Lab4 - Guideline

Topics

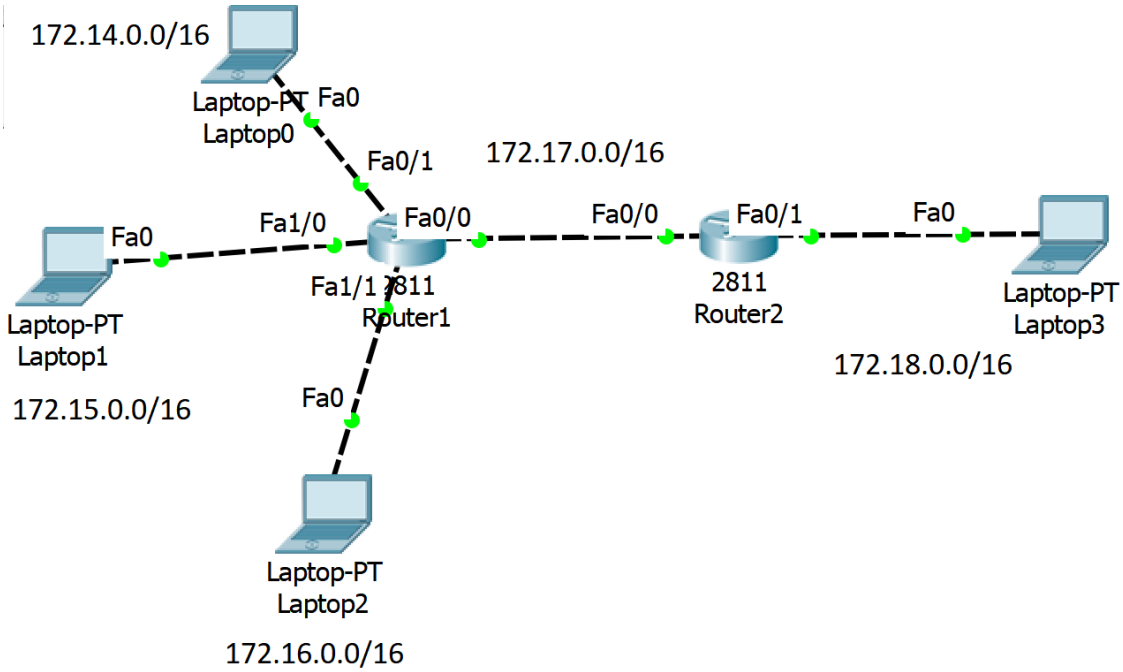
A. Commands – routing table
B. IPv4; Static routing; Default route
C. IPv6; Static routing; Default route

A. Commands – routing table

Netstat and route commands

nestat –rn
route print
route –Cn
route add
route del

B. IPv4 – use routers 2811 and add one NM-2FE2W interface in the Physical tab
Device Interface IPaddress Netmask Gateway
Laboratory test configuration:



Device	Interface	IPaddress	Network mask	Gateway
R1	*Fa0/0*	*172.17.0.1*	*255.255.0.0*	-
	Fa0/1	*172.14.0.1*	*255.255.0.0*	-
	Fa1/0	*172.15.0.1*	*255.255.0.0*	-
	Fa1/1	*172.16.0.1*	*255.255.0.0*	-
R2	*Fa0/0*	*172.17.0.2*	*255.255.0.0*	-
	Fa0/1	*172.18.0.1*	*255.255.0.0*	-
Laptop0	*Fa0*	*172.14.0.2*	*255.255.0.0*	*172.14.0.1*
Laptop1	*Fa0*	*172.15.0.2*	*255.255.0.0*	*172.15.0.1*
Laptop2	*Fa0*	*172.16.0.2*	*255.255.0.0*	*172.16.0.1*
Laptop3	*Fa0*	*172.18.0.2*	*255.255.0.0*	*172.18.0.1*

Step1: Assign static IPv4 addresses to routers' interfaces

Router1(config)#interface fastethernet 0/0
Router1(config-if)#ip address 172.16.0.1 255.255.0.0
Router1(config-if)#no shutdown
Description: Add an IP address on Fa0/0subinterface

Step2: Set static routes

General syntax:
Router(config)#**ip route** netw_dest_address netw_mask next_hop_address/interface

Router1(config)#ip route 172.18.0.0 255.255.0.0 172.17.0.2

Router1 #show ip route
Description: Visualize the routing table

Step3: Assign static IPv4 addresses to the computers (IP, Subnet mask, Gateway)

Test the connectivity.

a. *ping <target IP>*
b. *tracert <target IP>*

Step4:
Delete previous defined static routes on Router2 and add only one network that will offer connectivity with all the other networks.
Router2(config)#no ip route ….

HINT: summarize (using supernetting technique) the networks attached to Router1 172.14.0.0/16, 172.15.0.0/16, 172.16.0.0/16, so that only one network will be advertise to Router2.

Router2 #show ip route
Description: Visualize the routing table

Test the connectivity.

a. *ping <target IP>*
b. *tracert <target IP>*

Default static routes

Default routes are used to direct packets addressed to networks not explicitly listed in the routing table. The simplest option is to configure a default route to send all traffic to an upstream router, relying on the router to route the traffic for you.

A default route identifies the gateway IP address to which the router sends all IP packets for which it does not have a learned or static route. A default static route is simply a static route with 0.0.0.0/0 as the destination IP address. Routes that identify a specific destination take precedence over the default route.

Step5:
Delete previous defined static routes on Router2
Router2(config)#no ip route ….

Add a default static route, also named gateway of last result:
*Router2(config)#ip route **0.0.0.0** **0.0.0.0** 172.17.0.1*

C. IPv6

IPv6 has 128-bit source and destination addresses

IPv6 header

An IPv6 address is formed by two entities: `prefix` and `interface id`

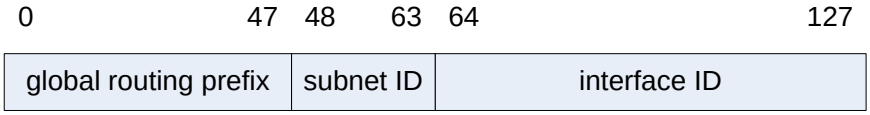
Prefix	Interface ID
3FFE:0301:DEC1::	0A00:2BFF:FE36:701E

IPv6 Addresses:

- Unicast, Multicast, Anycast

Unicast Addresses

- global



- private
  - Link local (for a link, used for address configuration, neighbor discovery):
    stars with FE80::/10 - FEB0::/10 prefix
  - Site local (for an organization):
    stars with FEC0::/10 - FEF0::/10 prefix

Adresele Multicast

0 7	8 11	12 15	16 127
Indicator (FF)	*Flags 000T (transient flag)*	*Scope ID*	*Group ID*
FF	IF T =0 well known multicast (permanent) IF T =1 transient	node-local=1, link-local=2, site-local=5, organization-local=8, global=14	

- Well-known Multicast Groups
  - solicited-node
  - all nodes

- all routers

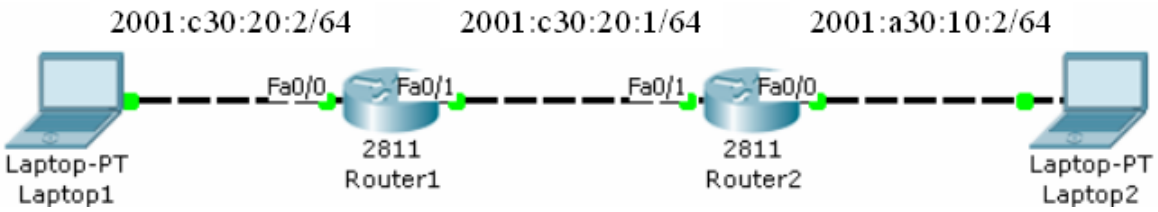
Anycast Addresses

- "send to any one member of this group"

Global addresses auto-configuration

- Stateless – **router**
  - Link-Local Address Generation
  - Link-Local Address Uniqueness Test: sends a Neighbor Solicitation message using the Neighbor Discovery (ND) protocol to check if it is unique
  - Link-Local Address Assignment
  - Router Contact
    - listening for Router Advertisement messages sent periodically by routers or
    - by sending a specific Router Solicitation to ask a router for information
  - Router Direction: specifica daca e retea statefull spunand adresa DHCP server sau trimite prefixul, daca e stateless
  - Global Address Configuration
- Statefull - **DHCPv6**

<u>Laboratory test configuration:</u>



Step0:
Router(config)#ipv6 unicast-routing
Description: enable the forwarding of IPv6 packets between interfaces on the router

Step1: Assign static IPv6 addresses to routers' interfaces

General syntax:
Router(config-if)#ipv6 address ipv6-address/prefix-length [eui-64]

Router1(config)#interface fastEthernet 0/0
Router1(config-if)#ipv6 address 2001:C30:20:2::/64 eui-64
Router1(config-if)#no shutdown

or

Router1(config)#interface fastEthernet 0/0
Router1(config-if)#ipv6 address 2001:C30:20:2:209:7CFF:FE4D:1501/64
Router1(config-if)#no shutdown

Router#show ipv6 interface fastEthernet 0/0
Description: Visualize IPv6 addresses assigned to the interface

Step2: Set static routes

General syntax:
Router(config)#ipv6 route ipv6-prefix/prefix-length next_hop_ipv6 address/interface

Router(config)# ipv6 route 2001:A30:10:2::/64 2001:C30:20:1:290:2BFF:FE71:6702
Description: configure a static route to 2001:A30:10:2::/64 network

!Important! The Next_Hop_IPv6_address can be seen by executing the *show ipv6 interface fastEthernet 0/x* on the next hop interface (neighbor router)

Router#show ipv6 route
Description: Visualize the routing table

Step3: Assign static IPv6 addresses to the computers (IPv6, Gateway)

Test the connectivity.

- *ping <target IP>*
- *tracert <target IP>*

Step4: Add IPv6 default static routes
Delete previous defined static routes on Router2
Router2(config)#no ipv6 route ….

Add a default static route, also named gateway of last result:
*Router2(config)#ipv6 route **::/0** 2001:C30:20:1:6290:2BAB:FE71:555*