HACETTEPE UNIVERSITY
COMPUTER ENGINEERING DEPARTMENT
COMPUTER NETWORKS LABORATORY

EXPERIMENT

Introduction to Router configuration

AIM

In this lab you are going to learn Cisco Router basics. You will see router hardware and interfaces and verify them using `show` commands. You will configure your Router's fundamental settings and establish network connection between your PC and your Router

INTRODUCTION

You should read Chapter 4 - Network Layer from the course textbook, especially **Section 4.3 What's Inside a Router?** for theoretical background.

General Information about Cisco Routers

Routers are dedicated/embedded computer systems. Cisco Routers that you are going to use in network lab are also dedicated computer systems which operates under Internetwork Operating System (called Cisco IOS). Main components of Cisco Routers are described below:

- *RAM (Random Access Memory):* It is the main memory of the system. Configuration information (`running-config`), routing tables, and some data structures are stored and updated in the process. RAM naturally loses its content when it is turned off.
- *NVRAM (Non-Volatile RAM):* It stores a copy of the configuration file (`startup-config`). This memory, which can be thought of as second memory, does not lose its contents when the router is turned off.
- *Flash*: This special memory, which is considered as part of the system's storage, stores IOS software, the operating system of Cisco routers. Router can store multiple IOS versions.
- *ROM*: If the flash memory is corrupted or there is no IOS copy stored there, the IOS is loaded from the ROM memory. Also the bootstrap program, which loads and starts the operating system into main memory, is included here.
- *CPU*: The main processing unit. It operates tasks related to all router functions.
- *Interfaces*: These are the network interfaces. They run the connection ports. It consists of local and public network interfaces and serial management (Auxiliary-Console) interfaces.

Router usage modes

The router can be used in two separate privileged modes. The lower privilege is called the *user*, the higher privilege is the *enable* mode. > cursor indicates *user* mode, and # indicates the *enable* mode.

Router> or Router#

Enable mode has various privilege levels in itself. These levels are numbered from 0 to 15. 0 is the lowest privileged (user mode), 15 is the highest privileged mode. There are different sets of operations that each privilege level allows. A user with privilege level 15 (running in enable mode) can perform configuration operations on the router.

The user who wants to perform a new configuration on the router needs to go through the general configuration mode (config mode). In general configuration mode, the user can change properties such as the name of the router, IP address(s), and so on.

It is necessary to switch from the general configuration mode to the sub-configuration mode to make changes to the interfaces on the router or to the running tasks (routing algorithms, etc.). In this mode only the relevant interface or relative properties can be changed. State diagram of the router modes are described in Figure-1.
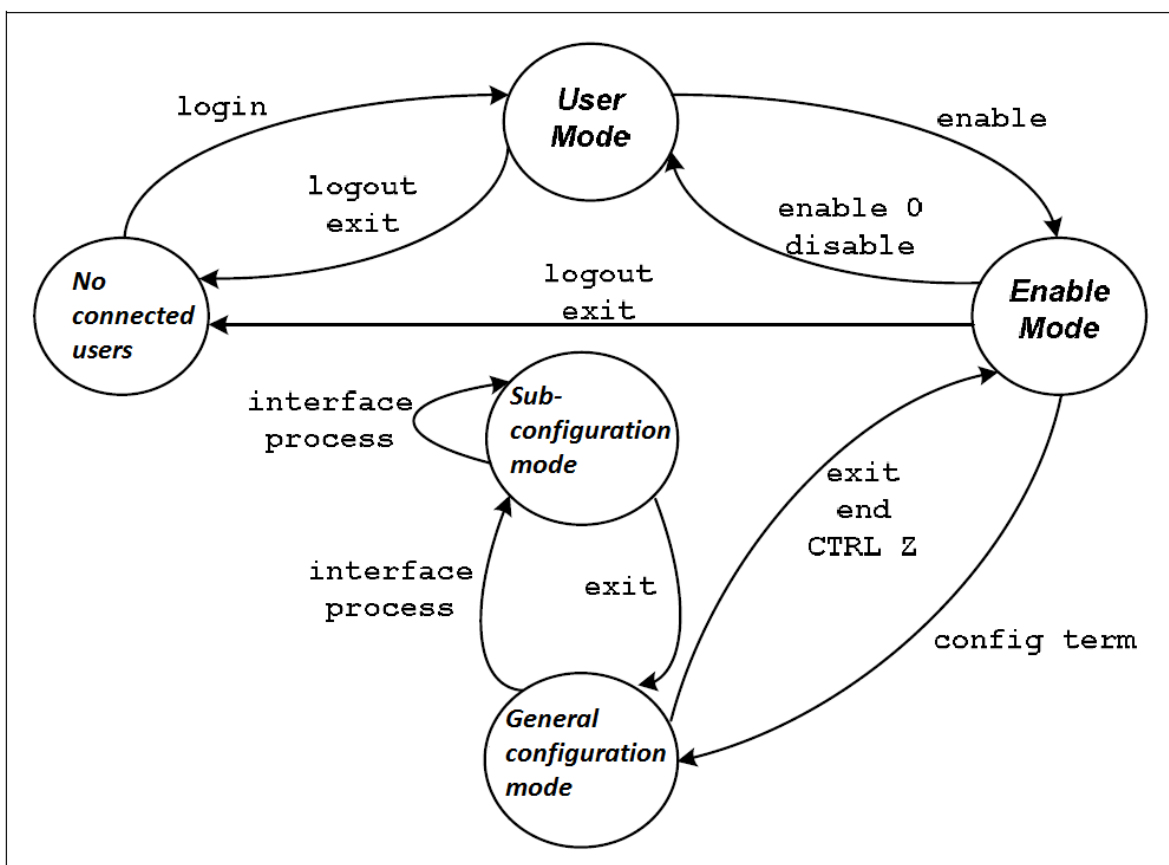

Figure 1- Router Usage Modes

EXPERIMENT STEPS

1. You should use one router, one switch and at least one PC for your group, and plug required cables and activate required connections. So you are going to create your own local area network with Router as a gateway. In the next lab, you're going to connect your groups and create a WAN (wide area network) as seen in Figure-2.
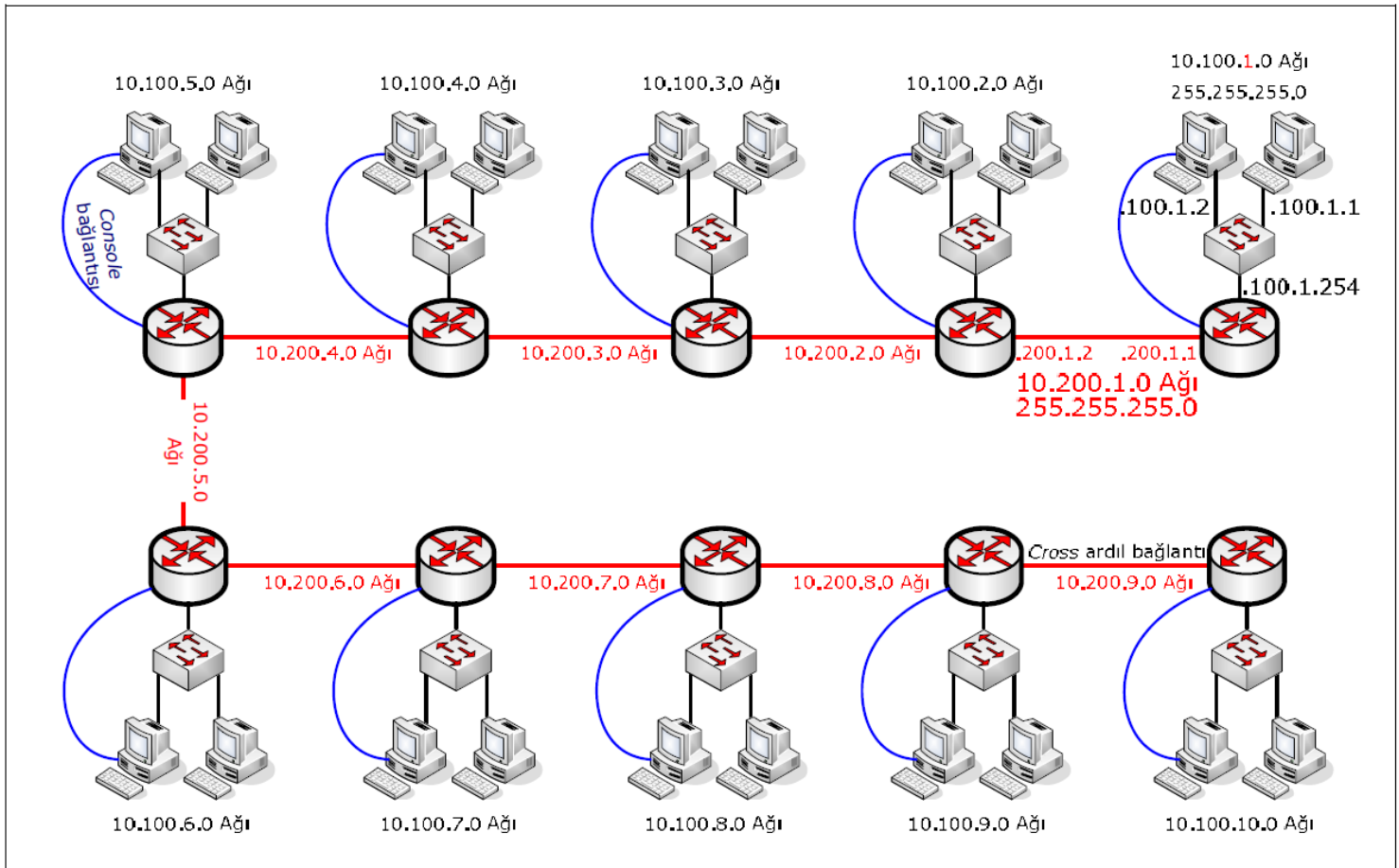

Figure 2 - Lab topology

2. You should enter enable mode if you want to configure anything on router. Show commands can be used in user or enable mode (outside of config mode). You can also use ? symbol for displaying usable commands in that mode and their simple explanations.

```
Router> enable
Password:*****
Router# configure terminal
Router(config)#
```

3. If there is any configuration settings stored in your Router, which may be left from previous lab sessions, you have to **reset your router to factory default setting** according to Cisco procedures documented in files in FTP directory of the course.
4. First you have to give appropriate names to your Router, according to your section/group number using **hostname** command
   E.g. Router-Section-1-Grup-X> for Monday 10:00 Section, Group no X
   Router-Section-2-Grup-X> for Mpnday 13:00 Section, Group no X

5. In this step, each group runs simple show commands, snapshot and discuss the results.

   show version: Displays general information about router and Cisco IOS version

```
router_1> show version

Cisco Internetwork Operating System Software
IOS(tm) C2600 Software (C2600-IS-M), Version 12.2(11)YT2,
EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
Copyright (c) 1986-2003 by Cisco Systems, Inc.
Compiled Thu 27-Feb-03 17:33 by cmong
Image text-base: 0x80008098, data-base: 0x818BA404

ROM: System Bootstrap, Version 12.2(7r) [cmong 7r], RELEASE
SOFTWARE (fc1)
ROM: C2600 Software (C2600-IS-M), Version 12.2(11)YT2, EARLY
DEPLOYMENT RELEASE SOFTWARE (fc1)

router_1 uptime is 1 day, 47 minutes
System returned to ROM by power-on
System image file is "flash:c2600-is-mz.122-11.YT2.bin"

cisco 2611XM (MPC860P) processor (revision 0x100) with
60416K/5120K bytes of memory.(Yönlendirici modeli)
Processor board ID JAE073207TK (951472077)
M860 processor: part number 5, mask 2
Bridging software.
X.25 software, Version 3.0.0.

2 FastEthernet/IEEE 802.3 interface(s)
4 Serial(sync/async) network interface(s)
4 Low-speed serial(sync/async) network interface(s)

32K bytes of non-volatile configuration memory.
49152K bytes of processor board System flash (Read/Write)

Configuration register is 0x2102
```

show running-config: Shows the current configuration settings (stored in main memory-RAM) on the router

show startup-config: Shows the configuration settings to be loaded on the router during bootup (stored in the NVRAM environment).

show users: Gives information about the connected users

```
router_1# show users

Line User    Host(s)  Idle       Location
33   tty 33 idle      00:00:00
*66  vty 0  idle      00:00:00 193.140.236.6
```
(*) shows the current user who runs the command

dir all-filesystems: It lists all files and directories in the memory units on the router.

```
router_1# dir all-filesystems
Directory of nvram:/
  25 -rw- 2089 <no date> startup-config
  26 ----    5 <no date> private-config
29688 bytes total (27542 bytes free)

Directory of system:/
  10 drwx   0 <no date> its
  2 dr-x    0 <no date> memory
  1 -rw- 2175 <no date> running-config
  9 dr-x    0 <no date> vfiles
No space information available

Directory of flash:/
1 -rw- 15860736 <no date> c2600-is-mz.122-11.YT2.bin

49807360 bytes total (33946560 bytes free)
```

show interfaces: Shows all details about interfaces on the router

show ip interface brief: Shows interfaces' ip address and status briefly.

6. Configure IP address of your PC and Router according to Figure 2 - Lab Topology.

```
router_1(config)# interface FastEthernet 0/0
router_1(config-if)# ip address 10.100.1.254 255.255.255.0
router_1(config-if)# no shutdown
```

All interfaces are assigned to *down* as default (in factory settings). This can be seen using show ip command. Also there is a line "shutdown" in interfaces section on running-config output which means that the interface is set to inactive. So you have to undo this command by running no shutdown command

7. Finally you are able to ping in both ways (PC to Router, Router to PC), if every cable connections and IP configurations are correct.

```
Router#ping 10.100.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.100.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5)
```

In Router console, "!" means succesful, "." means unreachable for data communication.

REFERENCES

- Computer Networks: A top-down approach, Kurose and Ross, 6th Edition, Addison-Wesley