合肥學院
HEFEI UNIVERSITY

Distributed Computing
Lesson 3: Network Links and Topologies

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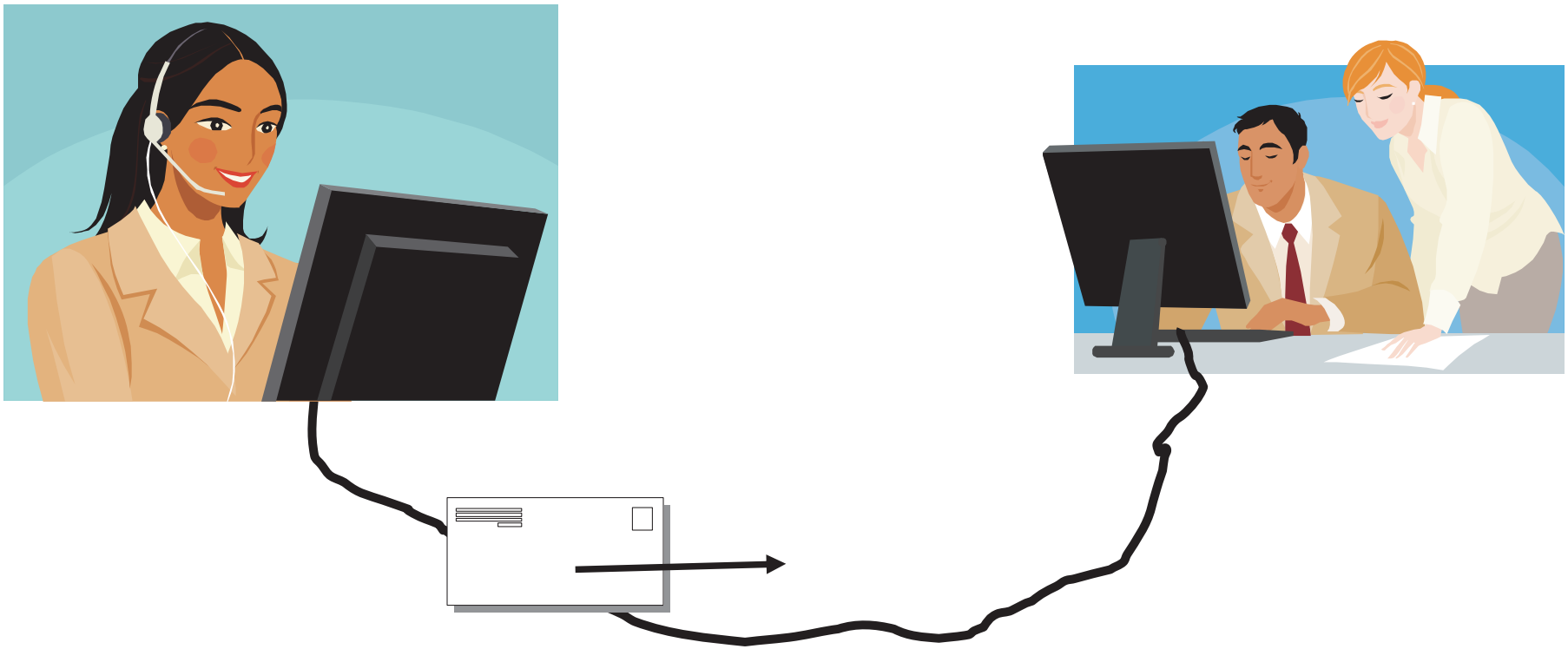
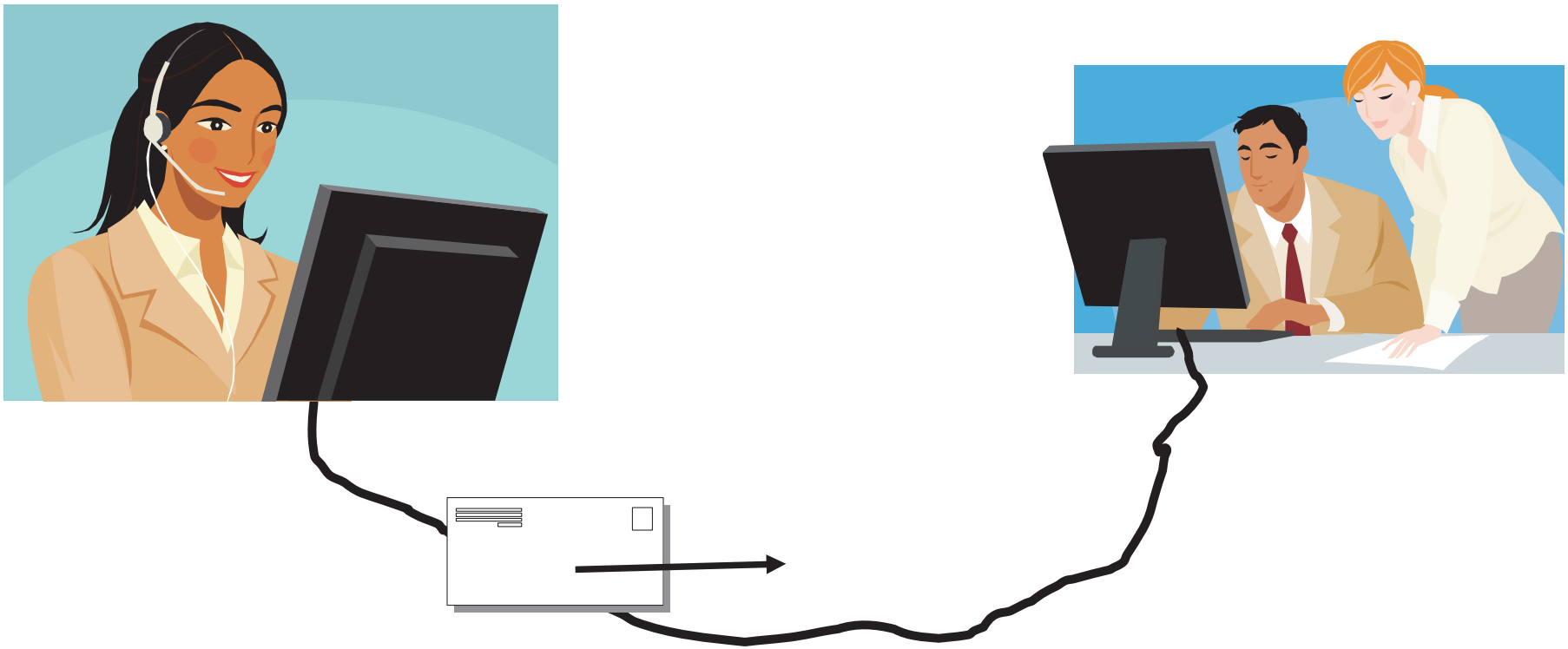
Outline

- In this and the next lesson we discuss *How to communicate?*



- In this and the next lesson we discuss *How to communicate?*
- What is needed to get a message from A to B?



Network Topologies

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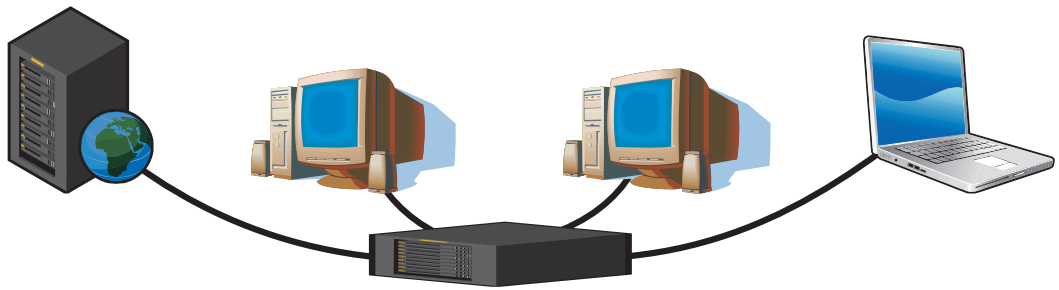
- Communication takes place over a network of such nodes and connections.
- The network topology is the arrangement of the connections and nodes of a computer network.



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  - Example: the connections in the Skype telephone service form a dynamic topology [1]

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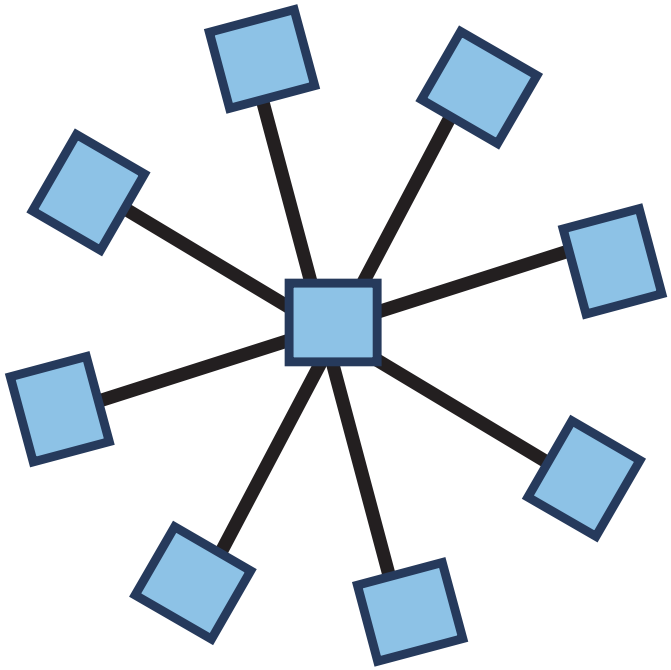
  - Example: the cables and routers in the university are a physical topology

Network Topologies

- Do you know any specific network structures/topologies?

Network Topologies: Star

- Star



Network Topologies: Star

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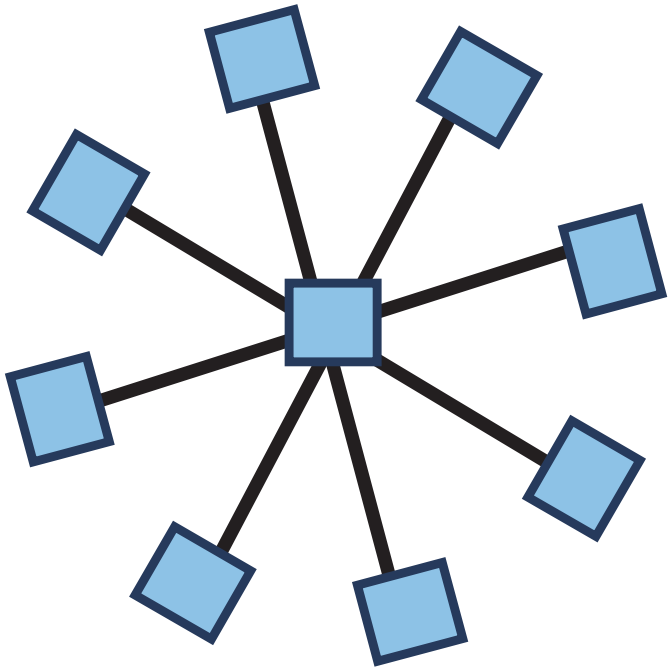
  - All computers connected to central node n_1



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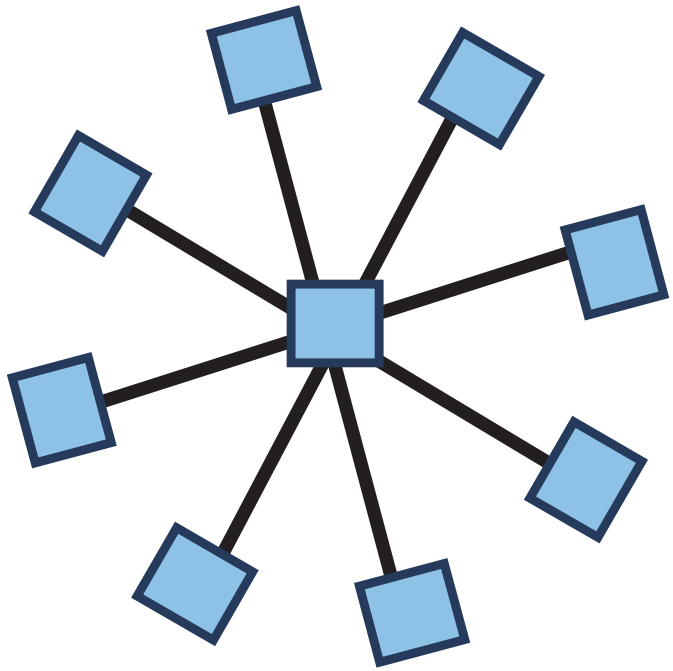

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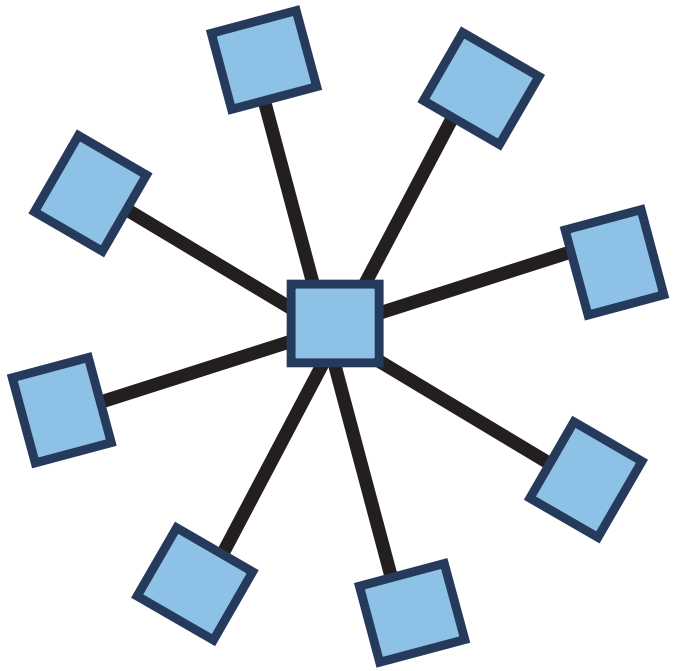

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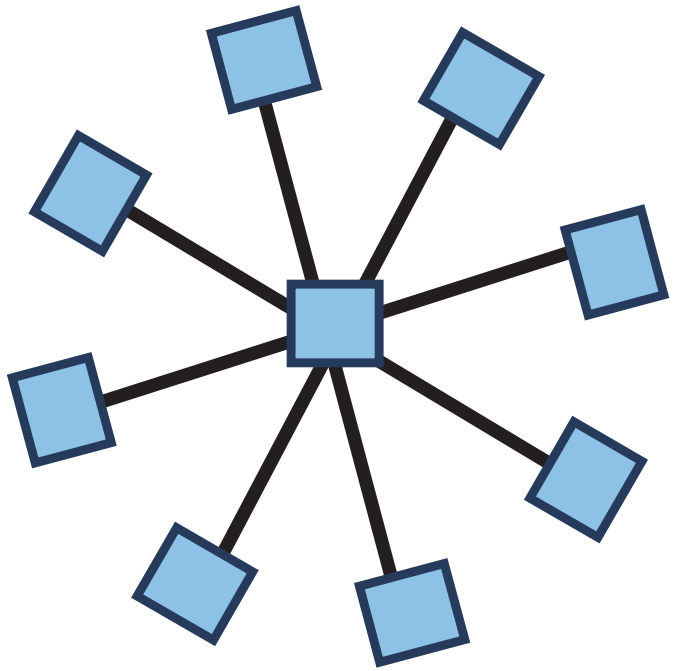
  - But: Single point of failure
  - Example: computers attached to one switch/router/hub



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  - Example: old Ethernet networks with coaxial cables and hubs [2]

Network Topologies: Complete Graph

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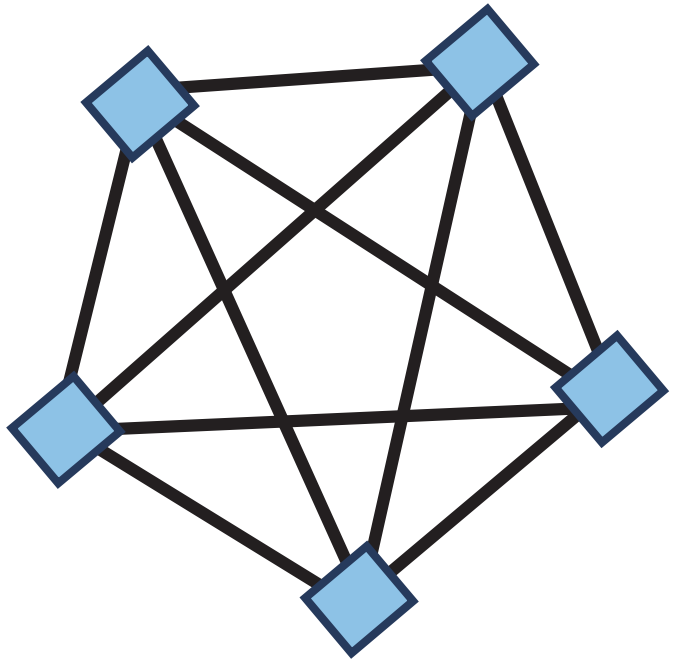

Network Topologies: Complete Graph

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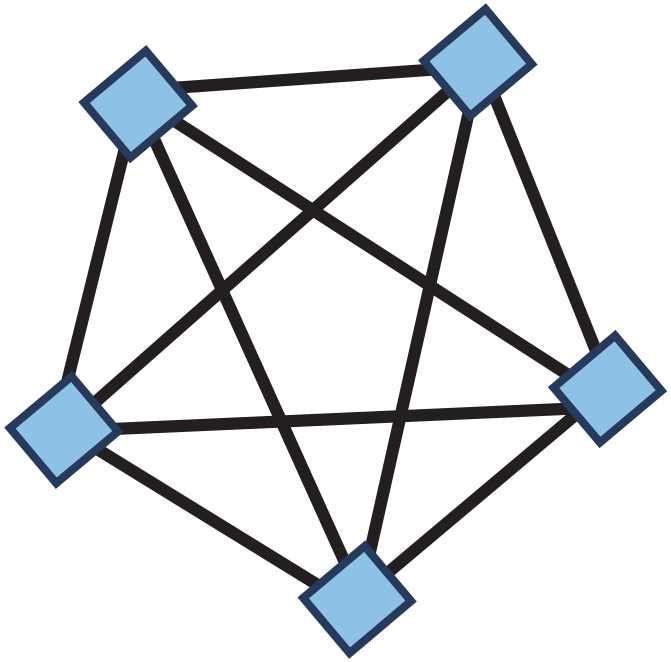
  - All nodes are connected with all nodes



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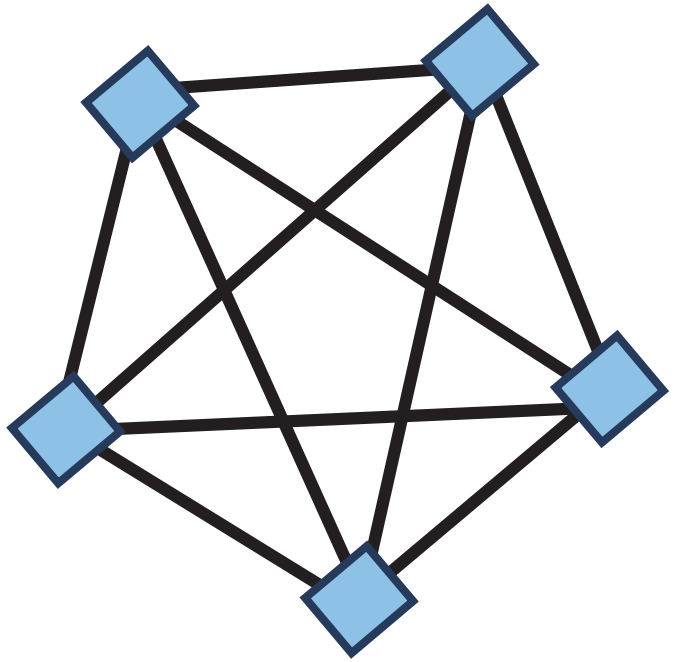

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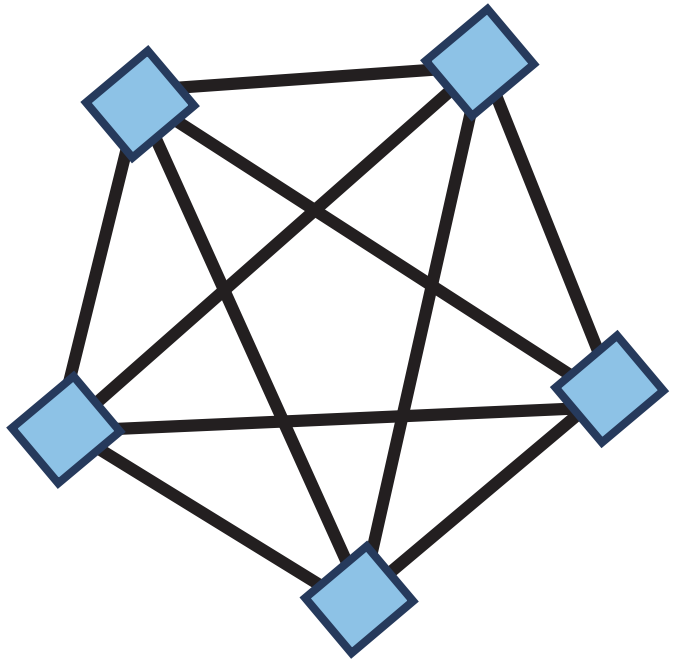
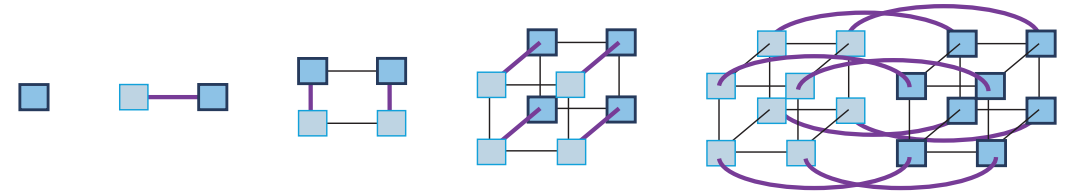
  - Example: IP protocol in internet provides a virtual complete graph topology



Hypercube



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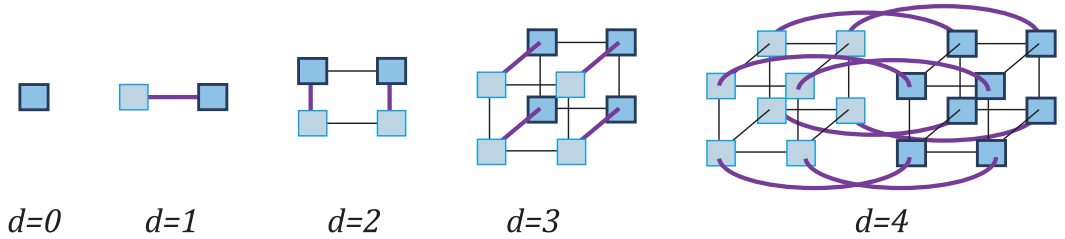
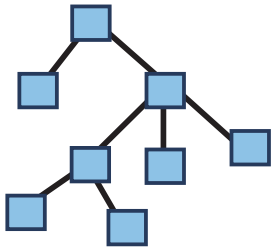
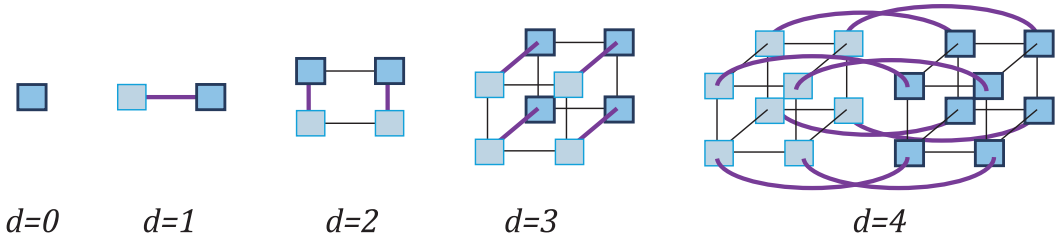


Tree



Network Topologies: Others

Hypercube



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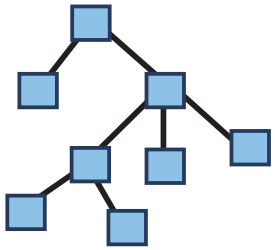
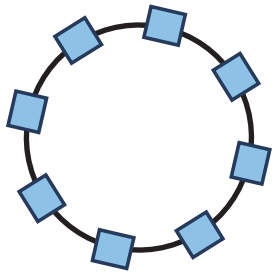


Ring



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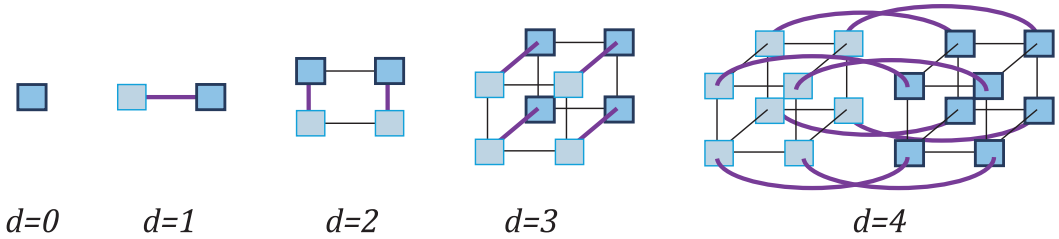

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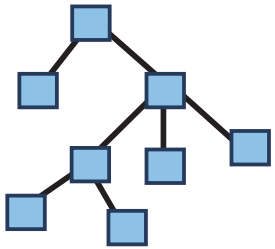

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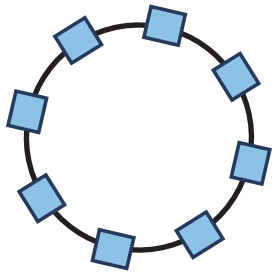
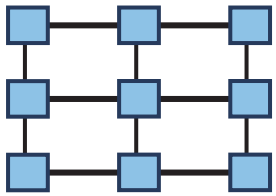


Lattice



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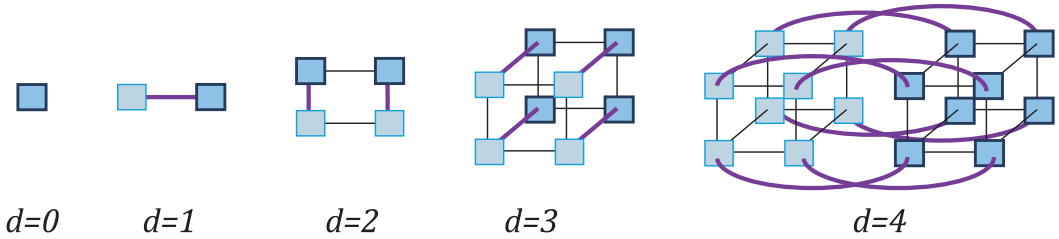

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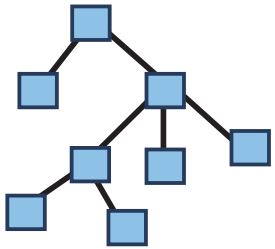

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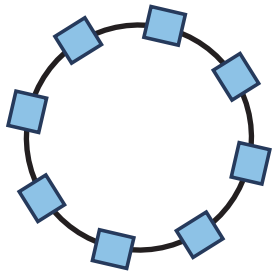

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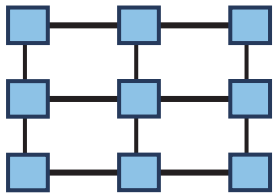
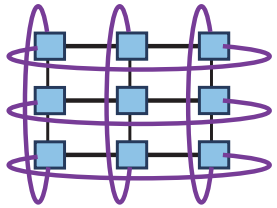


Torus



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  - Example: Radio, Ethernet, IP, and UDP provide unreliable communication

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  - Example: Most protocols in the internet are bidirectional

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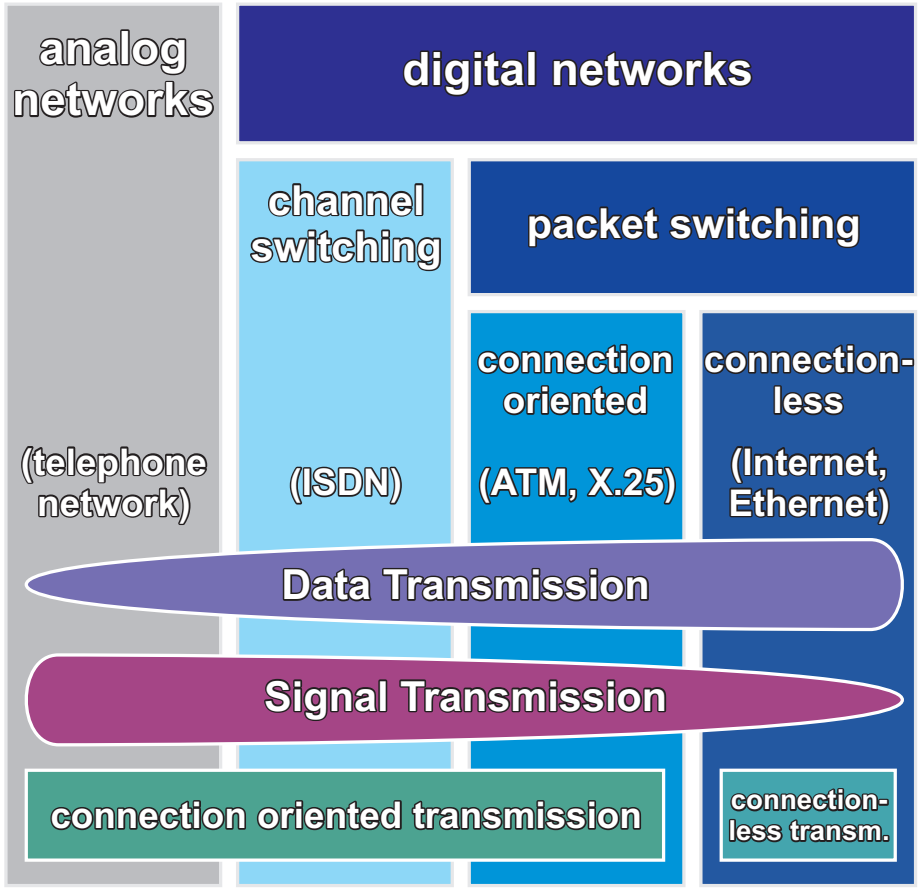
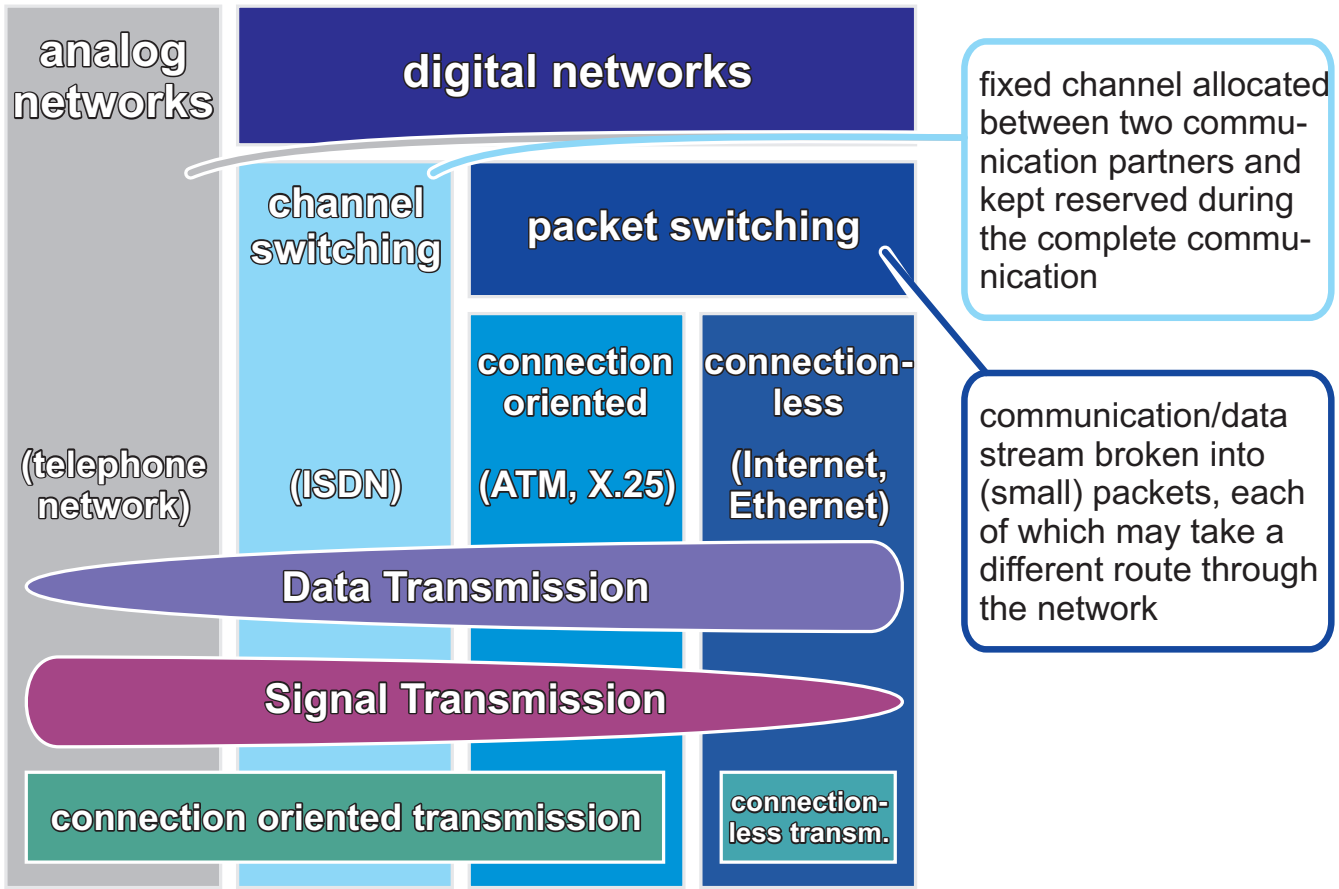
- Latency: the time a message needs to get from A to B
- Bandwidth: How many bits per second can we send:
  - Low bandwidth: Wait a long time until download *completes*

- Different types of networks



- Different types of networks



Communication Systems

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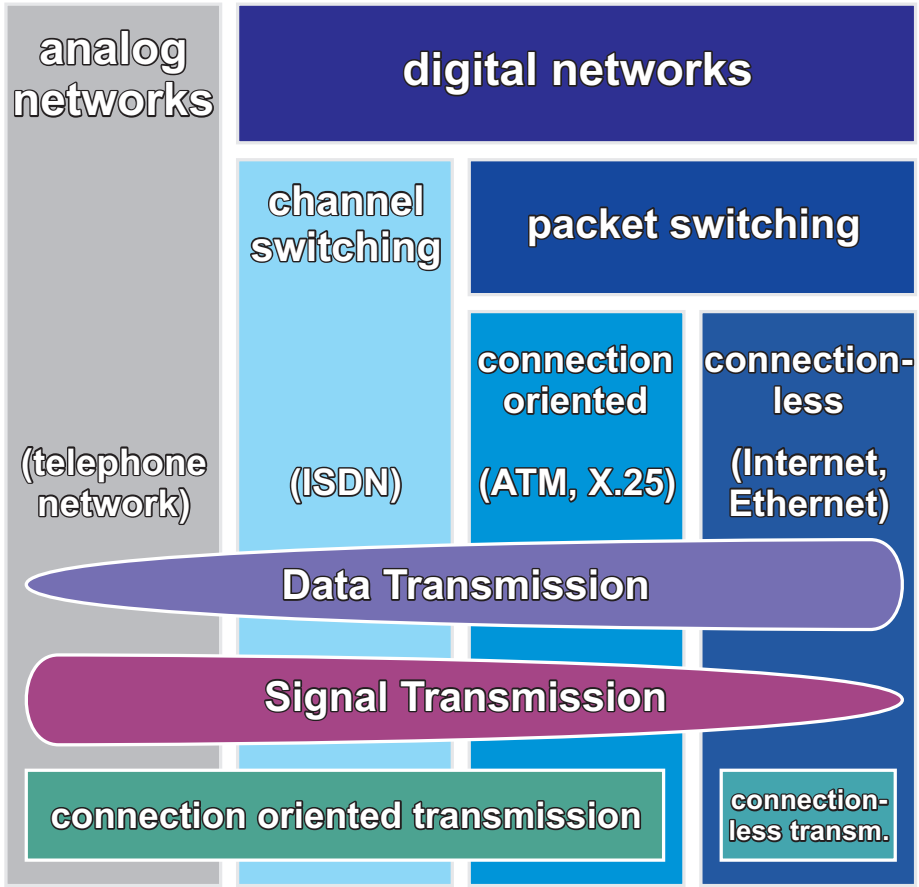
- Networks grow historically and organically [2, 3]



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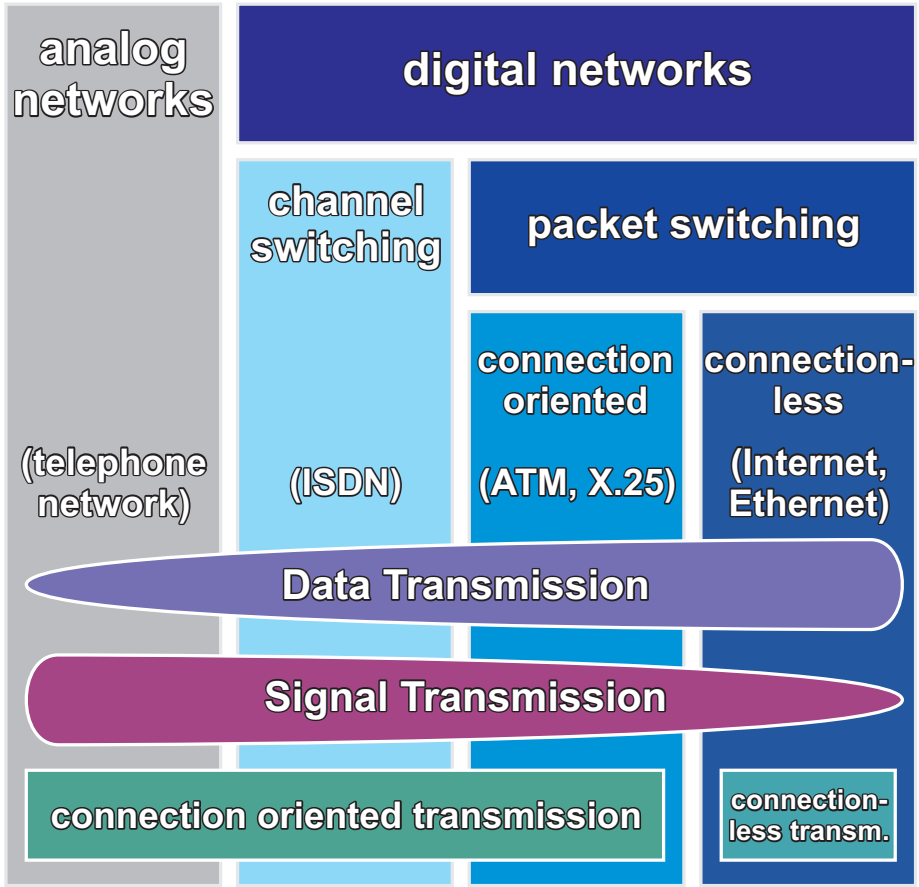

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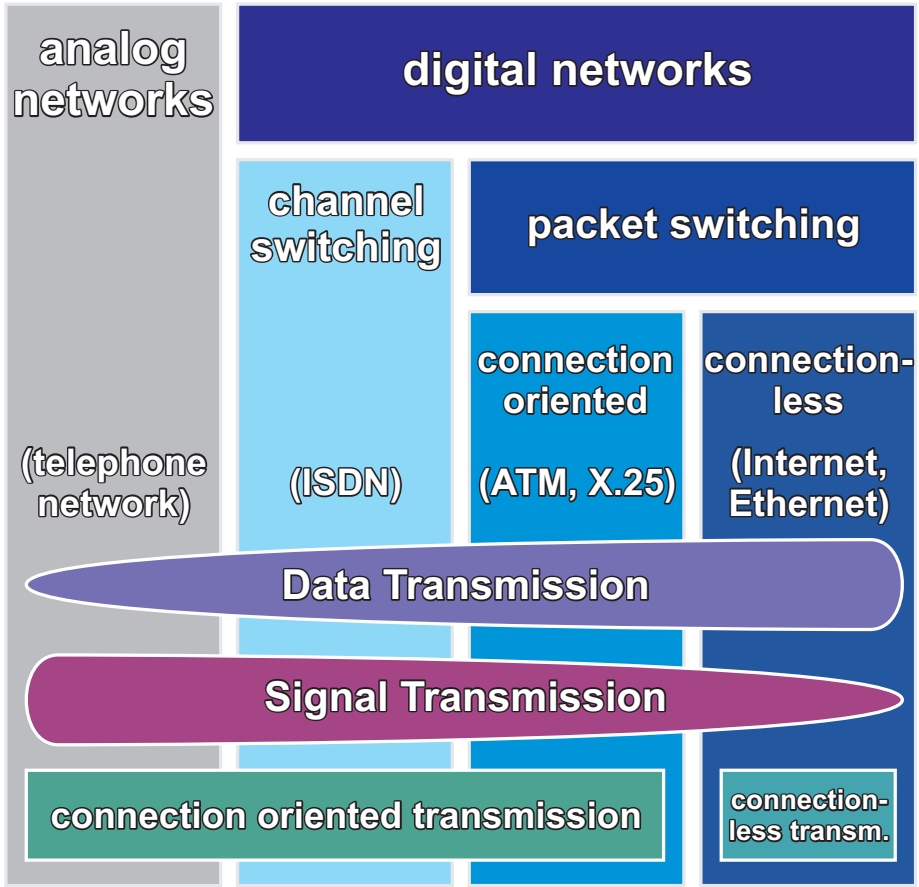

Summary

- We have learned about the topology of a network
- We have learned about properties of a communication link

谢谢

Thank you

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Caspar David Friedrich, “Der Wanderer über dem Nebelmeer”, 1818
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