Inter-Autonomous-System Routing: Border Gateway Protocol

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Outline

- Hierarchical routing
- BGP

- Goal: each router *u* must be able to compute, for each other router *v*, the next-hop neighbor *x* that is on the least-cost path from *u* to *v*

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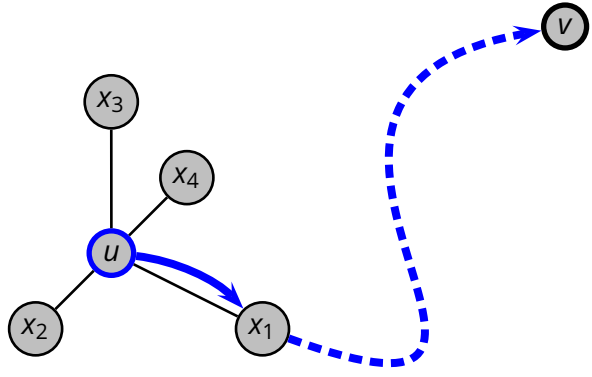

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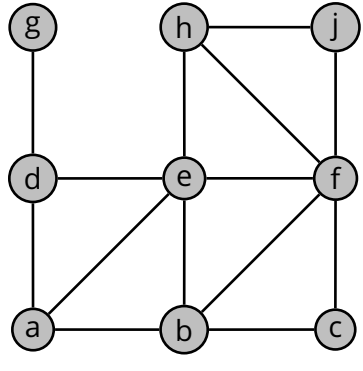

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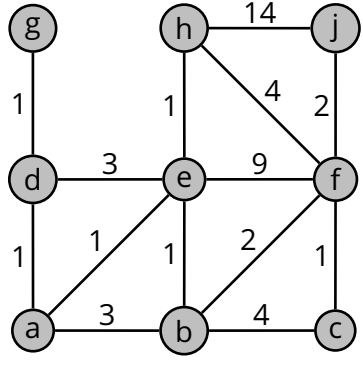

- Also, our objective has been to find the least-cost paths between sources and destinations

More Realistic Topologies

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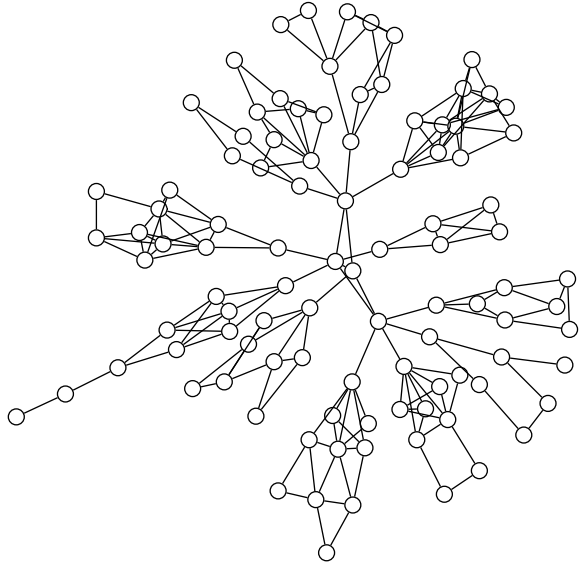

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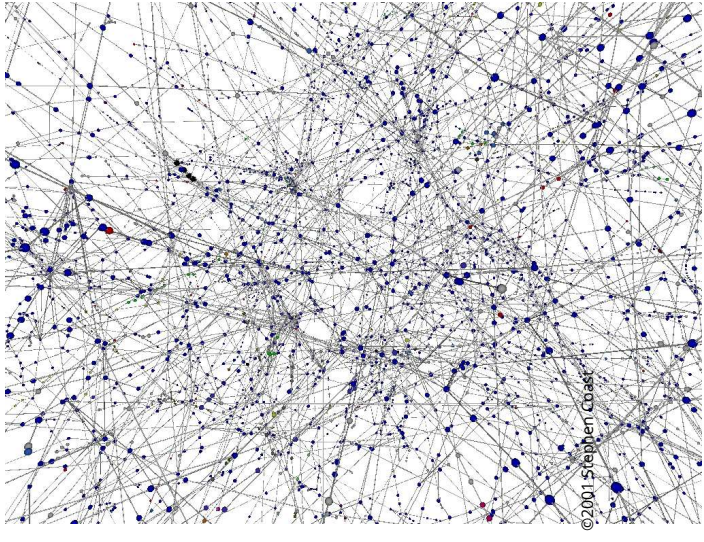
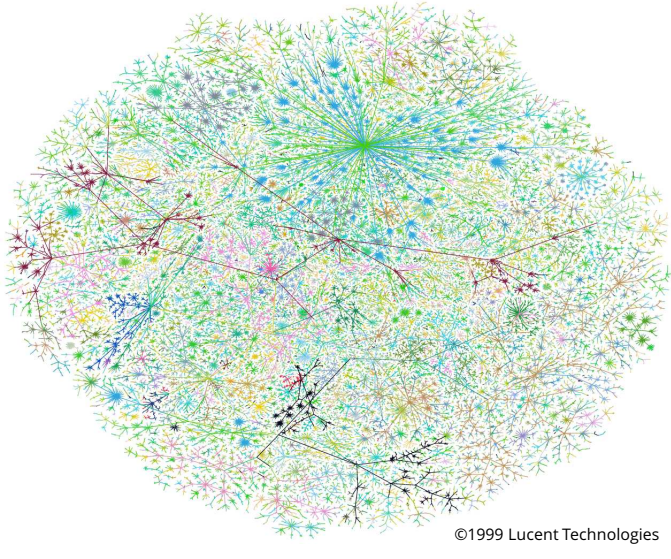


An Internet Map



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- An *intra-autonomous system routing protocol* runs within an autonomous system (e.g., OSPF)
  - this protocol determines internal routes
    - internal router ↔ internal router
    - internal router ↔ gateway router
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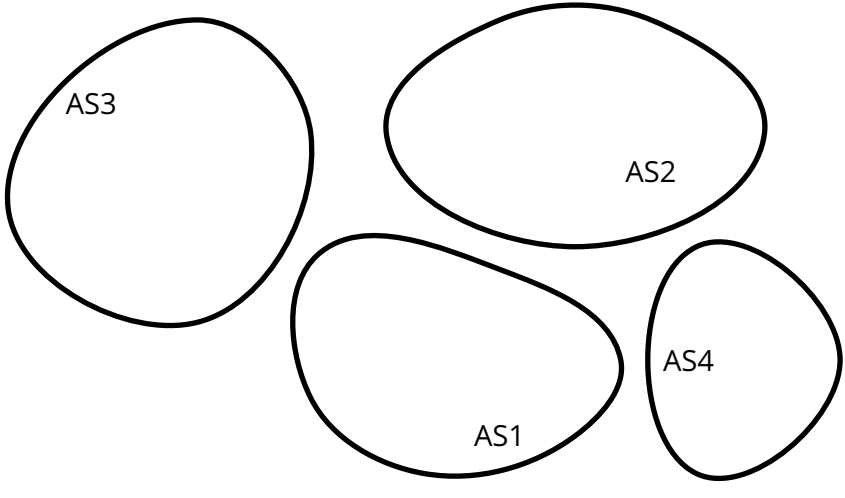

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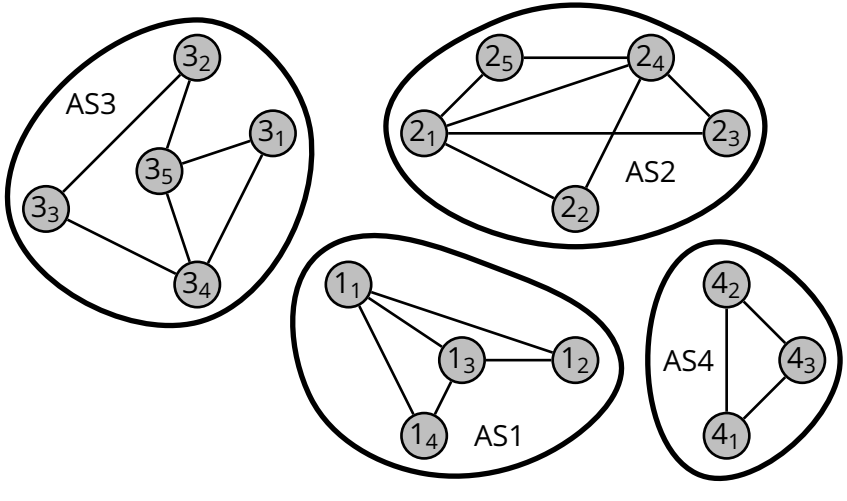

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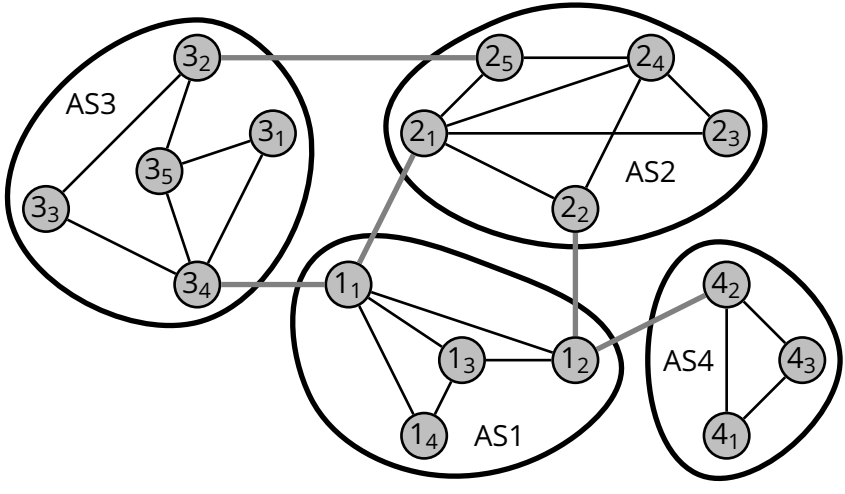

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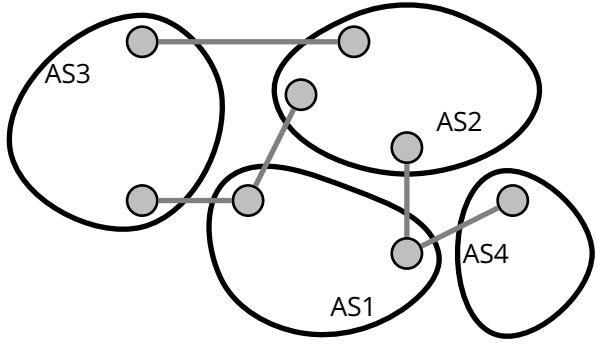

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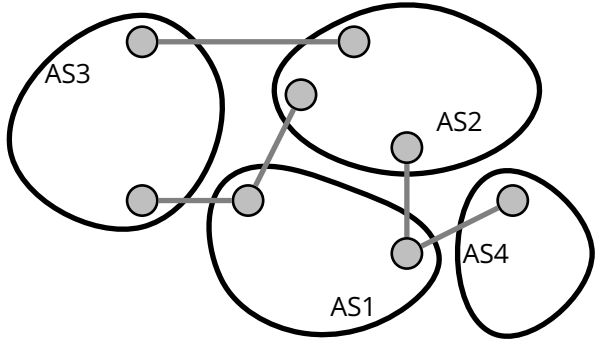

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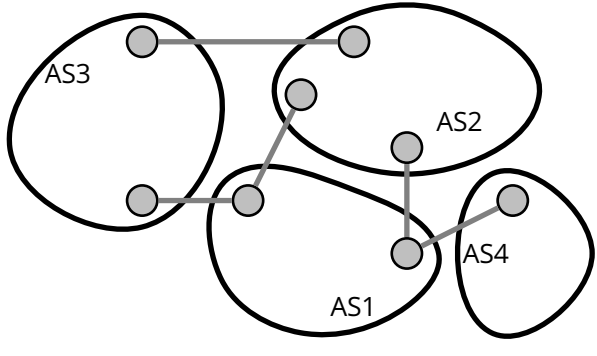

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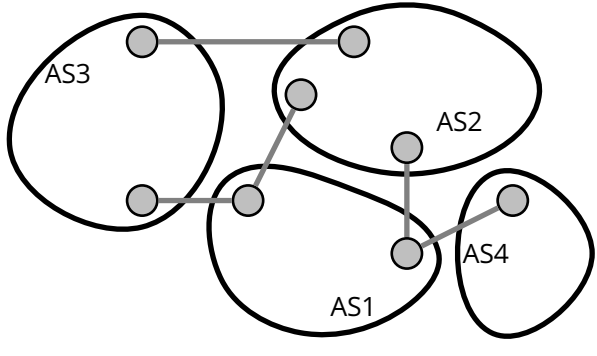

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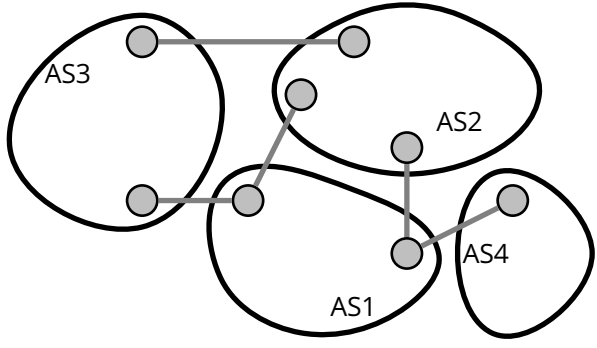

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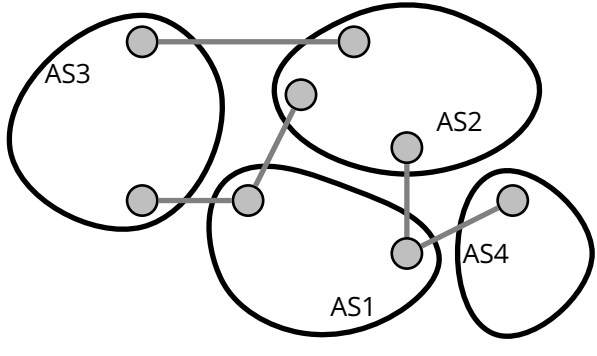

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- Both *inter-AS* and *intra-AS* routing information is used to compile the forwarding tables

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  - what if x is reachable through multiple gateway routers G_x, G'_x, . . .?
    - use *intra-AS* routing information to determine the costs of the (least-cost) paths to G_x, G'_x, . . .
    - "hot-potato" routing: send it through the closest gateway

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- External subnet addresses are likely to “aggregate” in groups that admit compact representations
  - this process is called *supernetting*

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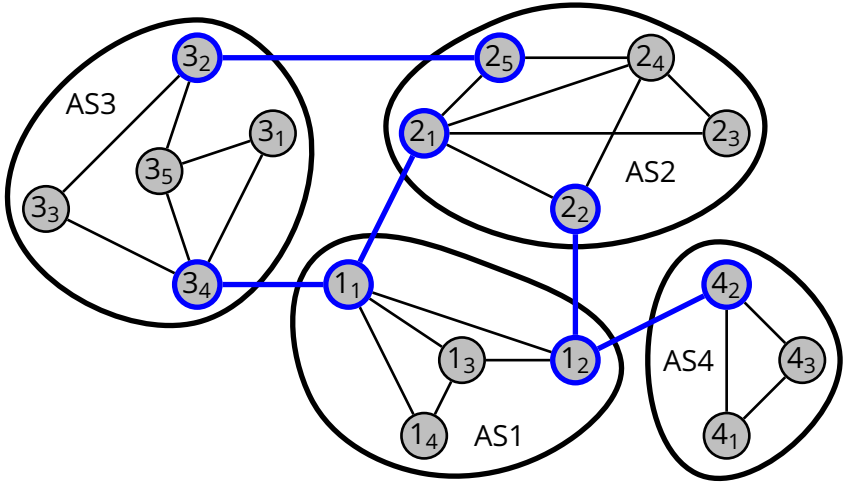
- ***BGP external session (eBGP):*** a session across two autonomous systems
- ***BGP internal session (iBGP):*** a session within an autonomous system
  - note that internal sessions carry *inter-AS* information
  - *intra-AS* routing uses a separate protocol (e.g., OSPF)

Gateway Routers and *eBGP*



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- ***BGP import policy:*** used to decide whether to accept or reject the route advertisement
  - e.g., a router may not want to send its traffic through one of the AS listed in *AS-PATH*

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