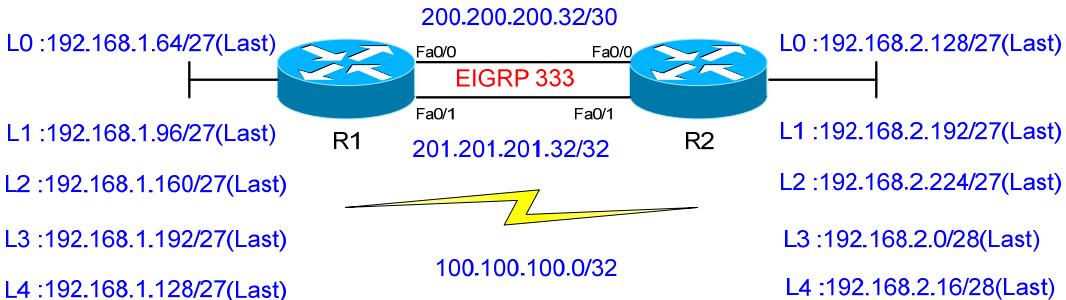
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
r - reply Status, s - sia Status

- P 192.168.1.160/27, 1 successors, FD is 128256
via Connected, Loopback2
P 200.200.200.32/30, 1 successors, FD is 28160
via Connected, FastEthernet0/0

P 192.168.1.128/27, 1 successors, FD is 128256
 via Connected, Loopback4
 P 201.201.201.32/30, 1 successors, FD is 28160
 via Connected, FastEthernet0/1
 P 192.168.2.128/26, 2 successors, FD is 156160
 via 201.201.201.34 (156160/128256), FastEthernet0/1
 via 200.200.200.34 (156160/128256), FastEthernet0/0
 IP-EIGRP Topology Table for AS(33)/ID(192.168.1.222)

2. Cấu hình tài không đồng đều:

Kết nối thêm 1 cổng Serial IP: 100.100.100.0/30



R1#sh ip eigrp neighbors

IP-EIGRP neighbors for process 333

| H | Address | Interface | Hold (sec) | Uptime (ms) | SRTT Cnt | RTO | Q | Seq Num |
|---|----------------|-----------|------------|-------------|----------|-----|-----|---------|
| 0 | 201.201.201.34 | Fa0/1 | | 14 00:02:46 | 3 200 | 0 | 147 | |
| 1 | 200.200.200.34 | Fa0/0 | | 13 00:03:24 | 334 2004 | 0 | 149 | |
| 2 | 100.100.100.2 | Se0/3/0 | | 11 00:08:07 | 1 200 | 0 | 148 | |

R1#sh ip eigrp topology

IP-EIGRP Topology Table for AS(333)/ID(192.168.1.94)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
 r - reply Status, s - sia Status

P 192.168.1.96/27, 1 successors, FD is 128256
 via Connected, Loopback1
 P 192.168.1.64/27, 1 successors, FD is 128256
 via Connected, Loopback0
 P 100.100.100.0/30, 1 successors, FD is 2169856
 via Connected, Serial0/3/0
 P 192.168.2.0/28, 2 successors, FD is 156160
 via 201.201.201.34 (156160/128256), FastEthernet0/1
 via 200.200.200.34 (156160/128256), FastEthernet0/0
 via 100.100.100.2 (2297856/128256), Serial0/3/0
 P 192.168.2.16/28, 2 successors, FD is 156160
 via 201.201.201.34 (156160/128256), FastEthernet0/1
 via 200.200.200.34 (156160/128256), FastEthernet0/0
 via 100.100.100.2 (2297856/128256), Serial0/3/0
 P 192.168.2.224/27, 2 successors, FD is 156160
 via 201.201.201.34 (156160/128256), FastEthernet0/1
 via 200.200.200.34 (156160/128256), FastEthernet0/0
 via 100.100.100.2 (2297856/128256), Serial0/3/0
 P 192.168.1.192/27, 1 successors, FD is 128256

--More--

```
R1#sh ip route eigrp
192.168.2.0/24 is variably subnetted, 5 subnets, 3 masks
D 192.168.2.0/28
[90/156160] via 201.201.201.34, 00:05:43, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:05:43, FastEthernet0/0
D 192.168.2.16/28
[90/156160] via 201.201.201.34, 00:05:43, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:05:43, FastEthernet0/0
D 192.168.2.224/27
[90/156160] via 201.201.201.34, 00:05:43, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:05:43, FastEthernet0/0
D 192.168.2.192/27
[90/156160] via 201.201.201.34, 00:05:43, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:05:43, FastEthernet0/0
D 192.168.2.128/26
[90/156160] via 201.201.201.34, 00:05:43, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:05:43, FastEthernet0/0
```

```
R1#sh ip route eigrp
192.168.2.0/24 is variably subnetted, 5 subnets, 3 masks
D 192.168.2.0/28
[90/156160] via 201.201.201.34, 00:05:43, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:05:43, FastEthernet0/0
D 192.168.2.16/28
[90/156160] via 201.201.201.34, 00:05:43, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:05:43, FastEthernet0/0
D 192.168.2.224/27
[90/156160] via 201.201.201.34, 00:05:43, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:05:43, FastEthernet0/0
D 192.168.2.192/27
[90/156160] via 201.201.201.34, 00:05:43, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:05:43, FastEthernet0/0
D 192.168.2.128/26
[90/156160] via 201.201.201.34, 00:05:43, FastEthernet0/1
[90/156160] via 200.200.200.34, 00:05:43, FastEthernet0/0
```

```
R1#sh ip protocols
Routing Protocol is "eigrp 333"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Default networks flagged in outgoing updates
Default networks accepted from incoming updates
EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
EIGRP maximum hopcount 100
```

EIGRP maximum metric variance 1

```
Redistributing: eigrp 333
EIGRP NSF-aware route hold timer is 240s
Automatic network summarization is not in effect
```

```
Maximum path: 4
```

```
Routing for Networks:
```

```
 100.0.0.0
 192.168.1.0
 200.200.200.0
 201.201.201.0
```

```
Routing Information Sources:
```

| Gateway | Distance | Last Update |
|----------------|----------|-------------|
| (this router) | 90 | 02:11:59 |
| 100.100.100.2 | 90 | 00:05:56 |
| 200.200.200.34 | 90 | 00:05:56 |
| 201.201.201.34 | 90 | 00:05:56 |

Distance: internal 90 external 170

***** Mong muon dua Feasible Successor vao bang dinh tuyen de ho tro can bang tai khong dong deu.

- Cau hinh thay doi thong so EIGRP **maximum metric variance**, co mien gia tri (1 - 128).

+ **EIGRP maximum metric variance = 1** chi dua Successor Router vao bang dinh tuyen ma thoi.

$$\text{Variance} > \frac{\text{MetricFeasibleSuccessor}}{\text{FD}}$$

R1#sh ip eigrp topology
IP-EIGRP Topology Table for AS(333)/ID(192.168.1.94)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
r - reply Status, s - sia Status

P 192.168.1.96/27, 1 successors, FD is 128256
 via Connected, Loopback1
 P 192.168.1.64/27, 1 successors, FD is 128256
 via Connected, Loopback0
 P 100.100.100.0/30, 1 successors, FD is 2169856
 via Connected, Serial0/3/0
 P 192.168.2.0/28, 2 successors, FD is 156160
 via 201.201.201.34 (156160/128256), FastEthernet0/1
 via 200.200.200.34 (156160/128256), FastEthernet0/0
 via 100.100.100.2 (2297856/128256), Serial0/3/0
 P 192.168.2.16/28, 2 successors, FD is 156160
 via 201.201.201.34 (156160/128256), FastEthernet0/1
 via 200.200.200.34 (156160/128256), FastEthernet0/0
 via 100.100.100.2 (2297856/128256), Serial0/3/0
 P 192.168.2.224/27, 2 successors, FD is 156160
 via 201.201.201.34 (156160/128256), FastEthernet0/1
 via 200.200.200.34 (156160/128256), FastEthernet0/0
 via 100.100.100.2 (2297856/128256), Serial0/3/0
 P 192.168.1.192/27, 1 successors, FD is 128256
 via Connected, Loopback4
 P 192.168.2.192/27, 2 successors, FD is 156160
 via 201.201.201.34 (156160/128256), FastEthernet0/1
 via 200.200.200.34 (156160/128256), FastEthernet0/0
 via 100.100.100.2 (2297856/128256), Serial0/3/0
 P 200.200.200.0/24, 1 successors, FD is 28160
 via Connected, FastEthernet0/0
 P 192.168.1.160/27, 1 successors, FD is 128256
 via Connected, Loopback3
 P 201.201.201.32/30, 1 successors, FD is 28160
 via Connected, FastEthernet0/1
 P 192.168.1.128/27, 1 successors, FD is 128256
 via Connected, Loopback2
 P 192.168.2.128/26, 2 successors, FD is 156160
 via 201.201.201.34 (156160/128256), FastEthernet0/1
 via 200.200.200.34 (156160/128256), FastEthernet0/0
 via 100.100.100.2 (2297856/128256), Serial0/3/0

ex: **Variance > 2297856/ 156160 = 14,7147540.....**

Chinh Variance = 14 --> 2 duong

Chinh Variance = 15 --> 3 duong

```
R1(config)#router eigrp 333  
R1(config-router)#variance 15
```

```
R1#sh ip route eigrp  
192.168.2.0/24 is variably subnetted, 5 subnets, 3 masks  
D 192.168.2.0/28  
  [90/156160] via 201.201.201.34, 00:01:19, FastEthernet0/1  
  [90/156160] via 200.200.200.34, 00:01:19, FastEthernet0/0  
  [90/2297856] via 100.100.100.2, 00:01:19, Serial0/3/0  
D 192.168.2.16/28  
  [90/156160] via 201.201.201.34, 00:01:19, FastEthernet0/1  
  [90/156160] via 200.200.200.34, 00:01:19, FastEthernet0/0  
  [90/2297856] via 100.100.100.2, 00:01:19, Serial0/3/0  
D 192.168.2.224/27  
  [90/156160] via 201.201.201.34, 00:01:19, FastEthernet0/1  
  [90/156160] via 200.200.200.34, 00:01:19, FastEthernet0/0  
  [90/2297856] via 100.100.100.2, 00:01:19, Serial0/3/0  
D 192.168.2.192/27  
  [90/156160] via 201.201.201.34, 00:01:19, FastEthernet0/1  
  [90/156160] via 200.200.200.34, 00:01:19, FastEthernet0/0  
  [90/2297856] via 100.100.100.2, 00:01:19, Serial0/3/0  
D 192.168.2.128/26  
  [90/156160] via 201.201.201.34, 00:01:19, FastEthernet0/1  
  [90/156160] via 200.200.200.34, 00:01:19, FastEthernet0/0  
  [90/2297856] via 100.100.100.2, 00:01:19, Serial0/3/0
```

```
R1#sh ip route 192.168.2.128 255.255.255.192
```

Routing entry for 192.168.2.128/26

Known via "eigrp 333", distance 90, metric 156160, type internal

Redistributing via eigrp 333

Last update from 100.100.100.2 on Serial0/3/0, 00:02:15 ago

Routing Descriptor Blocks:

201.201.201.34, from 201.201.201.34, 00:02:15 ago, via FastEthernet0/1

Route metric is 156160, traffic share count is 15

Total delay is 5100 microseconds, minimum bandwidth is 100000 Kbit

Reliability 255/255, minimum MTU 1500 bytes

Loading 1/255, Hops 1

* 200.200.200.34, from 200.200.200.34, 00:02:15 ago, via FastEthernet0/0 --> goi tin tiep theo xac dinh cong nao de ra ngoai

Route metric is 156160, traffic share count is 15

Total delay is 5100 microseconds, minimum bandwidth is 100000 Kbit

Reliability 255/255, minimum MTU 1500 bytes

Loading 1/255, Hops 1

100.100.100.2, from 100.100.100.2, 00:02:15 ago, via Serial0/3/0

Route metric is 2297856, traffic share count is 1

Total delay is 25000 microseconds, minimum bandwidth is 1544 Kbit

Reliability 255/255, minimum MTU 1500 bytes

Loading 1/255, Hops 1

Variance * FD > Feasible Successor

3. Route Summarization :

Tom tat thong tin dinh tuyen tu 1 Router quang ba sang Router khac voi muc dich chinh la la "**thu hep kich co bang dinh tuyen cua cac Router**".

-Buoc 1 : Liet ke ca Network muon Summary

192.168.1.64/27
192.168.1.96/27
192.168.1.128/27
192.168.1.168/27
192.168.1.192/27

Liet ke Bit giong nhau nhieu nhat cua cac Network muon Summary tu trai qua phai.

=====> cac network tren giong nhau 24 bit

summary route : 192.168.1.0/24

ex1 : 192.168.128.0/24
192.168.159.0/24

summary route : 192.168.128.0/19

ex2 : 200.200.64.0/24

.....

200.200.79.0/24

summary route : 200.200.64.0/20

- Buoc 2 : Vao tung Interface cua Router ket noi voi lang gieng cua no quang ba Summary Route

```
R1(config)#int fa0/0
R1(config-if)#ip summary-address eigrp 333 192.168.1.0 255.255.255.0
R1(config-if)#
R1(config-if)#exit
R1(config)#
R1(config)#int fa0/1
R1(config-if)#ip summary-address eigrp 333 192.168.1.0 255.255.255.0
R1(config-if)#
R1(config-if)#exit
R1(config)#
R1(config)#int s0/3/0
R1(config)#ip summary-address eigrp 333 192.168.1.0 255.255.255.0
```

R1#sh ip route eigrp
192.168.1.0/24 is variably subnetted, 6 subnets, 2 masks
D 192.168.1.0/24 is a summary, 00:00:05, Null0

----> Tu tao

D 192.168.2.0/24 [90/156160] via 201.201.201.34, 00:00:05, FastEthernet0/1

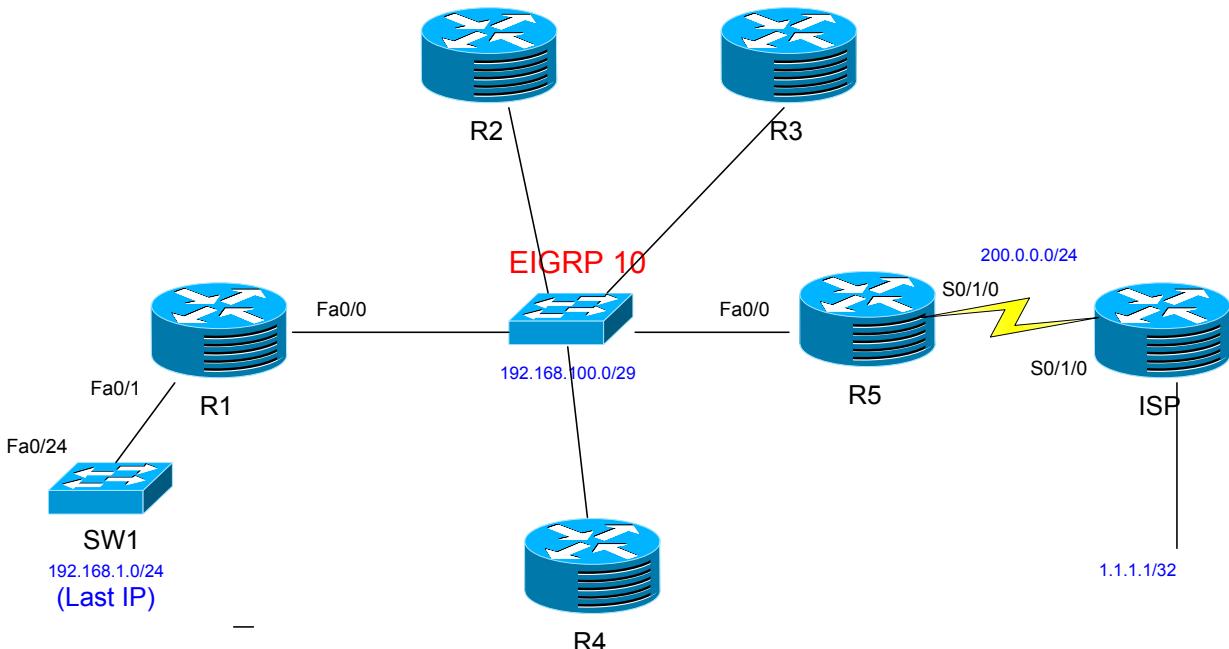
----> Tao cho Neighbor
[90/156160] via 200.200.200.34, 00:00:05, FastEthernet0/0
[90/2297856] via 100.100.100.2, 00:00:05, Serial0/3/0

***** **Chu y** : Router hoc duoc Summary Route tu Neigbor cua no
Router tu tao ra Summary Router da quang ba cho Neighbor va chi ve **NULL 0**

4. KY THUAT NULL 0 : là kỹ thuật chống Routing Loop khi Router cấu hình Summary Route thì mặc định Router tạo ra Summary Route chỉ về NULL 0

- Cau Router tra cứu trong Routing Table theo luật Longest Match First

5. BORDERGATEWAY EIGRP:



* Static Default Route :

Để quảng bá Default Route từ Border Gateway ngược về các Router khác trong cùng AS 1 cách tự động thì ta có 2 cách

- Cách 1 : sử dụng trong trường hợp mạng kết nối giữa Border Gateway và ISP là 1 mạng khác MajorNet

B1 : Cấu hình Default Route (không quảng bá Network kết nối giữa Border Gateway và ISP vào EIGRP)

B2 : Vào dùng tiến trình EIGRP trên Router Border Gateway thực hiện câu lệnh

R5(config)#router eigrp 222

R2(config-router)#redistribute static

+ ==> quảng bá Static Default Router từ Router Border Gateway cho các Router khác trong cùng AS)

*** Các Router khác

```
#clear ip route *
```

VI DU: **External Route:** những thông tin định tuyến mà Router chạy EIGRP có được từ giao thục định tuyến khác
AD = 170 (default).

```
R1#sh ip protocols
```

EIGRP NSF-aware route hold timer is 240s

Automatic network summarization is not in effect

Address Summarization:

192.168.1.0/24 for FastEthernet0/1, Serial0/1/0

Summarizing with metric 28160

Maximum path: 4

Routing for Networks:

192.168.1.0/26
192.168.1.64/26
192.168.1.128/26
192.168.1.0
192.168.14.16/30
192.168.100.0/29

Routing Information Sources:

| Gateway (this router) | Distance | Last Update |
|-----------------------|----------|-------------|
| 192.168.100.4 | 90 | 00:01:17 |
| 192.168.100.5 | 90 | 00:32:51 |
| 192.168.100.2 | 90 | 00:01:17 |
| 192.168.100.3 | 90 | 00:01:17 |
| 192.168.14.18 | 90 | 00:01:17 |

Distance: internal 90 external 170

#sh ip route

Gateway of last resort is 192.168.100.5 to network 0.0.0.0

192.168.14.0/30 is subnetted, 1 subnets
C 192.168.14.16 is directly connected, Serial0/1/0
192.168.4.0/26 is subnetted, 1 subnets
D 192.168.4.128 [90/2297856] via 192.168.14.18, 00:01:19, Serial0/1/0
192.168.1.0/24 is variably subnetted, 4 subnets, 2 masks
C 192.168.1.64/26 is directly connected, FastEthernet0/0.10
C 192.168.1.0/26 is directly connected, FastEthernet0/0.1
D 192.168.1.0/24 is a summary, 00:01:19, Null0
C 192.168.1.128/26 is directly connected, FastEthernet0/0.20
192.168.2.0/28 is subnetted, 1 subnets
D 192.168.2.64 [90/156160] via 192.168.100.2, 00:04:11, FastEthernet0/1
192.168.100.0/29 is subnetted, 1 subnets
C 192.168.100.0 is directly connected, FastEthernet0/1
192.168.3.0/28 is subnetted, 1 subnets
D 192.168.3.160 [90/30720] via 192.168.100.3, 00:04:13, FastEthernet0/1
D*EX 0.0.0.0/0 [170/30720] via 192.168.100.5, 00:01:14, FastEthernet0/1

- Cach 2:

Trong truong hop noi giua BorderGateway Router va ISP la 1 Network cung MajorNet(A: /8; B: /16; C: /24)

- Buoc 1 : Van cau hinh Static Default Route
 - Buoc 2 : Quang ba Network ket noi voi ISP vao EIGRP
- R5(config)#router eigrp 10
(config-router)#net 200.0.0.0
- Buoc 3 : Quang ba Default Route cho cac Router cung chay Eigrp trong cung AS bang cach :
- R5(config)#ip default-network 200.0.0.0
[**<network ket noi voi ISP>**](#)

Cac Router khac :

```
#clear ip route *
#sh ip route
D <network ket noi voi ISP>
```

R1#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2
 i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
 ia - IS-IS inter area, * - candidate default, U - per-user static route
 o - ODR, P - periodic downloaded static route

Gateway of last resort is 192.168.100.5 to network 200.0.0.0

- D* 200.0.0.0/24 [90/30720] via 192.168.100.5, 00:04:48, FastEthernet0/0
 - 192.168.4.0/27 is subnetted, 1 subnets
 - D 192.168.4.64 [90/156160] via 192.168.100.4, 00:12:18, FastEthernet0/0
 - 192.168.5.0/26 is subnetted, 1 subnets
 - D 192.168.5.128 [90/156160] via 192.168.100.5, 00:12:18, FastEthernet0/0
 - C 192.168.1.0/24 is directly connected, FastEthernet0/1
 - 192.168.2.0/28 is subnetted, 1 subnets
 - D 192.168.2.160 [90/156160] via 192.168.100.2, 00:12:18, FastEthernet0/0
 - 192.168.100.0/29 is subnetted, 1 subnets
 - C 192.168.100.0 is directly connected, FastEthernet0/0
 - 192.168.3.0/28 is subnetted, 1 subnets
 - D 192.168.3.48 [90/30720] via 192.168.100.3, 00:12:18, FastEthernet0/0

R5#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
 D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
 E1 - OSPF external type 1, E2 - OSPF external type 2
 i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
 ia - IS-IS inter area, * - candidate default, U - per-user static route
 o - ODR, P - periodic downloaded static route

Gateway of last resort is 200.0.0.2 to network 0.0.0.0

- C* 200.0.0.0/24 is directly connected, FastEthernet0/1 --> qui định đường này là Default Route của nhung Router ben trong
- 192.168.4.0/27 is subnetted, 1 subnets
- D 192.168.4.64 [90/156160] via 192.168.100.4, 00:41:47, FastEthernet0/0
- 192.168.5.0/26 is subnetted, 1 subnets
- C 192.168.5.128 is directly connected, Loopback0
- D 192.168.1.0/24 [90/30720] via 192.168.100.1, 00:00:18, FastEthernet0/0
- 192.168.2.0/28 is subnetted, 1 subnets
- D 192.168.2.160 [90/156160] via 192.168.100.2, 00:23:09, FastEthernet0/0
- 192.168.100.0/29 is subnetted, 1 subnets
- C 192.168.100.0 is directly connected, FastEthernet0/0
- 192.168.3.0/28 is subnetted, 1 subnets
- D 192.168.3.48 [90/30720] via 192.168.100.3, 00:44:30, FastEthernet0/0
- S* 0.0.0.0/0 [1/0] via 200.0.0.2

******* Mo rong :**

Router Gateway chạy EIGRP quảng bá Default Route cho các Router khác chạy EIGRP trong cùng AS bằng cách nó sẽ: "**đánh dấu**" một Network X kết nối trực tiếp với nó bằng câu lệnh:

"ip default-network"

- Network X này phải là 1 Network có Address thuộc Major Network.
- Network X này phải được Router Gateway trong EIGRP quảng bá cho các Router khác bằng EIGRP
- Câu lệnh "**"ip default-network"**" giúp Router Gateway hướng dẫn cho các Router khác Forward Packet với Destination Address không nằm trong bảng định tuyến của chúng đến Router Gateway thông qua Network được đánh dấu.

ACCESS CONTROL LIST (ACLs)

I. LY THUYET :

1. Khai niem :

- ACLs là ứng dụng được tích hợp trong Cisco IOS
- Nham muc dich :
 - + Filtering Traffic trong he thong. Router chỉ có thể lọc các Traffic đi qua nó (Pass through it) nhung khong the loc duoc cac Traffic xuat phat tu tren chinh Router (Originate from It).
 - *** Thực hiện việc lọc Traffic như sau :
 - > Source IP và Destination IP
 - > Source Port và Destination Port

2. Ứng dụng:

- Triển khai Security trong hệ thống vì thế được xem như Firewall
- Qui định ra các đường đi chỉ IP cần NAT
- Filter các thông tin định tuyến gửi từ Router này sang Router khác (BSCI)
- Chất lượng dịch vụ - Quality Of Service (QoS): BCMSI, ONT, QoS (CCNP), CCIP

3. Tính năng ứng dụng Firewall :

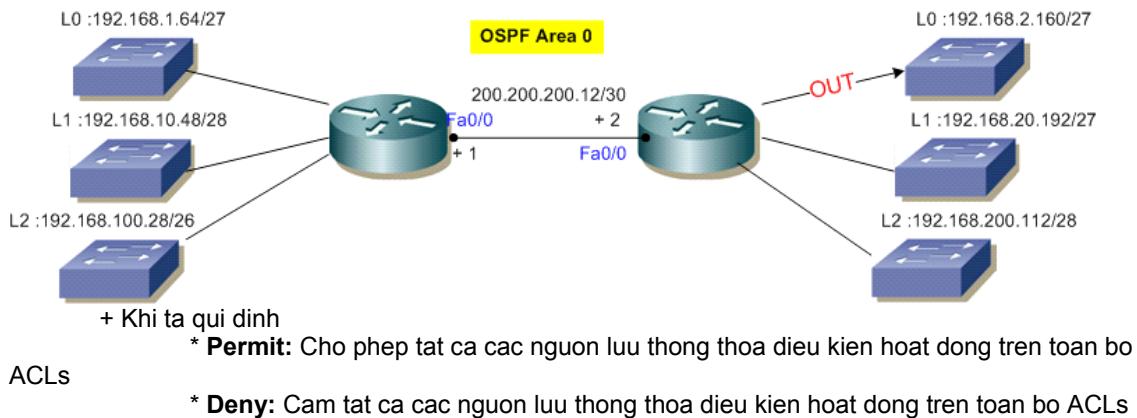
*** Các hình thức Router xử lý tin khi triển khai ACLs :

- ACLs được viết dưới dạng 1 script (văn bản) có trình tự
 - ACLs chỉ có tác dụng khi và chỉ khi nó được **Apply** vào các Interface và các Line trên Router.
 - Một Access List được viết bao gồm các câu lệnh cấm hoặc là cho phép (Permit/Deny).
- ACLs không có thể áp dụng trên các Interface của Router theo chiều **IN/OUT**
- + **IN**: Router sẽ lọc và xử lý các Packet của các Traffic đi vào Interface trên Router. Khi Router nhận được Packet nào đó sẽ xem xét các điều kiện của ACLs sau đó mới thực hiện công việc định tuyến.
 - + **OUT**: Router sẽ lọc và xử lý các Packet của Traffic đi ra khỏi Interface trên Router. Khi Router nhận được Packet nào đó sẽ xem xét định tuyến trước sau đó mới xem xét điều kiện ACLs.
- Router đọc điều ACLs theo trình tự Top - Down, nếu Packet dung ở bất kỳ dòng nào của ACLs thì ngay lập tức Router sẽ thoát ra khỏi ACLs và xử lý Packet trên ứng theo qui định của ACLs là Permit/Deny
- *** Nếu như Packet không dung với ACLs trên thì Packet sẽ bị Drop.

4. Phân loại ACLs :

a> Standard ACLs :

- + Có số hiệu là 1 - 99, đối với IOS 12.3 trở về sau hỗ trợ trên 1300 – 1999 ACLs
- + **La loai ACLs loc Traffic chi dua vao SourceIP cua Packet**

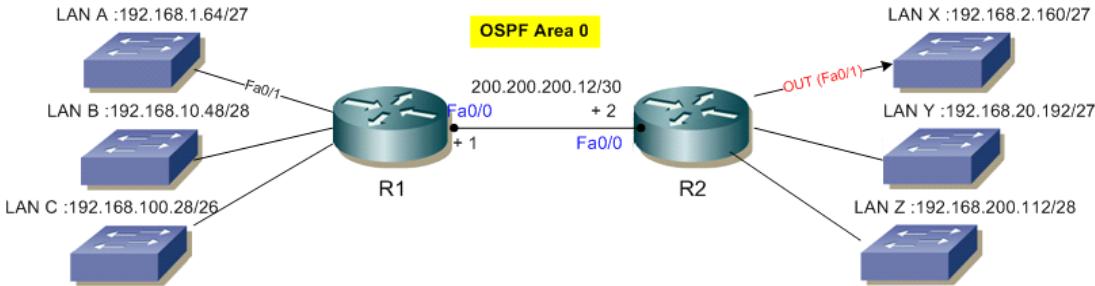


Khi Apply Standard ACLs ta nên viết nó ở gần đích của luồng lưu thông.

Ví dụ: Viết Standard ACLs sao cho:

+ Cho User thuộc LAN A và LAN B trên Router 1 truy xuất LAN X
 Access-list 1 deny 192.168.1.64 0.0.0.31
 Access-list 1 deny 192.168.10.48 0.0.0.31

+ Chỉ cho phép LAN C trên R1 truy xuất LAN X
 Access-list 1 permit 192.168.100.28 0.0.0.63



```
R2(config)#access-list 1 deny 192.168.1.64 0.0.0.31
<so hieu> <Source IP Address> <WildCard>
R2(config)#access-list 1 deny 192.168.10.48 0.0.0.15
R2(config)#access-list 1 permit 192.168.100.128 0.0.0.63
R2(config)#access-list 1 permit 0.0.0.0 255.255.255.255
hoặc
```

R2(config)#access-list 1 permit any -----> nhằm cho Traffic của LAN Y, Z có thể vào LAN X, LAN C có thể vào LAN Y, Z

***** **Chú ý** : + điều kiện nào của ACLs có thể được truy cập thì sẽ được Router xử lý trước
 + Khi ta dùng lệnh "NO" bất kỳ dòng nào của ACLs thì mặc định sẽ xoá hết luôn
 ACLs đó
 + Nên viết ACLs ngoài nhập trước và phải tinh toán chính xác hợp lý.
 + Mặc định ở cuối ACLs có 1 câu lệnh an là "**DENY ANY**"

```
R2(config)#int fa0/0
R2(config-if)#ip access-group 1 out
<so hieu> <Chieu>
```

**** WILDCARD MASK :(Challenge)

VD 1: Lọc Traffic 192.168.1.0/24
 Nguyên Net: 192.168.1.0 0.0.0.255
 + IP Chan trên Net: (Bit cuối cùng của IP luôn là 0)
 192.168.1.00000000
 Wildcard Bit: 0.0.11111110
 ==> 192.168.1.0 0.0.0.254
 + IP le trên Net: (Bit cuối cùng là số 1)
 192.168.1.00000001
 0.0.0.11111110
 ==> 192.168.1.0 0.0.0.254
 + IP của 1 host cụ thể:
 192.168.1.100 0.0.0.0

Hoặc host 192.168.1.100

|
 VD2: Lọc traffic 192.168.100.32/27

+ Nguyen Net 192.168.100.32 0.0.0.31
+ IP Chan 192.168.100.**00100000**
Wildcard Bit 0.0.0.11011110 ==> .30
+ IP le 192.168.100.00100001
WC 0.0.0.11011110 ==> .30

VD3: Loc traffic 192.168.20.112/28
+ Nguyen Net 192.168.20.112 0.0.0.15
+ IP Chan 192.168.20.**01110000**
Wildcard Bit 0.0.0.**10001110**
==> 192.168.20.128.14
+ IP le 192.168.100.01110001
WC 0.0.0.**10001110**
==> 192.168.20.129 0.0.0.14

VD4: Loc traffic 192.168.1.128/26
+ Nguyen Net 192.168.1.128 0.0.0.63
+ IP Chan 192.168.1.**10000000**
Wildcard Bit 0.0.0.**01111110** ==> .62
==> 192.168.1.128 0.0.0.62
+ IP le 192.168.100.**10000001**
WC 0.0.0.**01111110** ==> .62
==> 192.168.1.129 0.0.0.62

VD5: 192.168.1.128- 192.168.1.159

192.168.1.**10000000**
192.168.1.**10111111**

➔ 192.168.1.128 0.0.0.31

VD6: Day IP
192.168.1.0

.....
192.168.7.0

192.168.**00000001**.0
192.168.**0000111**.0

==> 192.168.1.0 0.0.7.255

VD7:

Day 192.168.1.1 192.168.3.254
192.168.1.1 0.0.3.255

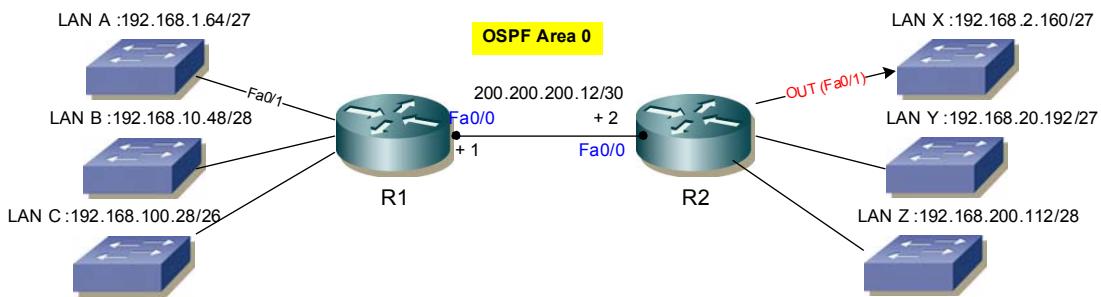
VD8: Loc Le, Chan 192.168.128.1

.....
192.168.192.154

IP Chan 192.168.10000000.00000001
IP Le 192.168.11000000.00000001
KQ: 0.0.01111111.11111110

192.168.128.1 0.0.127.254

II. THỰC HÀNH :



VD ACLs1 : Apply tren R2

Viet 1 Standard ACL tren R2 thoa dieu kien:

- Chỉ cho phép host 192.168.1.66 ở LAN A truy xuất LAN X.
- Các host con ở LAN A truy xuất X
- Cho phép LAN B truy xuất LAN X
- Các LAN C truy xuất LAN X
- Cho phép các LAN con truy xuất LAN X (chỉ rõ nội bộ ACLs)

```
R2(config)#access-list 1 permit 192.168.1.66 0.0.0.0
R2(config)#access-list 1 deny 192.168.1.64 0.0.0.31
R2(config)#access-list 1 permit 192.168.10.48 0.0.0.15
R2(config)#access-list 1 deny 192.168.100.128 0.0.0.63
R2(config)#access-list 1 permit any
```

VD ACLs2: Apply tren R1

Viet 1 Standard ACLs thoa dieu kien

- Chỉ cho phép IP của LAN X truy xuất LAN A. Các IP khác truy xuất LAN A
- Các IP từ LAN Y và Z truy xuất LAN A
- Cho phép các LAN con truy xuất LAN A (chỉ rõ nội bộ ACLs)

```
access-list 1 permit 192.168.2.160 0.0.0.14
access-list 1 deny 192.168.2.161 0.0.0.14
access-list 1 permit 192.168.20.193 0.0.0.30
access-list 1 permit 192.168.200.113 0.0.0.30
access-list 1 permit any
```

VD3:

Viet 1 Standard ACL tren R2 thoa dieu kien:

- Chỉ cho phép host 192.168.1.66 ở LAN A truy xuất LAN X.
- Cho phép các IP của LAN X truy xuất LAN X
- Cho phép các IP khác truy xuất LAN X

```
access-list permit 192.168.1.66 0.0.0.0
access-list permit 192.168.1.64 0.0.0.30
access-list permit 192.168.1.65 0.0.0.30
```

R2#sh access-lists

Standard IP access list 1

```
10 deny 192.168.1.66 (3 matches)
20 permit 192.168.1.64, wildcard bits 0.0.0.30 (13 matches)
30 deny 192.168.1.65, wildcard bits 0.0.0.30 (3 matches)
```

40 permit any

***** Bo Access List:**

Khi ta muon bo Access List ta nen :

+ > Den Int da Apply va bo Apply

+ > Bo ACLs bang cach

(config)#no access-group 1

VD4 : Viet 1 Standard thoa dieu kien :

- Cam User 192.168.2.165 Telnet den R1 va IP le Telnet den R1

- Chi cho hep cac User co IP Chan tu LAN X truy xuat den R1

```
access-list 1 deny host 192.168.2.165
access-list 1 permit 192.168.2.160 0.0.0.14
access-list 1 deny 192.168.2.161 0.0.0.14
access-list 1 permit any
```

```
line vty 0 15
access-class 1 in
exit
```

====> Ngan Telnet bang Standard ACLs

```
int fa0/1
ip access-group 1 out
```

b> Extended ACLs:

R2#sh run int fa0/1 -----> Thay ACLs
Building configuration...

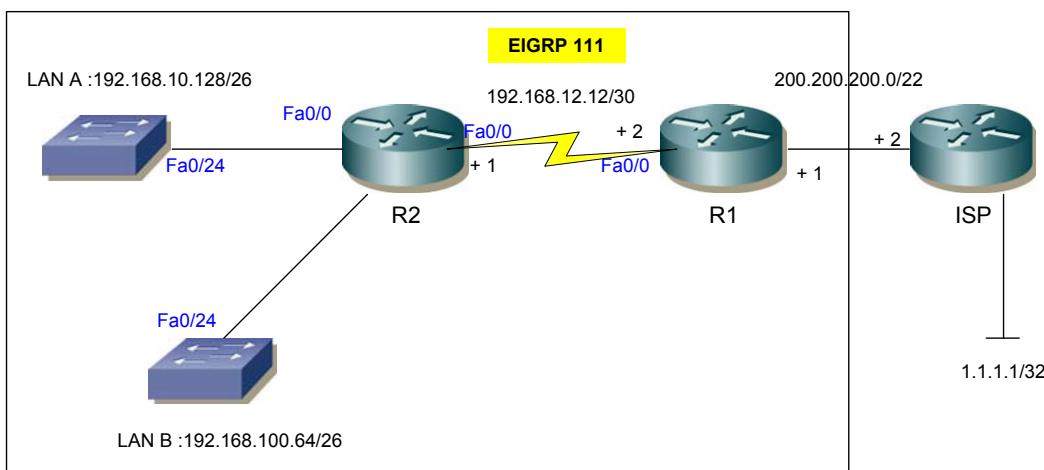
Current configuration : 123 bytes

```
!
interface FastEthernet0/1
ip address 192.168.2.174 255.255.255.240
ip access-group 1 out
duplex auto
speed auto
end
```

R2#sh ip int fa0/1
FastEthernet0/1 is up, line protocol is up
 Internet address is 192.168.2.174/28
 Broadcast address is 255.255.255.255
 Address determined by setup command
 MTU is 1500 bytes
 Helper address is not set
 Directed broadcast forwarding is disabled
 Multicast reserved groups joined: 224.0.0.5 224.0.0.6
 Outgoing access list is 1
 Inbound access list is not set
 Proxy ARP is enabled
 Local Proxy ARP is disabled
 Security level is default
 Split horizon is enabled
 ICMP redirects are always sent
 ICMP unreachables are always sent
 ICMP mask replies are never sent
 IP fast switching is enabled

IP fast switching on the same interface is disabled
 IP Flow switching is disabled
 IP CEF switching is enabled
 IP CEF Feature Fast switching turbo vector
 IP multicast fast switching is enabled
 IP multicast distributed fast switching is disabled
 IP route-cache flags are Fast, CEF
 Router Discovery is disabled
 IP output packet accounting is disabled
 IP access violation accounting is disabled
 TCP/IP header compression is disabled
 RTP/IP header compression is disabled
 Policy routing is disabled
 Network address translation is disabled
 BGP Policy Mapping is disabled

- Extended ACL có số hiệu từ 100-199, đối với IOS 12.3 họ thêm 2000-2699
- Hỗ trợ thêm việc lọc Traffic dựa vào
 - + Source IP/ Destination IP
 - + Source Port/Destination Port
 - + Protocol
- Tăng tính uyên chuyển trong việc Traffic vì vậy tăng tính uyên chuyển trong việc truyền khai Security.
- Nên viết và **apply** **gan Source của luồng Traffic**, nhằm để tối ưu hóa lưu thông trong hệ thống.



VD1: Viết Extended ACL trên R2 thỏa điều kiện ;

- Chỉ cho phép người dùng có IP ở LAN A truy xuất Internet
`access-list permit 100 tcp 192.168.10.128 0.0.0.62 any eq www`
 - Cấm người dùng có IP ở LAN A truy xuất Internet
`access-list deny 100 tcp 192.168.19.129 0.0.0.62 any eq 80`
 - Chỉ cho phép người dùng có IP ở LAN A ping
`access-list permit 100 icmp 192.168.10.129 0.0.0.62 any echo`
 - Cấm người dùng có IP ở LAN A ping
`access-list deny 100 icmp 192.168.10.129 0.0.0.62 any echo`
 - Các lưu thông khác ở LAN A cho phép bình thường
- ```

access-list 100 permit tcp 192.168.10.128 0.0.0.62 any eq 80
<Source Port> <Source IP> <Des IP> <Des Port>

access-list 100 deny tcp 192.168.10.129 0.0.0.62 any eq www
<equal> <application>

```

```
access-list 100 permit icmp 192.168.10.129 0.0.0.62 any echo
access-list 100 deny icmp 192.168.10.129 0.0.0.62 any echo
access-list 100 permit ip any any
 <Protocol TCP/IP> <Source IP> <Destination IP>
```

```
int fa0/1
ip access-group 100 in
```

#### **VD 2 : Viet Extended ACLs**

Tai R2 viet 1 Extended ACL thoa dieu kien :

- + Chi cho phep user co IP 192.168.10.130 ping den 1.1.1.1 ma thoi
- + Cam tat ca cac User con lai ping 1.1.1.1
- + Cam User co IP 192.168.10.130 truy xuat WEB den 1.1.1.1
- + Cho phep tat ca cac User con lai truy xuat WEB den 1.1.1.1
- + Chi cho phep user co IP chan o LAN A TELNET ma thoi
- + Cam tat ca cac user con lai cua LAN A TELNET
- + Cac luu thong khac cho phep di binh thuong.

```
access-list 100 permit icmp host 192.168.10.130 host 1.1.1.1 echo
access-list 100 deny icmp 192.168.10.128 0.0.0.63 host 1.1.1.1 echo
access-list 100 deny tcp host 192.168.10.130 host 1.1.1.1 eq www
access-list 100 permit tcp 192.168.10.128 0.0.0.63 host 1.1.1.1 eq 80
access-list 100 permit tcp 192.168.10.128 0.0.0.62 any eq 23
access-list 100 deny tcp 192.168.10.129 0.0.0.62 any eq 23
access-list 100 permit ip any any
```

```
int fa0/0
ip access-group 100 in
```

#### **VD 3 : Viet Extended ACLs tren LAN B**

- + Chi cho phep User co IP la 192.168.100.68 truy xuat WEB ma thoi.
- + Cam User co IP chan truy xuat lan A va Truy xuat WEB
- + Cam User o LAN B ping den LAN A nhung co the ping den bat ki noi khac
- + Chi cho phep User IP le truy xuat LAN A ma thoi
- + Cac luu thong khac di binh thuong
- + Hay ghi chu Access-list nay la ACLs danh cho linh (cap duoi)

#### **5. Chu Y :**

a>\*\*\*\*\* Cach dat ghi chu cho ACL :

```
R2(config)#access-list 101 remark Chinh sach danh cho cap duoi.
```

```
access-list 101 remark CHO LINH XAI ACLs
access-list 101 permit tcp host 192.168.100.68 any eq 80

access-list 101 deny ip 192.168.100.64 0.0.0.62 192.168.10.128 0.0.0.63
access-list 101 deny tcp 192.168.100.64 0.0.0.62 any eq www

access-list 101 deny icmp 192.168.100.64 0.0.0.63 192.168.10.128 0.0.0.63 echo

access-list 101 permit ip 192.168.100.65 0.0.0.62 192.168.10.128 0.0.0.63
access-list 101 permit ip any any
```

b>Xoa ACLs:

Khi ta "NO" bat ki dong nao cua Standard va Extended ACLs thi mac dinh ta xoa han luon ca ACLs

c> Truong hop co nhieu ACL

Tai moi interface cua Router o moi chieu, ta co the Apply nhieu hon 1 ACLs thoac dieu kien :

- Chi su dung 1 ACLs cho moi chong giao thuc ma thoi.

- Neu nhu moi chieu IN hoac OUT cua Traffic tai 1 Interface cua Router co duoc Apply nhieu hon 1 ACLs danh cho 1 chong giao thuc thi Router se uu tien xu ly ACL nao co so hieu cao hon.

## NAME ACCESS LIST

1. Khai niem :

- La loai ACL duoc dinh nghia bang Name (Case Sensitive, No Blank)
- Phai duoc dinh ro la Standard hay Extended
- Co the su dung lenh "NO" tung dong trong ACL ma khong bi xoa han ca ACL
- Cho phep hoan doi vi tri cac dong lenh, them bot, chinh sua , de dang.

**VD 1 tai R1:** Viet 1 name ACL Standard thoac dieu kien

```
+ Cam User tu LAN A Telnet den R1
+ Chi cho phep User tu LAN B co IP le Telnet den R1
R1(config)#ip access-list standard Telnetcontrol
 <ACL Type> <name ACL>
R1(config-std-nacl)#remark DIEU KHIEN TELNET DEN R1
 <standard>
R1(config-std-nacl)#deny 192.168.10.128 0.0.0.63
R1(config-std-nacl)#permit 192.168.100.65 0.0.0.62
R1(config-std-nacl)#permit any
```

```
ip access-list standard Telnetcontrol
remark DIEU KHIEN TELNET DEN R1
deny 192.168.10.128 0.0.0.63
permit 192.168.100.65 0.0.0.62
permit any
```

```
int line vty 0 15
access-class Telnetcontrol in
 <ACL name>
R1#sh access-list
Standard IP access list telnetcontrol
 10 deny 192.168.10.128, wildcard bits 0.0.0.63
 20 permit 192.168.100.65, wildcard bits 0.0.0.62 --> thieu cam IP chan LAN B
 30 permit any
```

```
ip access-list standard telnetcontrol
permit host 192.168.10.130
deny 192.168.100.64 0.0.0.62
```

```
R1#sh access-list
Standard IP access list telnetcontrol
 40 permit 192.168.10.130
 10 deny 192.168.10.128, wildcard bits 0.0.0.63
 20 permit 192.168.100.65, wildcard bits 0.0.0.62
 30 permit any
 50 deny 192.168.100.64, wildcard bits 0.0.0.62
```

====> Thu tu ACL khong chinh xac

## 2. Chinh sua Name Access List :

Ta muon bo dong nao cua Name ACL thi ta vao cai Mode cua ACL do va dung lenh **no <sequence number>**  
(config-std-nacl)#no 10

## 3. Them 1 dong truoc 1 dong lenh trong name ACL : nham de Router xu ly truoc.

### \*\*\* Them 1 Rule:

+ Chi cho phep host 192.168.10.130 tu LAN A Telnet den R1

- Vao Mode config cua name ACL

- Thuc hien cau lenh :

```
R1(config-std-nacl)#9 permit host 192.168.10.130
```

```
R1(config-std-nacl)#9 permit host 192.168.10.130
```

```
R1(config-std-nacl)#do sh access-list
```

```
Standard IP access list Telnetcontrol
```

```
 9 permit 192.168.10.130
```

```
 10 deny 192.168.10.128, wildcard bits 0.0.0.63
```

```
 20 permit 192.168.100.65, wildcard bits 0.0.0.62
```

```
 30 permit any
```

```
Standard IP access list telnetcontrol
```

+ Cam IP chan LAN B Telnet den R1

```
29 deny 192.168.100.64 0.0.0.62
```

```
R1(config-std-nacl)#do sh access-list
```

```
Standard IP access list Telnetcontrol
```

```
 9 permit 192.168.10.130
```

```
 10 deny 192.168.10.128, wildcard bits 0.0.0.63
```

```
 20 permit 192.168.100.65, wildcard bits 0.0.0.62
```

```
 29 deny 192.168.100.64, wildcard bits 0.0.0.62
```

```
 30 permit any
```

```
Standard IP access list tel
```

+ Viet 1 Name Extended ACL cam User co IP le cua 2 LAN A va B ping va truy xuat WEB

+ Cac Traffic khac cho di binh thuong

```
ip access-list Extended Policy
```

```
remark CHINH SACH CAM LINH
```

```
deny icmp 192.168.10.129 0.0.0.62 any eq echo
```

```
deny tcp 192.168.10.129 0.0.0.62 any eq www
```

```
deny icmp 192.168.100.65 0.0.0.62 any eq echo
```

```
deny icmp 192.168.100.65 0.0.0.62 any eq 80
```

```
permit ip any any
```

```
int s0/2/0
```

```
ip access-group Policy Out
```

VD1: Tai Router Ha Noi viet 1 name ACL dang Extended thoa dieu kien :

+ Ghi chu la VLAN Policy

- + Cam User thuoc VLAN 11 va 33 truy xuat LAN Hue
  - + Cam User thuoc VLAN 1 va 22 truy xuat LAN Nha Trang
  - + Chi co user co IP chan cua 2 VLAN 11 va 22 duoc quyen truy xuat WEB
  - + Chi co User thuoc VLAN 1 co quyen Ping
  - + Chi co User co IP le cua VLAN 33 duoc quyen Telnet
  - + Cac luu thong khac di binh thuong
- Viet ACL va chi ro noi Apply va Chieu

```
ip access-list Extended VLANPolicy
remark VLAN Policy
```

```
deny ip 192.168.11.0 0.0.0.255 192.168.40.0 0.0.0.255
deny ip 192.168.33.0 0.0.0.255 192.168.40.0 0.0.0.255
deny ip 192.168.1.0 0.0.0.255 192.168.20.0 0.0.0.255
deny ip 192.168.22.0 0.0.0.255 192.168.20.0 0.0.0.255
```

```
permit tcp 192.168.11.0 0.0.0.255 any eq 80
permit tcp 192.168.22.0 0.0.0.255 any eq www
deny tcp any any eq 80
```

```
permit icmp 192.168.1.0 0.0.0.255 any eq echo
deny icmp any any eq 23
```

```
permit tcp 192.168.33.1 0.0.0.254 any eq 23
permit tcp any any eq 23
```

```
permit ip any any
```

Apply tren tung SubInterface.

\*\*\* Lưu ý :

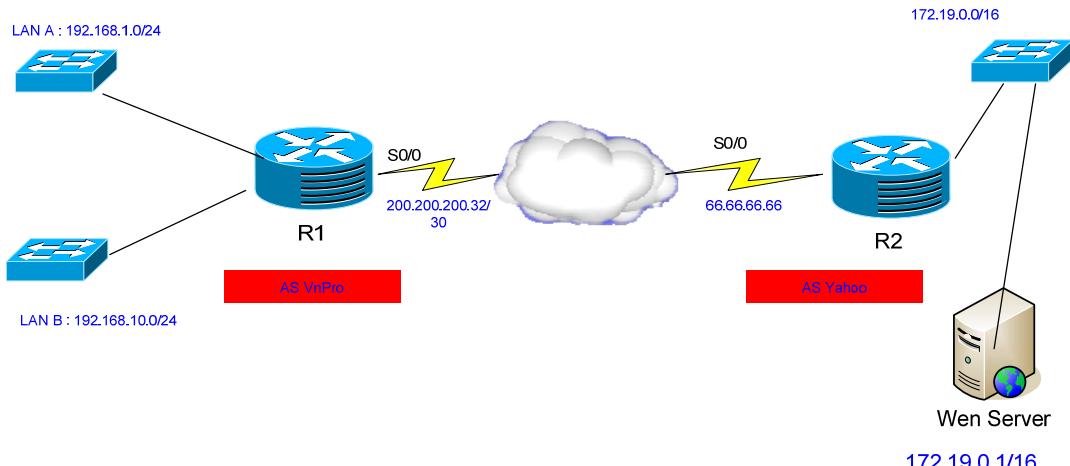
- ACL tang do tre trong qua trinh xu ly Packet cua Router
- Nen soan thao ACL can than va chi tiet o Notepad truoc khi trien khai tren Router

## NAT (Command Line)

### I . Lý Thuyết :

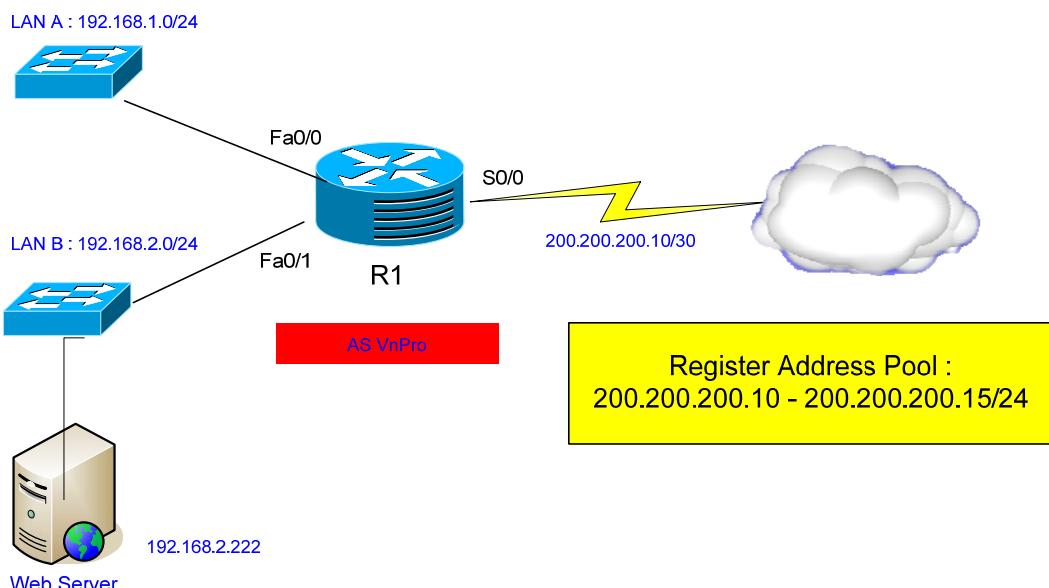
#### 1. Khai niem :

- La hinh thuc chuyen doi Source IP cua cac luong luu thong ben trong mang noi bo voi Internet
- Giam su can kiet tai nguyen IPv4 (RFC 1918 IP Private: A: 10.x.x.x; B: 172.16 - 172.31, C: 192.168)
- Router thuc hien viec chuyen doi dia chi bang cach xay dung 1 CSDL goi la NAT Table bao gom cac truong anh xa tu Inside Local - Inside Global (#show ip NAT Translation)



- \* **Inside Local:** là những địa chỉ (thường là Private) được sử dụng để gán cho user thuộc các LAN nội bộ. Là địa chỉ cần được NAT để giao tiếp với Internet
- \* **Inside Global:** là 1 hoặc nhiều IP Public/Registration sẽ đại diện cho các địa chỉ Inside Local giao tiếp với Internet
- \* **Outside Local:** là những địa chỉ IP được sử dụng để gán cho các User trong LAN nội bộ của các AS khác nhau của mình. Cũng cần được NAT để giao tiếp với Internet
- \* **Outside Global:** được dùng để đại diện cho địa chỉ Outside Local truy xuất Internet.

#### 2. Mô hình thực NAT:



a> **Static NAT** là hình thức xây dựng 1 trung gian xa tinh tú

<1> Inside Local -----> <1> Inside Global

+ là ảnh xa cho phép các máy chủ bên trong LAN có thể được xuất bởi User ngoài Internet

**VD:** Static NAT ảnh xa IP của Web Server thành 200.200.200.15

- Bước 1: Cấu hình xây dựng trung gian xa tinh (Static NAT Entry)

R1(config)#ip NAT inside source static 192.168.2.222 200.200.200.15

<Inside Local> <Inside Global>

Xây dựng 1 trung gian xa tinh trong bảng NAT của R1. Router sẽ chuyển đổi dữ liệu xuất phát từ máy tính có Source IP là 192.168.2.222 thành 200.200.200.15 để giao tiếp với Internet

- Bước 2: Apply câu lệnh IP NAT Inside và IP NAT Outside phu hop.

+ Đổi Interface kết nối với ISP

R1(config)#int s0/0

R1(config-if)#ip nat outside

+ Đổi với Interface kết nối với LAN

R1(config)#int fa0/1

R1(config-if)#ip nat inside

b> **Dynamic NAT**: là cách thực hiện xây dựng các trung gian xa tu dong

<n> Inside Local ----- <n> Inside Global.

**VD :** Cấu hình Dynamic NAT để ảnh xa tu dong 3 IP 192.168.1.68, 192.168.1.99, 192.168.1.88 thuộc LAN người dùng ra 3 Registered IP : 200.200.200.12; 200.200.200.13; 200.200.200.14

- Bước 1: Định nghĩa ACL để quy định ra các IP cần được NAT (Qui dinh ra cac ip Inside Local)

R1(config)#access-list 1 permit host 192.168.1.68

R1(config)#access-list 1 permit host 192.168.1.99

R1(config)#access-list 1 permit host 192.168.1.88

- Bước 2: Quy định ra NAT Pool có nghĩa là day IP Inside Global

R1(config)#ip NAT pool GIAMDOC 200.200.200.12 200.200.200.14 netmask 255.255.255.0

<Pool Name: case sensitive> <Star> <End>

- Bước 3: Viet câu lệnh NAT

R1(config)#ip NAT Inside Source list 1 pool GIAMDOC

Ảnh xa tu dong 3 IP qui dinh trong access-list 1 tra 3 IP trong Pool GIAMDOC

- Bước 4: Apply 2 câu lệnh NAT Inside và NAT Outside hợp lý.

+ Đổi Interface kết nối với ISP

R1(config)#int s0/0

R1(config-if)#ip nat outside

+ Đổi với Interface kết nối với LAN

R1(config)#int fa0/0

R1(config-if)#ip nat inside

c> **Dynamic NAT with Overloading (Port Address Translation):**

- Là hình thức ảnh xa tu dong <n> Inside Local ----- <m> Inside Global (n > m)

Sử dụng kèm giá trị Source Port (> 1024).

- Cấu hình Dynamic NAT with Overloading.

**VD :** Cấu hình tắt các IP còn lại của LAN A truy xuất Internet bằng địa chỉ 200.200.200.10

- B1 : Cấu hình Inside Local

R1(config)#access-list 2 permit 192.168.1.0 0.0.0.255

- Bước 2: Định nghĩa NAT Pool

Trong trường hợp Inside Global IP là 1 địa chỉ của Interface trên Router Gateway kết nối với ISP thì ta có thể "không cần" viết NAT Pool hoặc cùng có thể viết nhung với Start IP = End IP

R1(config)#ip nat pool NGUOIDUNG 200.200.200.10 200.200.200.10 netmask 255.255.255.0

- Bước 3: Viet câu lệnh NAT

+ Trường hợp có viết NAT Pool:

R1(config)#ip NAT inside source list 2 pool NGUOIDUNG overload

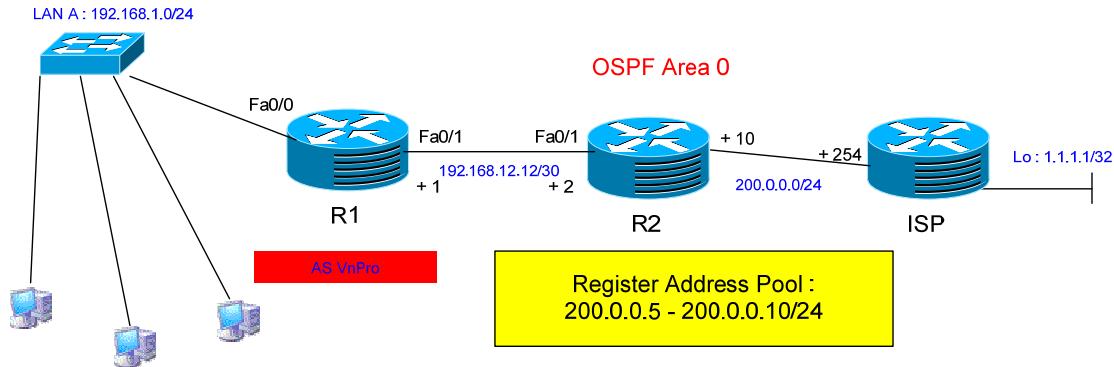
**Chú ý:** neu ko co tu khoa Overload thi so User truy xuat Internet bang so IP NAT Pool  
+ Truong hop ko viet NAT Pool

Do interface cua Inside Global ket noi truc tiep voi ISP

R1(config)#ip nat inside source list 2 interface s0/0 overload

- Buoc 4: Apply 2 cau lenh IP Nat Inside va IP Nat Outside hop le

## II. Thuc hanh :



VD 1: Cau hinh Static NAT tren R2

```
192.168.1.111 200.0.0.9
192.168.1.222 200.0.0.8
192.168.1.108 200.0.0.7
```

```
ip nat inside source static 192.168.1.111 200.0.0.9
ip nat inside source static 192.168.1.222 200.0.0.8
ip nat inside source static 192.168.1.108 200.0.0.7
```

```
int fa0/1
ip nat outside
```

```
int fa0/0
ip nat inside
```

```
R2#sh ip nat translation
Pro Inside global Inside local Outside local Outside global
icmp 200.0.0.7:512 192.168.1.108:512 1.1.1.1:512 1.1.1.1:512
--- 200.0.0.7 192.168.1.108 --- ---
--- 200.0.0.9 192.168.1.111 --- ---
icmp 200.0.0.8:512 192.168.1.222:512 1.1.1.1:512 1.1.1.1:512
--- 200.0.0.8 192.168.1.222 --- ---
```

R2#

```
debug ip nat
IP NAT debugging is on
R2#
Jan 10 12:05:26.955: NAT: s=192.168.1.222->200.0.0.8, d=1.1.1.1 [21931]
Jan 10 12:05:26.959: NAT: s=1.1.1.1, d=200.0.0.8->192.168.1.222 [21931]
Jan 10 12:05:27.615: NAT: s=192.168.1.111->200.0.0.9, d=1.1.1.1 [5356]
Jan 10 12:05:27.615: NAT: s=1.1.1.1, d=200.0.0.9->192.168.1.111 [5356]
Jan 10 12:05:27.691: NAT: s=192.168.1.108->200.0.0.7, d=1.1.1.1 [496]
Jan 10 12:05:27.691: NAT: s=1.1.1.1, d=200.0.0.7->192.168.1.108 [496]
Jan 10 12:05:27.959: NAT: s=192.168.1.222->200.0.0.8, d=1.1.1.1 [21932]
Jan 10 12:05:27.959: NAT: s=1.1.1.1, d=200.0.0.8->192.168.1.222 [21932]
Jan 10 12:05:28.615: NAT: s=192.168.1.111->200.0.0.9, d=1.1.1.1 [5357]
```

```
Jan 10 12:05:28.615: NAT: s=1.1.1.1, d=200.0.0.9->192.168.1.111 [5357]
Jan 10 12:05:28.691: NAT: s=192.168.1.108->200.0.0.7, d=1.1.1.1 [497]
Jan 10 12:05:28.691: NAT: s=1.1.1.1, d=200.0.0.7->192.168.1.108 [497]
Jan 10 12:05:28.959: NAT: s=192.168.1.222->200.0.0.8, d=1.1.1.1 [21933]
Jan 10 12:05:28.959: NAT: s=1.1.1.1, d=200.0.0.8->192.168.1.222 [21933]
Jan 10 12:05:29.691: NAT: s=192.168.1.108->200.0.0.7, d=1.1.1.1 [498]
Jan 10 12:05:29.691: NAT: s=1.1.1.1, d=200.0.0.7->192.168.1.108 [498]
```

R2#clear ip NAT translation \* ---> Xoa Static NAT van con.

R2#sh ip nat translations

| Pro  | Inside global | Inside local      | Outside local | Outside global |
|------|---------------|-------------------|---------------|----------------|
| icmp | 200.0.0.7:512 | 192.168.1.108:512 | 1.1.1.1:512   | 1.1.1.1:512    |
| ---  | 200.0.0.7     | 192.168.1.108     | ---           | ---            |
| ---  | 200.0.0.9     | 192.168.1.111     | ---           | ---            |
| icmp | 200.0.0.8:512 | 192.168.1.222:512 | 1.1.1.1:512   | 1.1.1.1:512    |
| ---  | 200.0.0.8     | 192.168.1.222     | ---           | ---            |

VD 2: Cau hinh Dynamic NAT tren R2

\* Inside Local:

    192.168.1.100  
    192.168.1.200

\* NAT Pool 200.0.0.5 200.0.0.6 /24

```
access-list 1 permit host 192.168.1.100
access-list 1 permit host 192.168.1.1200
```

```
ip nat pool GIAMDOC 200.0.0.5 200.0.0.6 netmask 255.255.255.0
```

```
ip nat inside source list 1 pool GIAMDOC
```

```
int fa0/0
ip nat inside
```

```
int s0/0
ip nat outside
```

```
debug ip nat
IP NAT debugging is on
R2#
Jan 10 12:31:53.715: NAT: s=192.168.1.100->200.0.0.5, d=1.1.1.1 [23586]
Jan 10 12:31:53.715: NAT: s=1.1.1.1, d=200.0.0.5->192.168.1.100 [23586]
Jan 10 12:31:54.623: NAT: s=192.168.1.200->200.0.0.6, d=1.1.1.1 [5705]
Jan 10 12:31:54.623: NAT: s=1.1.1.1, d=200.0.0.6->192.168.1.200 [5705]
```

\*\*\* R1#no ip nat inside → khi viet sai

R1#clear ip nat → mat het cac thong tin trong NAT Table

VD3 : Cau hinh Dynamic NAT wit Overload  
+ Inside Local : Tat ca cac User con lai cua LANA  
+ Inside Global 200.0.0.10

```
access-list 2 permit 192.168.1.0 0.0.0.255
```

```
ip nat pool NHANVIEN 200.0.0.10 200.0.0.10 netmask 255.255.255.0
```

```
ip nat inside source list 2 pool NHANVIEN overload
```

( hoặc ip nat inside source list 2 int s0/0 overload )