Networks and Connecting Things to the Cloud

Connecting Devices to the Network

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Connecting Devices to the Network

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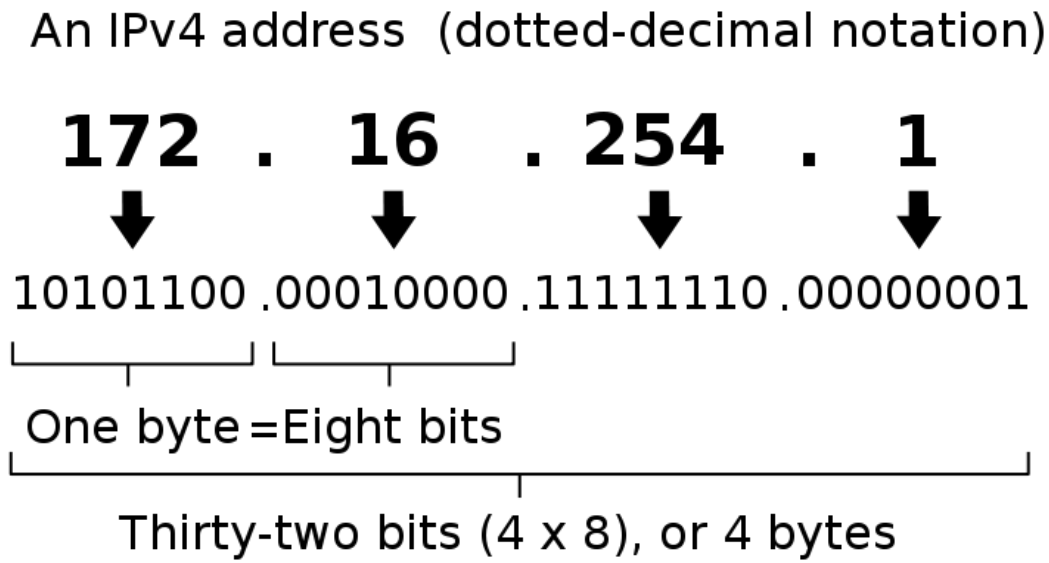
Internet Protocols - IPv4

- Internet Protocol version 4
- Developed by DARPA and released for production in 1983
- Uses 32-bit addresses, thus can represent 4294967296 (2^{32}) addresses



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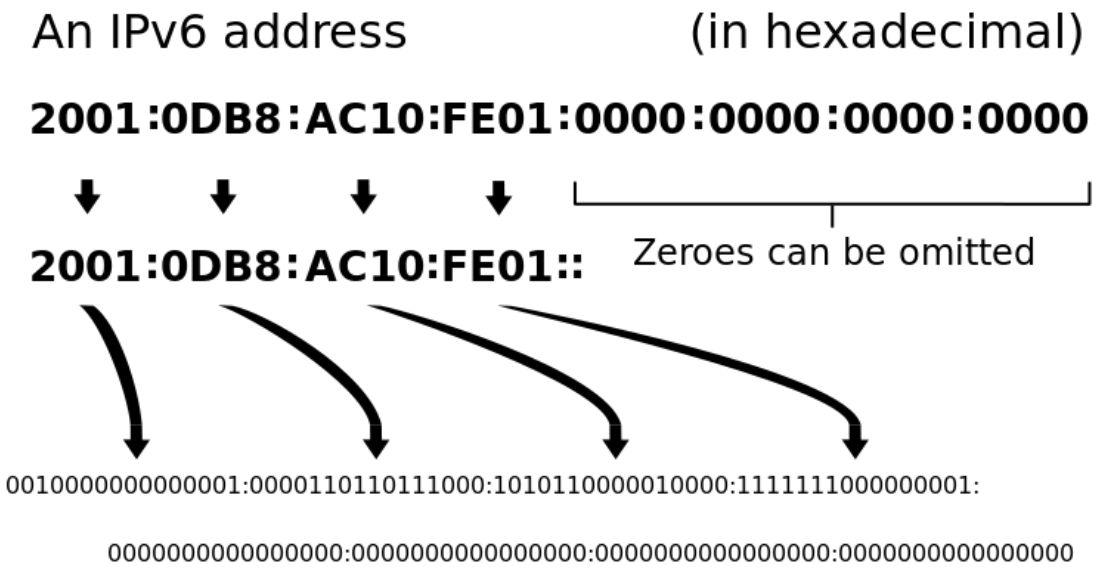
Internet Protocols - IPv6

- The most recent Internet Protocol version
- Developed by the Internet Engineering Task Force (IETF)
- Uses 128-bit addresses, thus can represent 3.4×10^{38} addresses (or about 4000 addresses for every person in the world)



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Internet Protocols - IPv4 vs IPv6

- IPv4
  - Fourth version of the Internet Protocol
  - Deployed for production in the ARPANET in 1983
  - 32 bit IP addresses
  - Supports 2^{32} addresses (just over 4 billion)
  - End-to-end encryption is optional and thus makes users vulnerable to "man-in-the-middle" attacks
- IPv6
  - The most recent version of the Internet Protocol
  - Developed by the Internet Engineering Task Force (IETF) due to IPv4 address exhaustion
  - 128 bit IP addresses
  - Supports 3.4×10^{38} addresses (or about 4000 addresses for every person in the world)
  - MAC-based IP addresses
  - Can run end-to-end data encryption

IoT Networking Protocols

- Infrastructure:
  - 6LowPAN
  - IPv6
- Comms/Transport:
  - NFC
  - Bluetooth
  - WiFi
  - LoRaWAN
- Data Protocols:
  - MQTT
  - CoAP
  - WebSockets

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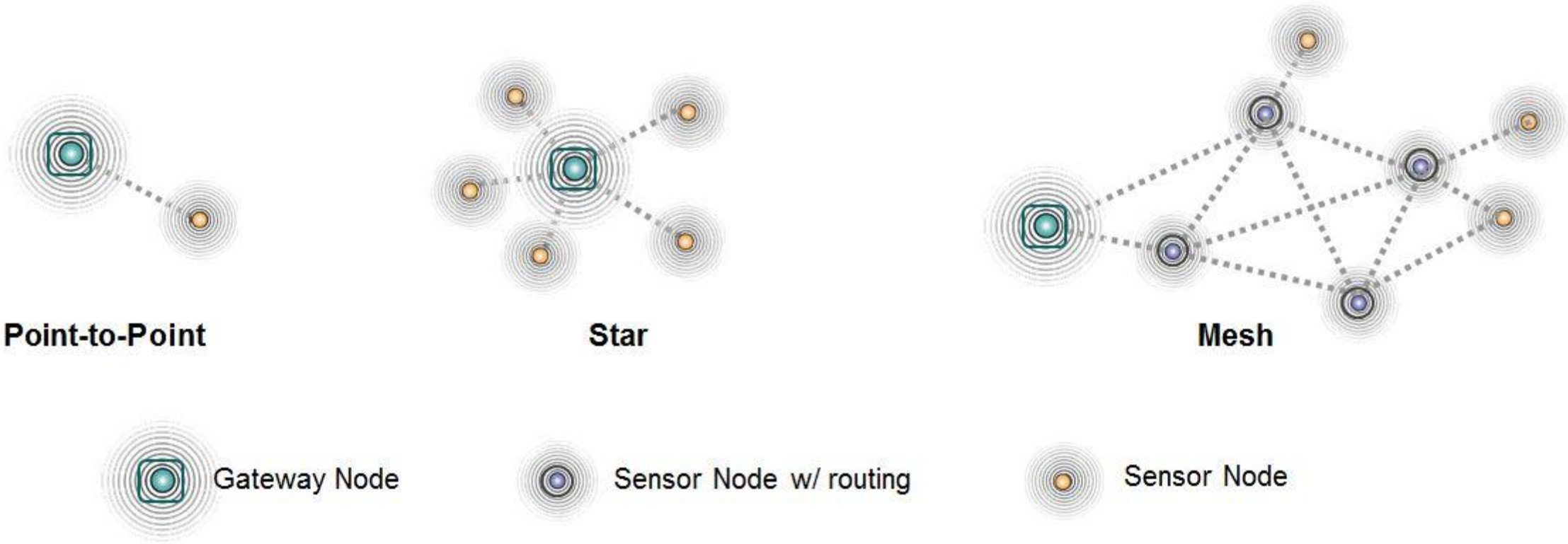
IoT Network Topologies



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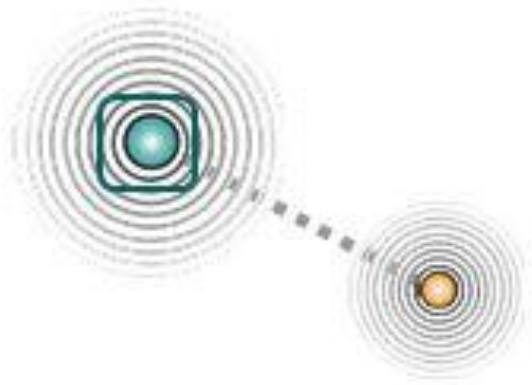
Point-to-Point Network

- Simplest topology
- Low cost
- Does not scale beyond two nodes
- Network range limited to one hop
- Network range defined by the transmission range of a single device



Point-to-Point

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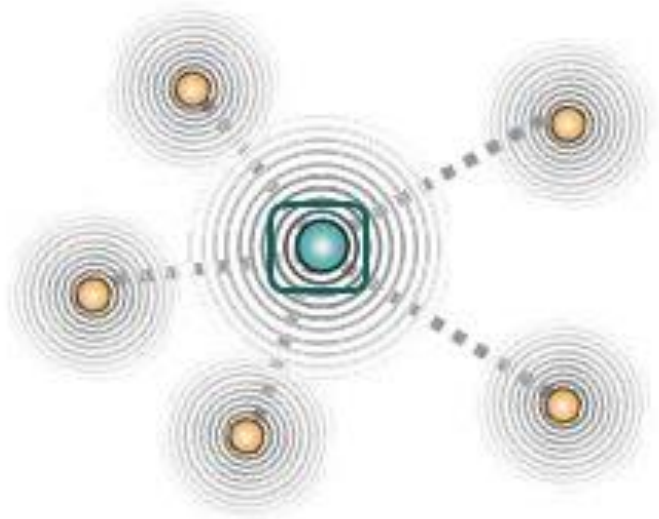
Star Network

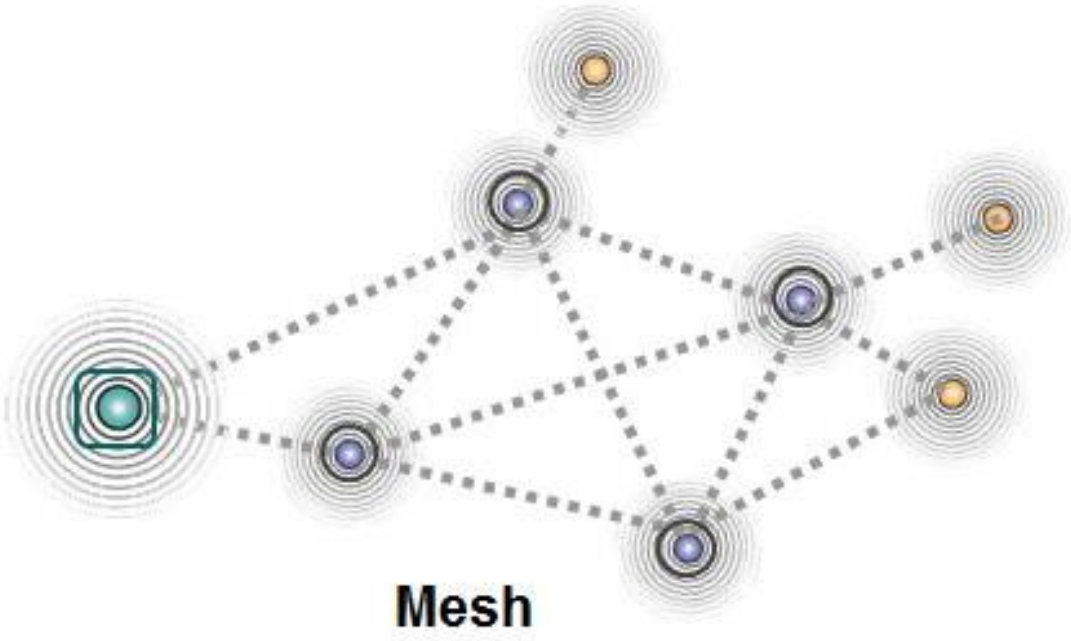
- Scales well
- Network range is defined by the transmission range of a single device
- Consistent and predictable network performance
- Easy fault-finding
- Single point of failure



Star

Mesh Network

- Consists of all three types of nodes
- Network range spans beyond a single device's transmission range
- Scalable to thousands of nodes
- High network resilience
- Complex network with high latency



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