Routing in IPv6

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Security and IPv6 addresses

- Network scanning
    - More difficult, from a theoretical point of view. because the larger number of combinations available (64 bits per LAN)
    - In reality, it is possible to used tricks to shrink the address space to be scanned
        - Addresses are assigned sequentially (from ::1 on)
        - Stateless address qutoconfiguration (48 bits to be scanned)
        - Hosts with sequential MAC addresses (once one is found, all the others have similar MACs)
        - Start scanning with known OUI (NIC manufacturers ➔ 24 bit)
        - IPv6 addresses derived from IPv4 ones
        - Often, an IPv6 host uses dual stack, hence it is possible to scan the IPv4 space
    - Address harvesting, used to find addresses to be used as "seeds"
        - Host published in DNS
        - Analysis of log files of an host (e.g tracker P2P, web server)
- DDoS
    - An attacker may use several different addresses from the same machine (potentially, a whole /64)

Routing Phases

- On-the-fly routing: use the routing table
- Proactive routing: build routing tables
  - Manual configuration
    - Static routing
  - Distribute destination information throughout the network
    - Routing protocols

- Support for both IPv4 and IPv6

Enabling IPv6 routing

- **Recent routers support IPv6 forwarding**
  - **Most likely disabled**
- **Sample configuration on Cisco router**

```
Router#configure terminal

Router(config)#ipv6 unicast-routing
```

  - **IPv6 addresses can be configured on interfaces**
  - **IPv6 packets are forwarded**

IPv6 routing table

- ## Routing based on longest prefix match
  - ### Same as in IPv4

- ## IPv6 and IPv4 are dealt with as two independent protocols
  - ### Separate routing tables

Routing protocols

- Integrated Routing

  - A single protocol to advertise destinations of both protocol families

- Ships in the night

  - Each address family uses a distinct protocol

    - Protocols are completely independent one from the other

Integrated Routing

- No need to duplicate mechanisms 👍
    - Advertisement messages
    - Fault detection

- Which family (IPv4, IPv6) will transport protocol messages?

- A new protocol: might have bugs 👎 hampering IPv4 operation

- IPv4 and IPv6 topologies might be 👎 different

Ships in the night

- It is possible to use different routing protocols 👍

    - Tune choice to topology/scenario

- Smoother migration 👍

- Simpler troubleshooting 👍

- Duplicated mechanisms 👎

IPv6 routing protocol options

Protocol	Approach
Static	Ships in the night
RIPng	Ships in the night
EIGRP	Ships in the night
OSPFv3	Ships in the night (Integrated routing is possible)
IS-IS	Integrated routing
MP-BGP	Both (configuration-dependent); "Integrated Routing" is the most commonly deployed because of practicality: BGP process identified by AS number, which is the same for both IPv4 and IPv6.

AS 1   **BGP**   **AS 2**   **RIPng OSPFv6 IS-IS EIGRP**
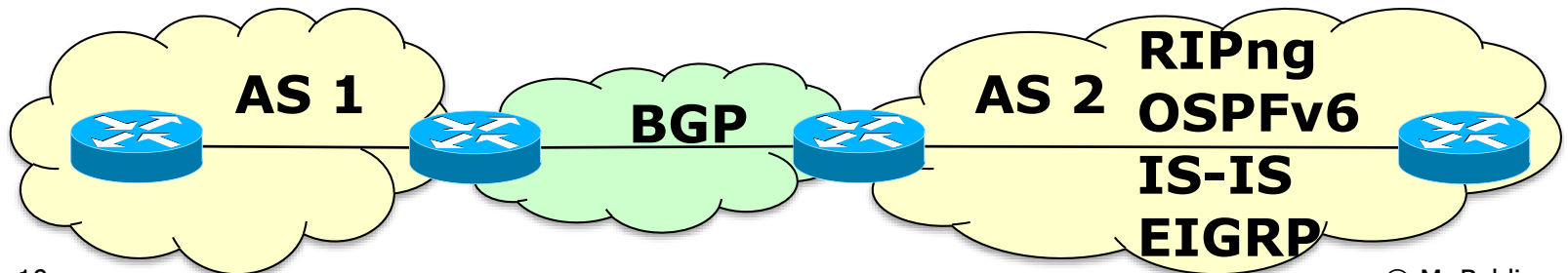
Routing table example

```
C2800#sh ipv6 route
IPv6 Routing Table - 15 entries
Codes: C - Connected, L - Local, S - Static, R – RIP
       O - OSPF intra, OI - OSPF inter
O    2013::/112 [110/65]
      via FE80::20F:34FF:FEE7:ABDE, FastEthernet1
O    2016::/112 [110/65]
      via FE80::223:EBFF:FE44:C6EE, FastEthernet0
      via FE80::20F:34FF:FEE7:ABDE, FastEthernet1
C    2017::/64 [0/0]                           On-link prefix
      via ::, FastEthernet0/1
L    2017::2/128 [0/0]                          Interface address
      via ::, FastEthernet0/1
L    FE80::/10 [0/0]                            Link-local prefix
      via ::, Null0
L    FF00::/8 [0/0]                             Multicast prefix
      via ::, Null0
S    ::/0 [1/0]                                 Default route (static)
      via FE80::20D:BCFF:FEB9:29A3, FastEthernet2
```