



## Building Scalable Cisco Internetworks (BSCI)

### IP Routing Overview

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## IP Routing Overview

- Three main steps
  - Routing
    - Find the outgoing interface
  - Switching
    - Move the packet between interfaces
  - Encapsulation
    - Build the layer 2 header
    - i.e. layer 2 packet rewrite

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## The Routing Process

- Step 1: Find the longest match
  - `show ip route 1.2.3.4`
    - 1.0.0.0/8
    - 1.2.0.0/16
    - 1.2.3.0/24
    - Which route chosen?
- Step 2: Perform recursive lookup
  - 1.2.3.4 via 5.6.7.8
    - 5.6.7.8 via 9.0.1.2
      - 9.0.1.2 via 3.4.5.6
        - » 3.4.5.6 directly connected, FastEthernet0/0

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## Metric vs. Administrative Distance

- If there are multiple longest matches from...
  - the same protocol
    - Metric used to decide between multiple routes from the same protocol
  - different protocols
    - Administrative distance used to decide between multiple routes from different protocols

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## Administrative Distance Reference

Connected	0
Static	1
EIGRP Summary	5
External BGP	20
Internal EIGRP	90
IGRP*	100
OSPF	110
IS-IS	115
RIP	120
EGP*	140
ODR	160
External EIGRP	170
Internal BGP	200
Infinite	255

\*Deprecated

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## The Switching Process

- Move the packet between interfaces
- Where load balancing occurs
- Switching Paths
  - Process
  - Fast
  - CEF
  - ...

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## The Encapsulation Process

- Build the layer 2 header based on the outgoing media
  - i.e. layer 2 packet rewrite
- Two different types of interfaces
  - Point-to-point
    - Only one possible destination
    - No need for layer 2 addressing
    - e.g. HDLC, PPP, etc.
  - Multipoint
    - More than one possible destination
    - Requires layer 3 to layer 2 resolution
    - e.g. Ethernet, Frame Relay, ATM, etc.

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## Routing to a Next-Hop vs. Interface

- To next-hop
  - e.g. `ip route 10.0.0.0 255.0.0.0 1.2.3.4`
  - Recursive lookup required
  - Resolve layer 2 address of 1.2.3.4
- To point-to-point interface
  - e.g. `ip route 10.0.0.0 255.0.0.0 Serial10/0.1`
  - No recursive lookup
  - Layer 2 resolution not required
- To multipoint Interface
  - e.g. `ip route 10.0.0.0 255.0.0.0 FastEthernet0/0`
  - No recursive lookup
  - Resolve layer 2 address for final destination
    - Ethernet Proxy-ARP
    - NBMA Mappings

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## IP Routing Q&A

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