SZÉCHENYI EGYETEM
UNIVERSITY OF GYŐR

Introduction to Networks

IT in Supply Chain

Supply Chain Management, MSc

Few Details

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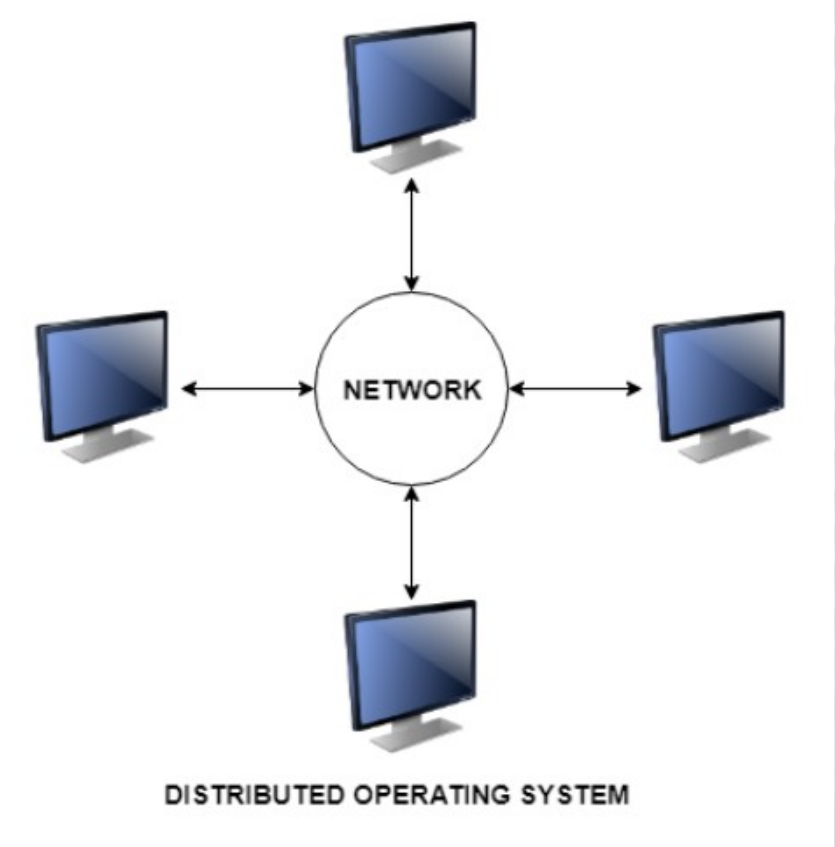
What is it?

- COMPUTER-NETWORK: Connection of at least two computers which can interact and change information.
- Internet: Not a computer-network. It is a net of nets. Basically, internet is a service.
- WWW: World Wide Web. Not a computer-network. It is a distributed system which is served by the internet.

Distributed systems

- A distributed system contains multiple nodes that are physically separate but linked together using the network.
- All the nodes in this system communicate with each other and handle processes in parallel.
- Each of these nodes contains a small part of the distributed operating system software.
- The main difference between computer-networks and distributed systems can be found in software rather than in hardware.



Utilization fields of networks

- Business applications
- Governance applications
- Home applications
- Personal applications
- Mobile applications

Business applications

- Source sharing (local networks, distributed systems)
- Conventional communication (chat, e-mail, phone calls, etc.)
- Video conference (Skype, Hangouts, Zoom, Join.me, etc.)
- E-Commerce (Amazon, E-bay, AliExpress, etc.)
- Online Banking and Mobile Payments (PayPal, Google Wallet Apple Pay, TransferWise, etc.)

Governance applications

- G2C (Government to Citizen): Two-way-communication for administration, electronic voting, digital signature, etc.
- G2E (Government to Employees): E-Tax Service, E-payroll, E-training, E-learning, etc.
- G2B (Government to Business): E-Tender Box, E-Procurement Programme, E-Support for Business.
- G2G (Goventment to Government): Government transactions, Digital Democracy, Interaction among governmental agencies.

Home applications

- Remote data access (FTP, P2P)
- Conventional communication (chat, e-mail, voice calls)
- Video calling or conferencing
- Interactive pastime (online movies, musics, streaming, gaming, etc.)
- E-commerce (Amazon, E-bay, AliExpress, etc.)
- Smart Home

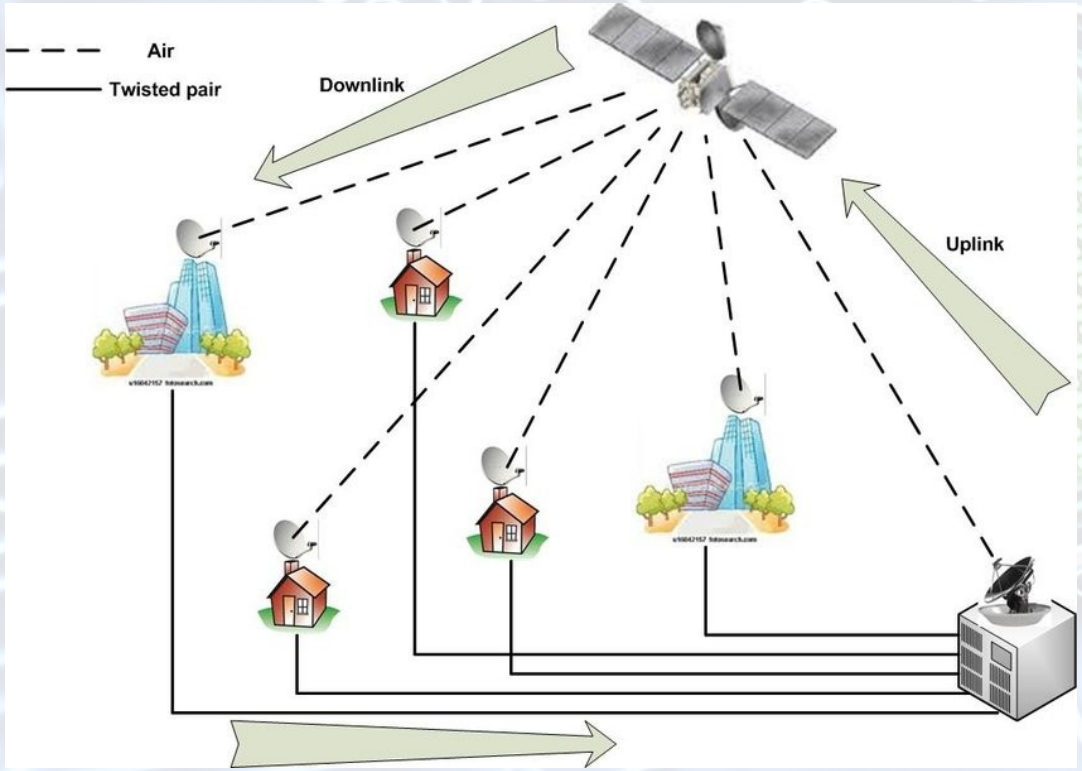
Categorization of networks

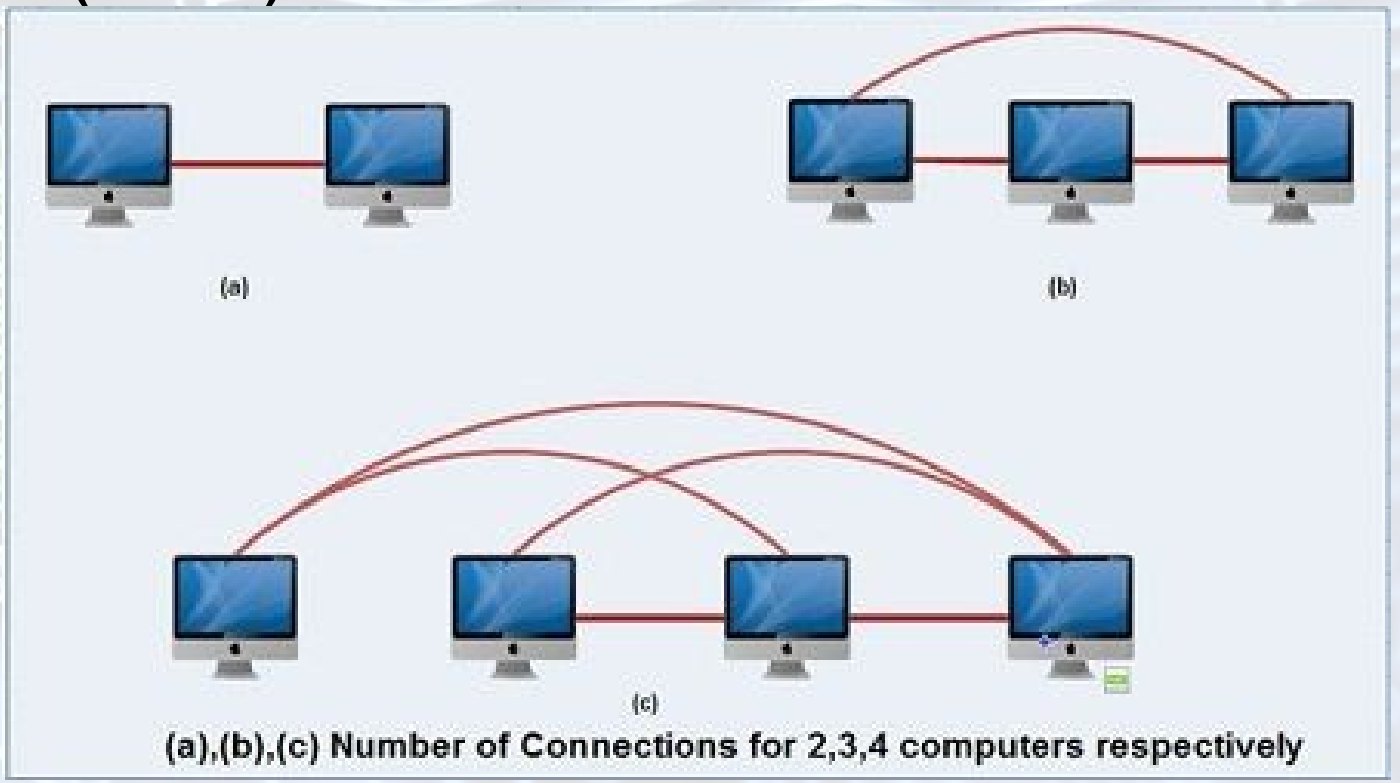
According to...

- data transfer mode
- local arrangement
- way of the communication
- connection type

Data Transfer Mode

- Casting Networks (Broadcast, Unicast, Multicast)
- Point-to-Point Networks (LAN)





Local Arrangement

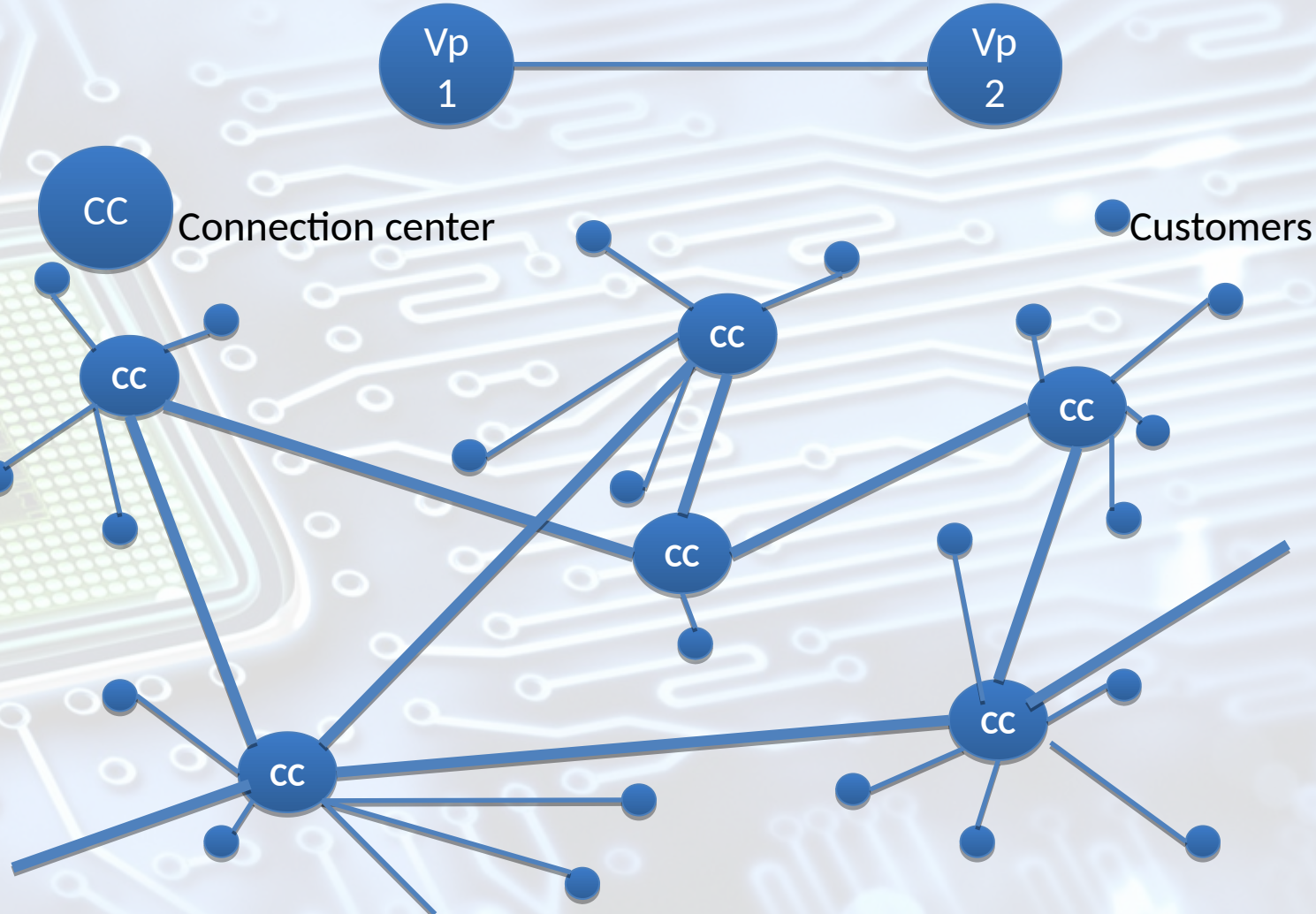
- Personal Area Network (PAN)
- Local Area Network (LAN)
- Metropolitan Area Network (MAN)
- Wide Area Network (WAN)
- Global Area Network (GAN)

Way of Communication

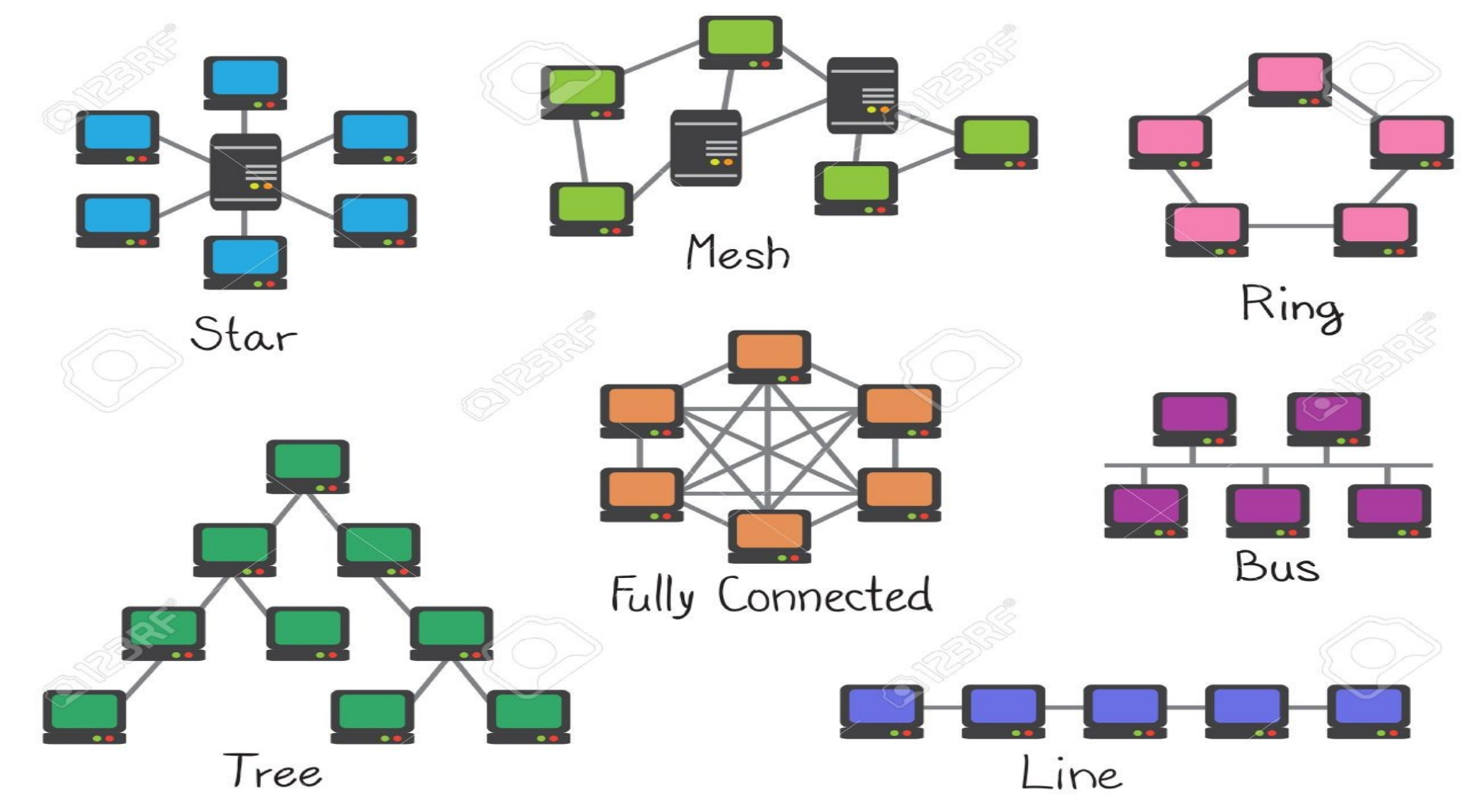
- Simplex (One-way communication)
- Half-duplex (Two-way communication, but only one way at a time)
- Full-duplex (Two-way communication at the same time)

Connection type

- Fixed-line networks (connection is always active)
- Connected-line net-works (connection is active during the transfer)

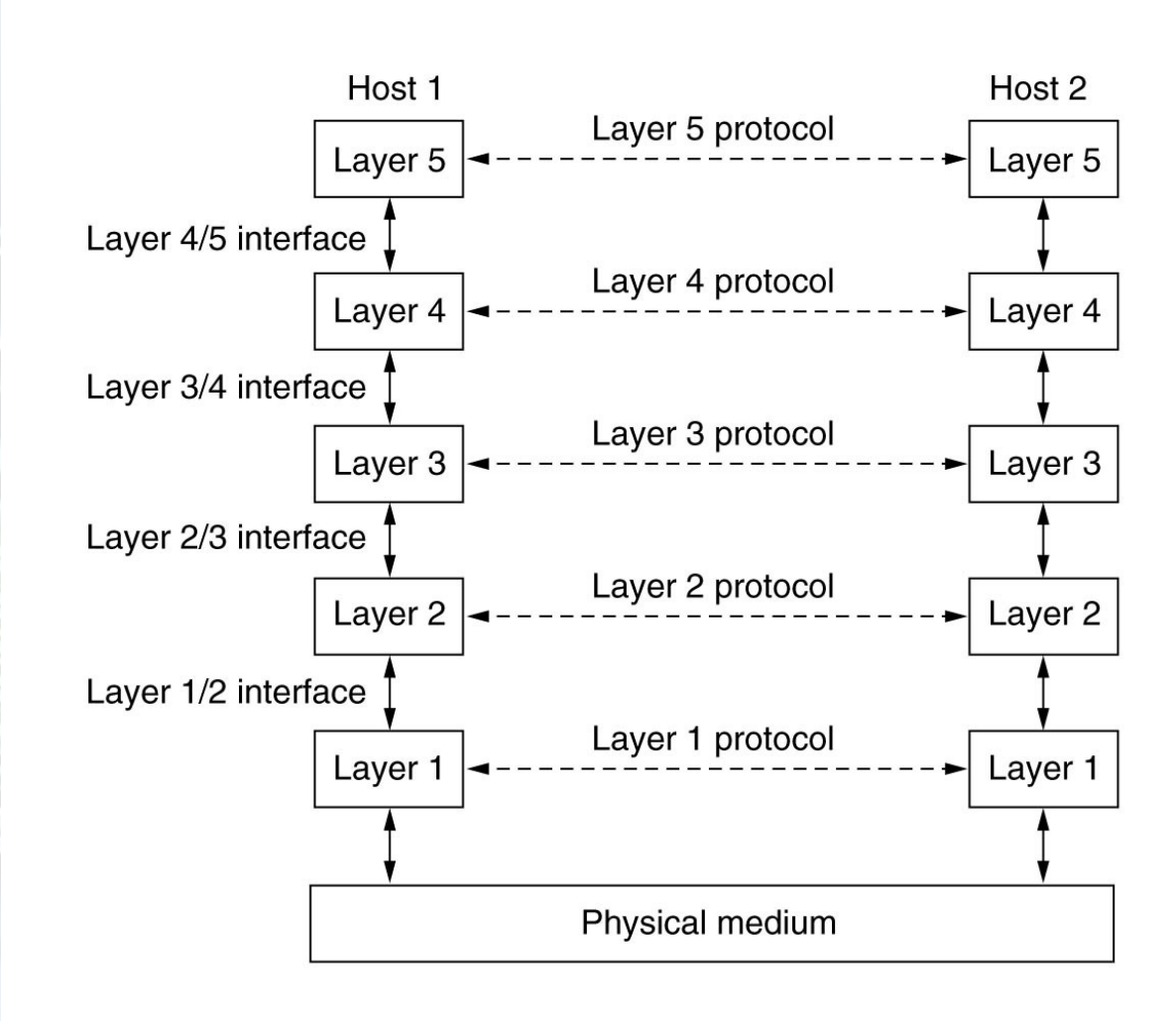


Network Topology

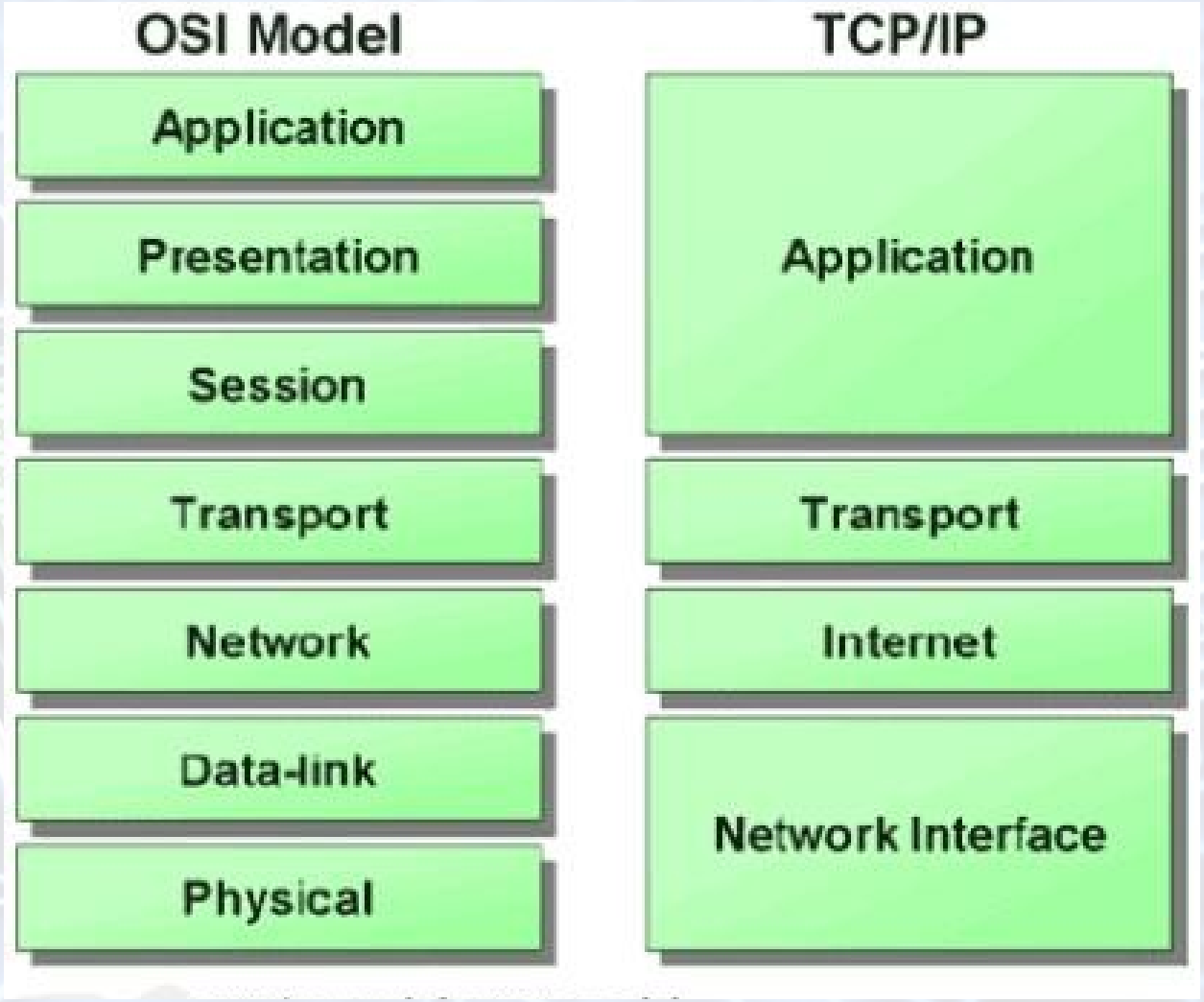


Network Architecture

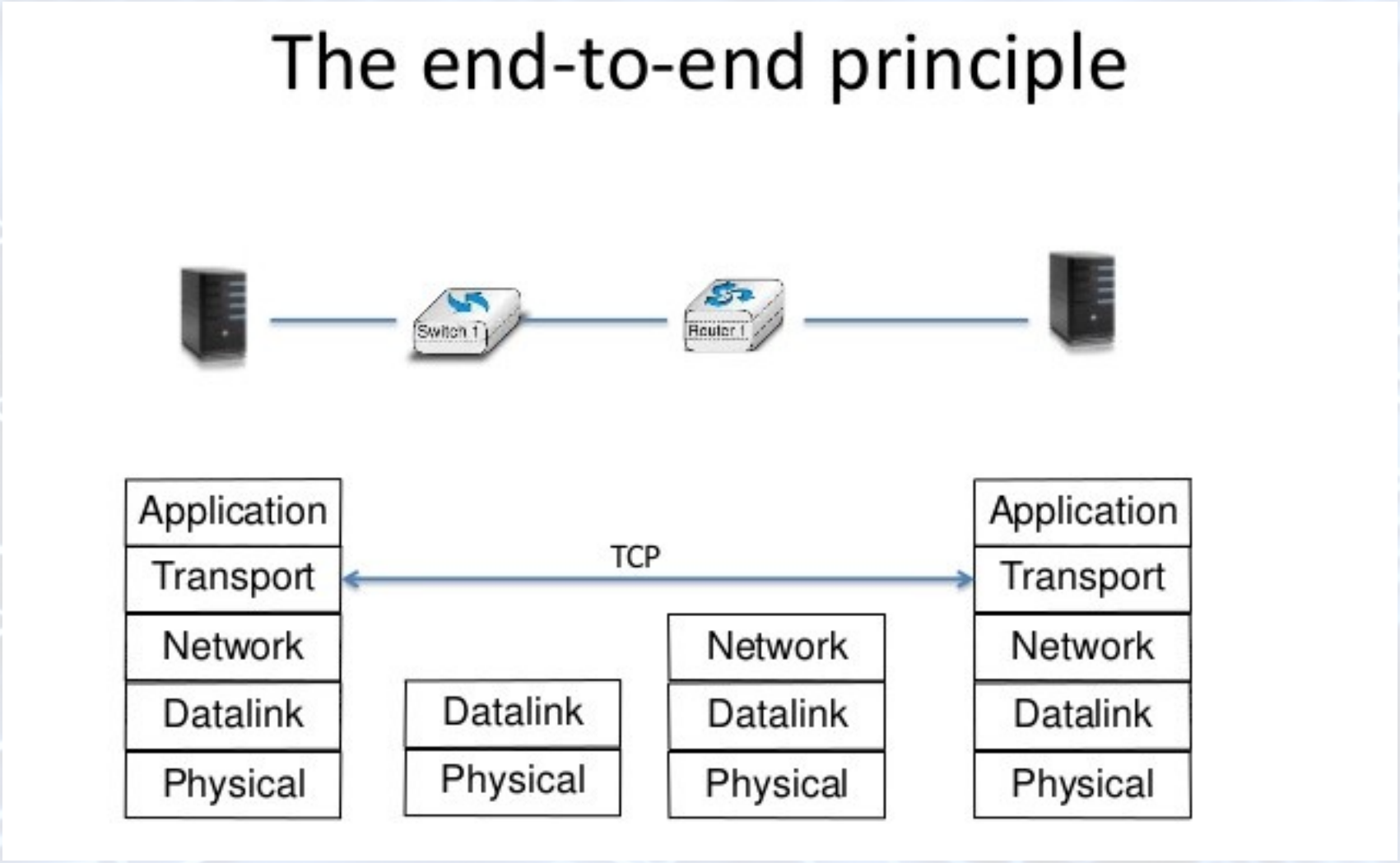
- Structured
- Layered
- Protocol-based



Network Reference Models



Network Layers in Practice



Physical Layer

- Converts electric waves to bits and vice versa
- Transmits binary numbers
- Ensures the values of bits
- Ensures the voltage levels
- Ensures the transmission time
- Ensures the duplexity

Data-link Layer

- Uses functional units (MAC, LLC)
- Handles the data-lines between hosts
- Organizes the bits-flow into frames
- Indicates the beginnings and the ends of the frames

Network Layer

- Controls the sub-nets
- Does routing using IP addresses
- Controls network traffic-jam
- Corrects addressing errors

Transport Layer

- End-to-End layer from the source to the destination
- Fragments data and forward to the network layer
- Ensures the data flow control
- Ensures error correction

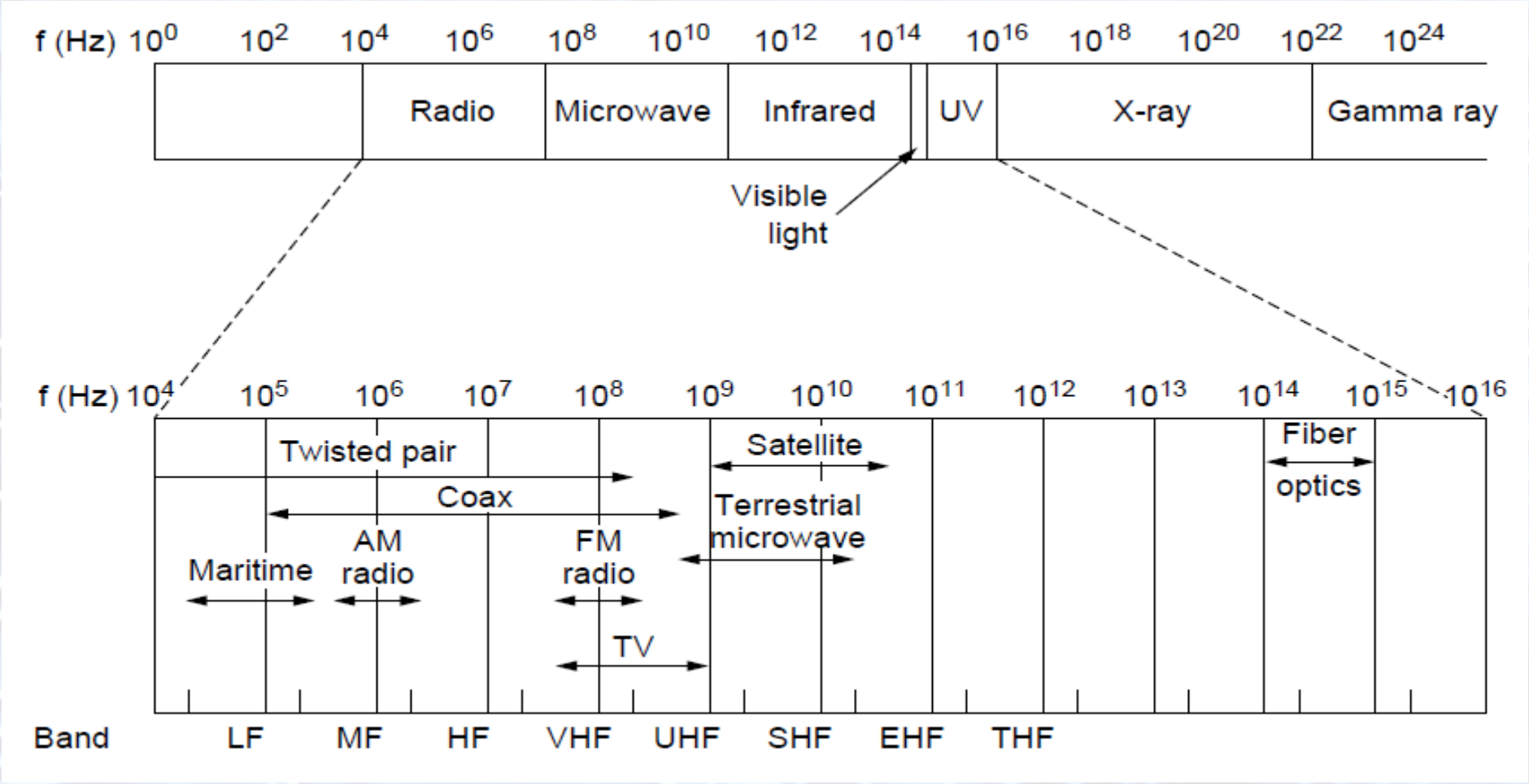
Application Layer

- Ensures variety of protocols:
  - ✔ HTTP, HTTPS, FTP
  - ✔ SMTP, IMAP, POP3
  - ✔ DHCP, DNS
  - ✔ SSH, Telnet, etc.

Wireless Networks

- Global Mobile Systems
- Global Positioning Systems
- IEEE 802.11 – Wi-Fi
- Low Power WAN
- Wireless Mesh Networks

Wireless Transmission: The Electro-Magnetic Sphere



Wireless Networks

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To be continued…

Thank you for your attention!