

# 14 Routing Concepts

## 14.1 Path Determination

- Two Functions of Router
  - determine the best path
  - forward packets toward their destination
- Router Functions Example
- Best Path Equals Longest Match
- IPv4 Address Longest Match Example
- IPv6 Address Longest Match Example
- Build the Routing Table
  - Directly Connected Networks
  - Remote Networks (Static routes / Dynamic Routes)
  - Default Route

## 14.2 Packet Forwarding

- Packet Forwarding Decision Process
  - Forward to Device on a Directly connected Network
  - Forward to Next Hop Router
  - Drop Packet
- End-to-End Packet Forwarding: PC - R1 - R2 - R3 - PC
- Packet Forwarding Mechanisms
  - Process switching
  - Fast switching (Fast Forward Cache)
  - Cisco Express Forwarding (CEF) (FIB and Adjacency Table)

## 14.3 Basic Router Configuration Review

- Topology
- Configuration Commands

```
Router> enable
Router# configure terminal

Router(config)# hostname R1

R1(config)# enable secret class

R1(config)# line console 0
R1(config-line)# logging synchronous
R1(config-line)# password cisco
R1(config-line)# login

R1(config)# line vty 0 4
R1(config-line)# password cisco
R1(config-line)# login
R1(config-line)# transport input ssh telnet

R1(config)# service password-encryption

R1(config)# banner motd #
Enter TEXT message. End with a new line and the #
*****
WARNING: Unauthorized access is prohibited!
*****
#
R1(config)# ipv6 unicast-routing

R1(config)# interface gigabitethernet 0/0/0
R1(config-if)# description Link to LAN 1
R1(config-if)# ip address 10.0.1.1 255.255.255.0
R1(config-if)# ipv6 address 2001:db8:acad:1::1/64
R1(config-if)# ipv6 address fe80::1:a link-local
R1(config-if)# no shutdown

R1# copy running-config startup-config
```

- Verification Commands (IP / IPV6)
  - show ip interface brief
  - show running-config interface interface-type number
  - show interfaces
  - show ip interface
  - show ip route
  - ping
- Filter Command Output: section, include, exclude, begin
- 14.3.5 Packet Tracer - Basic Router Configuration Review

## 14.4 IP Routing Table

- Route Sources
  - Directly connected networks
  - Static routes
  - Dynamic routing protocols
- Routing Table Principles
- Routing Table Entries: Route Source, Destination Network, [Adm. distance/Metric] via Next Hop, Exit Interface
- Directly Connected Networks
- Static Routes
- Static Routes in the IP Routing Table
- Dynamic Routing Protocols
- Dynamic Routes in the IP Routing Table
- Default Route
- Structure of an IPv4 Routing Table
- Structure of an IPv6 Routing Table
- Administrative Distance
  - Directly connected: 0
  - Static route: 1
  - EIGRP summary route: 5
  - External BGP: 20
  - Internal EIGRP: 90
  - OSPF: 110
  - IS-IS: 115
  - RIP: 120
  - External EIGRP: 170
  - Internal BGP: 200

## 14.5 Static and Dynamic Routing

- Static or Dynamic?
- Dynamic Routing Evolution
  - Interior Gateway Protocols
    - \* Distance Vector: RIPv2, RIPv3, EIGRP, EIGRP for IPv6
    - \* Link-State: OSPFv2, OSPFv3, IS-IS, IS-IS for IPv6
  - Exterior Gateway Protocols
    - \* Path Vector: BGP-4, BGP-4MP
- Dynamic Routing Protocol Concepts: Data Structures, Routing Protocol Messages, Algorithm
- Best Path: hop count / cost (bandwidth) / bandwidth + delay
- Load Balancing