# Transport Network Design

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EXTERIOR GATEWAY PROTOCOLS (EGPs)

- Handle routing outside an Autonomous System*****
  and get you onto any other network
- To get from place to place outside your network(s)
  you must use an EGP

- EGP Categories:

  - Exterior Gateway Protocol (older)
  - Border Gateway Protocol (BGP)
    - Used by companies with more than one
      Internet provider allowing redundancy
      and load balancing

Exterior Gateway
Protocol:
- BGP

Autonomous
System 100

Interior Gateway
Protocols:
- RIP
- IGRP
- EIGRP
- OSPF
- IS-IS

Autonomous
System 200
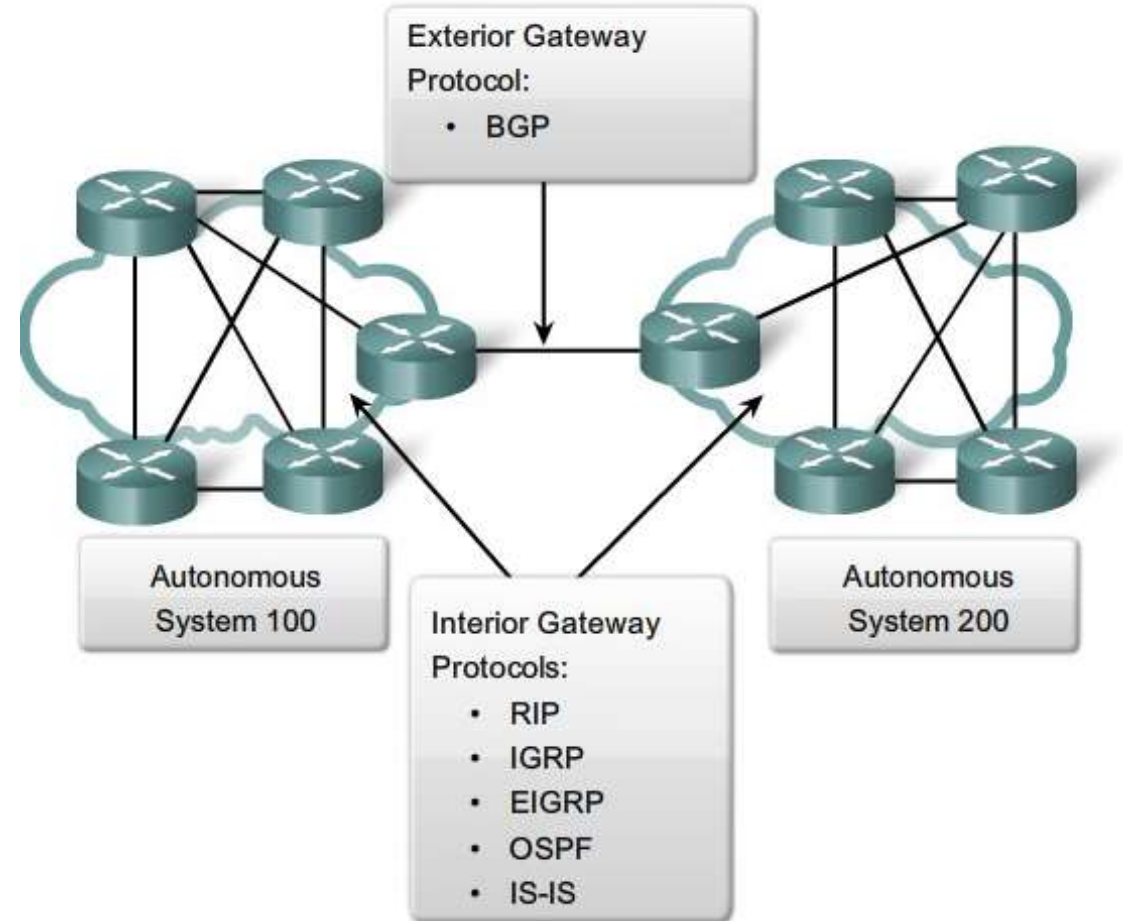
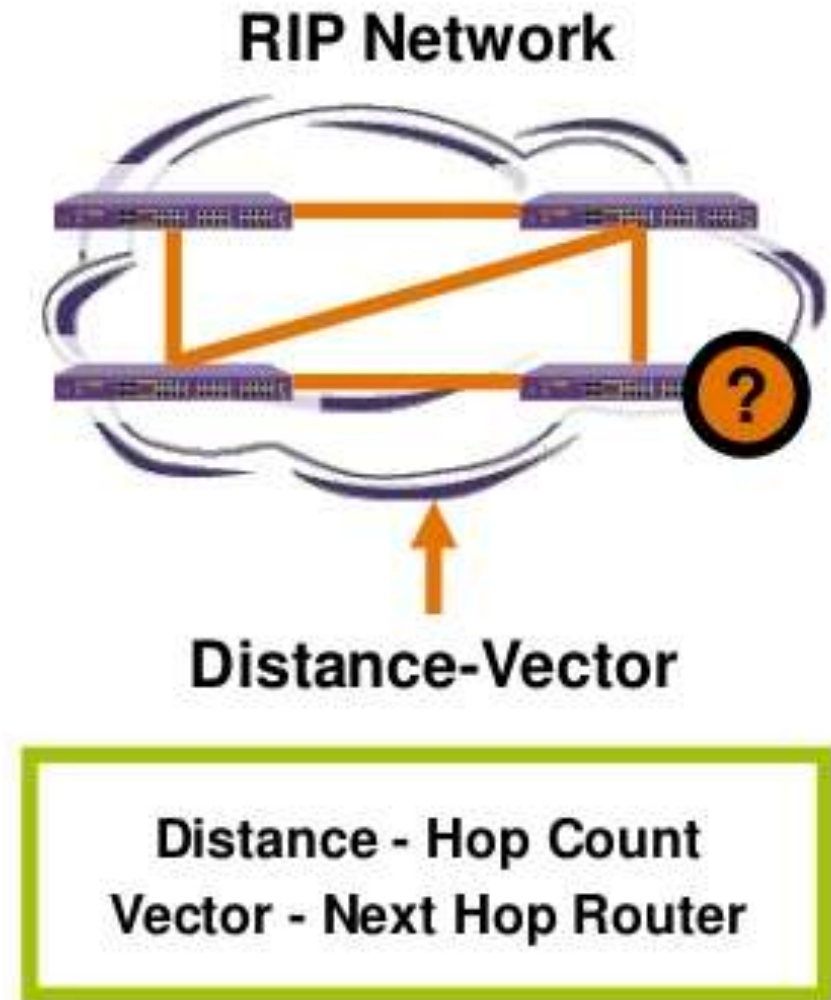** typically all combined networks managed under a single routing domain*

INTERIOR GATEWAY PROTOCOLS (IGPs)

- Handle routing within an Autonomous System

- Dynamic routing protocols that keep track of paths used to move data

- Two IGP categories:
  - Distance Vector Protocols
    - Routing Information Protocol (RIP)
    - Interior Gateway Routing Protocol (IGRP)

  - Link State Protocols
    - Open Shortest Path First (OSPF)
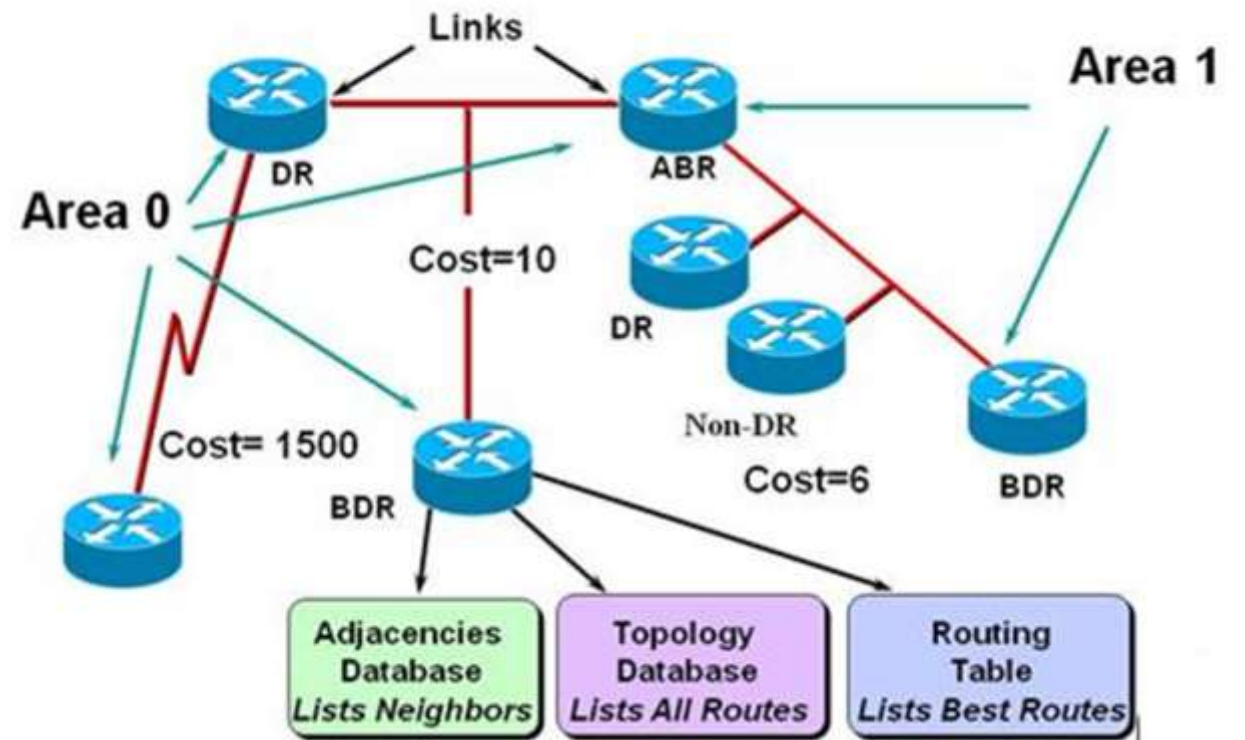   - Intermediate System to Intermediate System (IS-IS)

Exterior Gateway Protocol:
- BGP

Autonomous System 100

Autonomous System 200

Interior Gateway Protocols:
- RIP
- IGRP
- EIGRP
- OSPF
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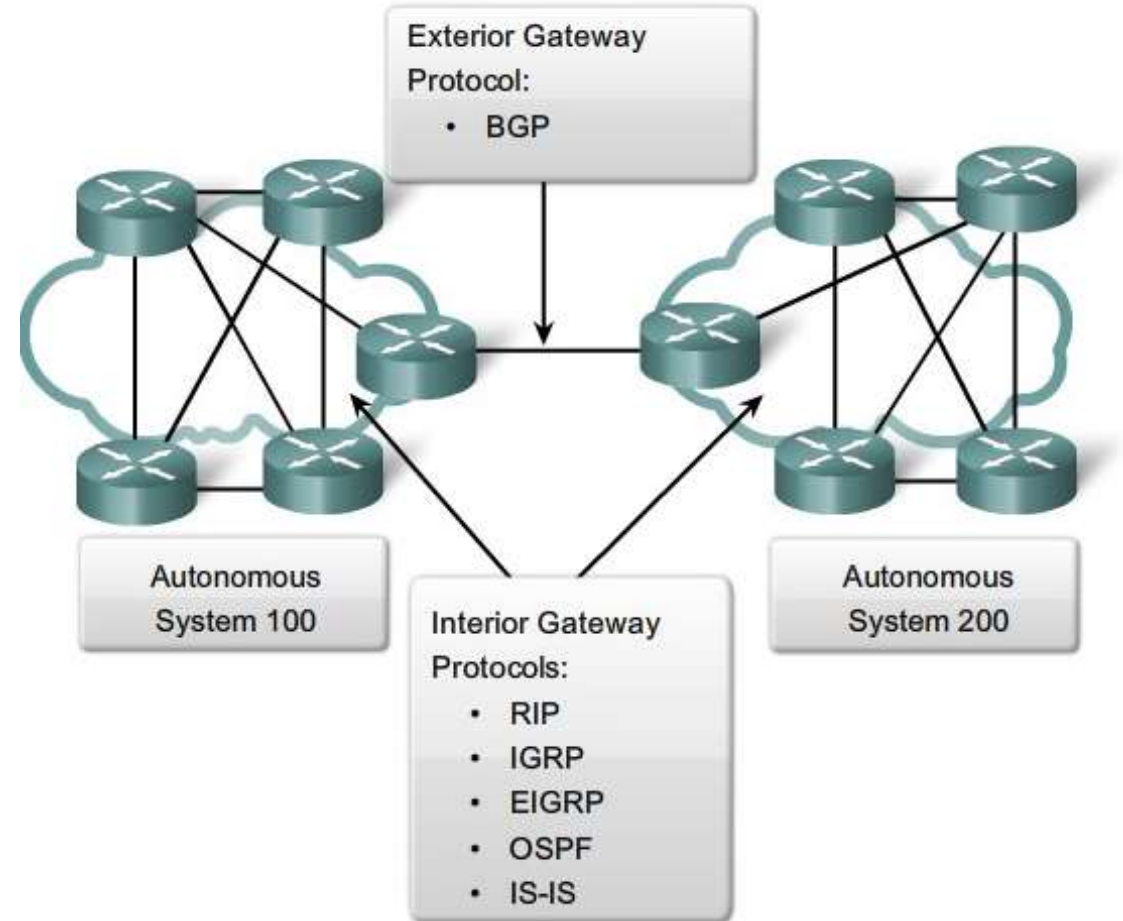
Routing Information Protocol (RIP)

- Router ``***tells the neighbors about the world''***

- Routers broadcast their entire current routing database periodically, typically every 30 seconds

- Each router creates routing table based on exchanged information

- Works fine for small, stable high-speed networks, but uses a hop count of 15 to denote infinity, unsuitable for large networks

- The most widely accepted routing protocol, but many Internet sites adopted RIP without considering technical merits and limitations

RIP Network

Distance-Vector

Distance - Hop Count
Vector - Next Hop Router

Open Shortest Path First (OSPF)

Router ``*tells the world about the neighbors.''*

- Specifies class of messages called Link-State Advertisements (LSAs)

- Allow routers to update each other about connected links

- When change is made to network, LSAs flow between routers

Open Shortest Path First (OSPF)

- Routers receive link-state updates and store them in topology database

- Database contains a representation of every link and router

- When routers receive traffic to be forwarded, topology database used to calculate table of best routes

- OSPF addresses all RIP shortcomings
  - Better suited for small , dynamic networks
  - In large configurations, number of router updates can become an issue

Intermediate System to Intermediate System (IS-IS)

- A native Layer 3 (network layer) protocol capable of passing routing information for any routable protocol

- Can implement comparable link-state routing but not restricted to IP like OSPF and other protocols

- Network-protocol neutral, can support IPv6

- Better suited for larger networks than other protocols, not as susceptible to scaling issues
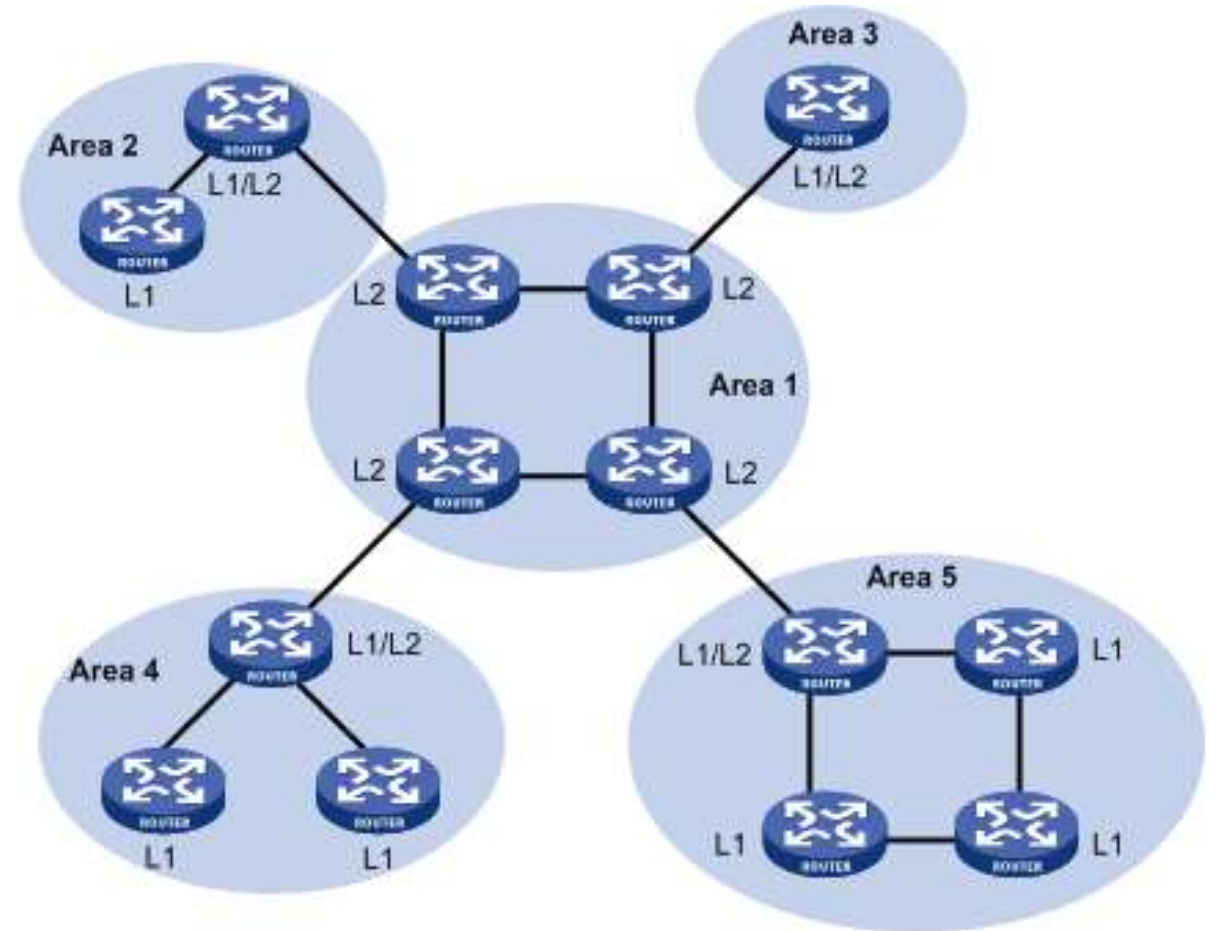
Summary

- Reliability protocols and vendor implementations have and continue to evolve

- For different sized networks and scenarios, these protocol solutions should be considered for implementation to improve routing reliability

- Resources available to learn more about these protocols:

  - RIP
  - OSPF V2
  - OSPF for IPv6
  - IS-IS