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IPv6DISSemination and Exploitation

## Routing Protocols

- Internal Routing
  - RIPng - RFC 2080 & 2081
  - IS-IS - draft-ietf-isis-ipv6-05.txt
  - OSPFv3 - RFC 2740
- External Routing
  - BGP 4+ - RFC 2545 : based on MBGP (RFC 2848)
- No major differences with IPv4!



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## Routing Protocols - RIPng

- Same as IPv4
  - Distance vector, max. 15 hop, split-horizon
  - Based on RIPv2
- Updated Features
  - Uses IPv6 for transport
  - IPv6 prefix, next-hop IPv6 address
  - For RIP updates, uses multicast address FF02::9

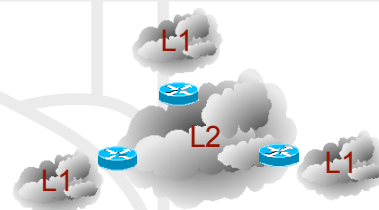


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## Routing Protocols – ISISv6

- OSI Protocol
- Based on two levels
  - L2 = Backbone
  - L1 = Stub
  - L2L1 = interconnect L2 and L1
- Runs on top of CNLS
  - Each IS device still sends out LSP (Link State Packets)
  - Send information via TLV's (Tag/Length/values)
  - Neighborship process is unchanged
- **Major operation remains unchanged**



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## Routing Protocols – ISISv6 #2

- Updated features:
  - Two new Tag/Length/Values (TLV) for IPv6
    - IPv6 Reachability
    - IPv6 Interface Address
  - New network Layer Identifier
    - IPv6 NLPID



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## Routing Protocols – OSPFv3

- OSPFv3 = OSPF for IPv6
  - Based on OSPFv2
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- The diagram illustrates a network topology for OSPFv3. It features a central backbone structure at the top, represented by a horizontal bar with vertical lines extending downwards. Below the backbone, there are three distinct network areas, each represented by a cloud-like shape. The central area is labeled 'Backbone Area #0' and contains two blue router icons. The two side areas are labeled 'Area #1' and 'Area #2' and each contains one blue router icon. The routers are interconnected, showing a multi-level hierarchy. An 'Internet' cloud is also shown at the top, connected to the backbone.
- Topology of an area is invisible from outside the area
    - LSA flooding is bounded by area
    - SPF calculation is performed separately for each area
  - All areas must have a connection to the backbone



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# Routing Protocols – OSPFv3

- **OSPFv3 is an IPv6-only protocol**
  - In a dual-stack environment, running OSPF, you'll need OSPFv2 (IPv4) and OSPFv3 (IPv6)
- Updated Features
  - Runs directly over IPv6
  - Distributes IPv6 prefixes
  - New LSA types
  - Uses the Multicast address
    - ALLSPFRouters (FF02::5)
    - ALLDRouters (FF02::6)

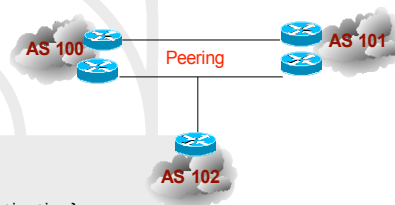


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# Routing Protocols – BGP4+

- Exterior Gateway Protocol
  - Connect separate routing domains that contain independent routing policies (AS)
  - Carries sequences of AS numbers indicating path
  - Supports the same features and functionality as IPv4 BGP
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- Extensions for IPv6
    - Support IPv6 address family
    - Network layer reachability information
    - Next hop (next router in the path to destination)



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# Routing Protocols

One thing to remember: MTU Path discovery

- Fragmenting happens between 2 communicating peers
- MTU path discovery uses ICMP “packet too big” error messages
- IPv6 MTU must be at least 1280 bytes
  - Recommended MTU: 1500 bytes



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