

CT 1502

Planning and Design of Communication Networks

Local Area Networks (LANs) & Networks Inter-Connection

Chapter 5

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Outlines

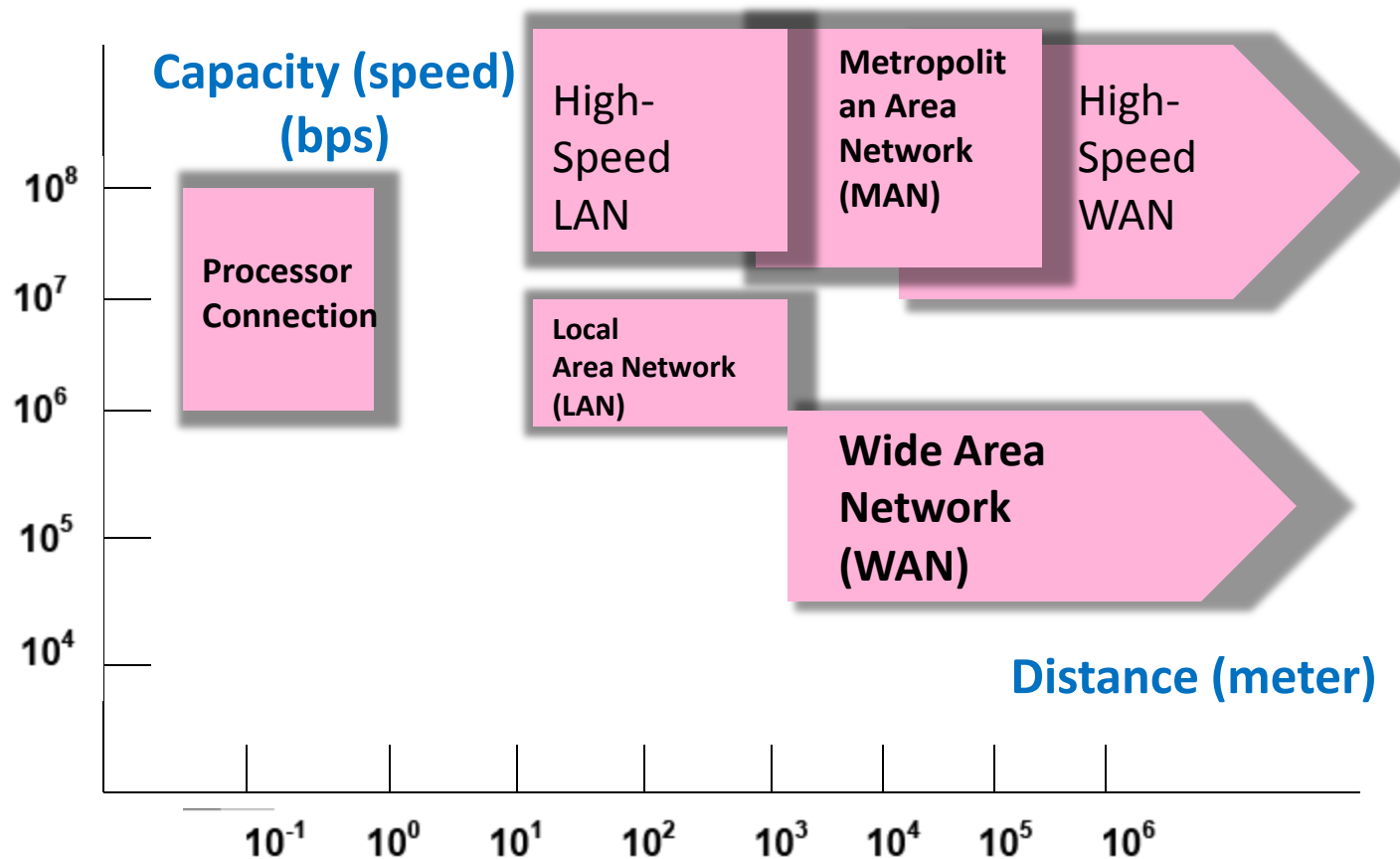
- **Understanding Local Area Networks (LANs)**
- **LAN Connectivity**
- **LAN Protocols**
- **Network Inter-connectivity**

Understanding Local Area Networks (LANs)

Understanding Local Area Networks (LANs)

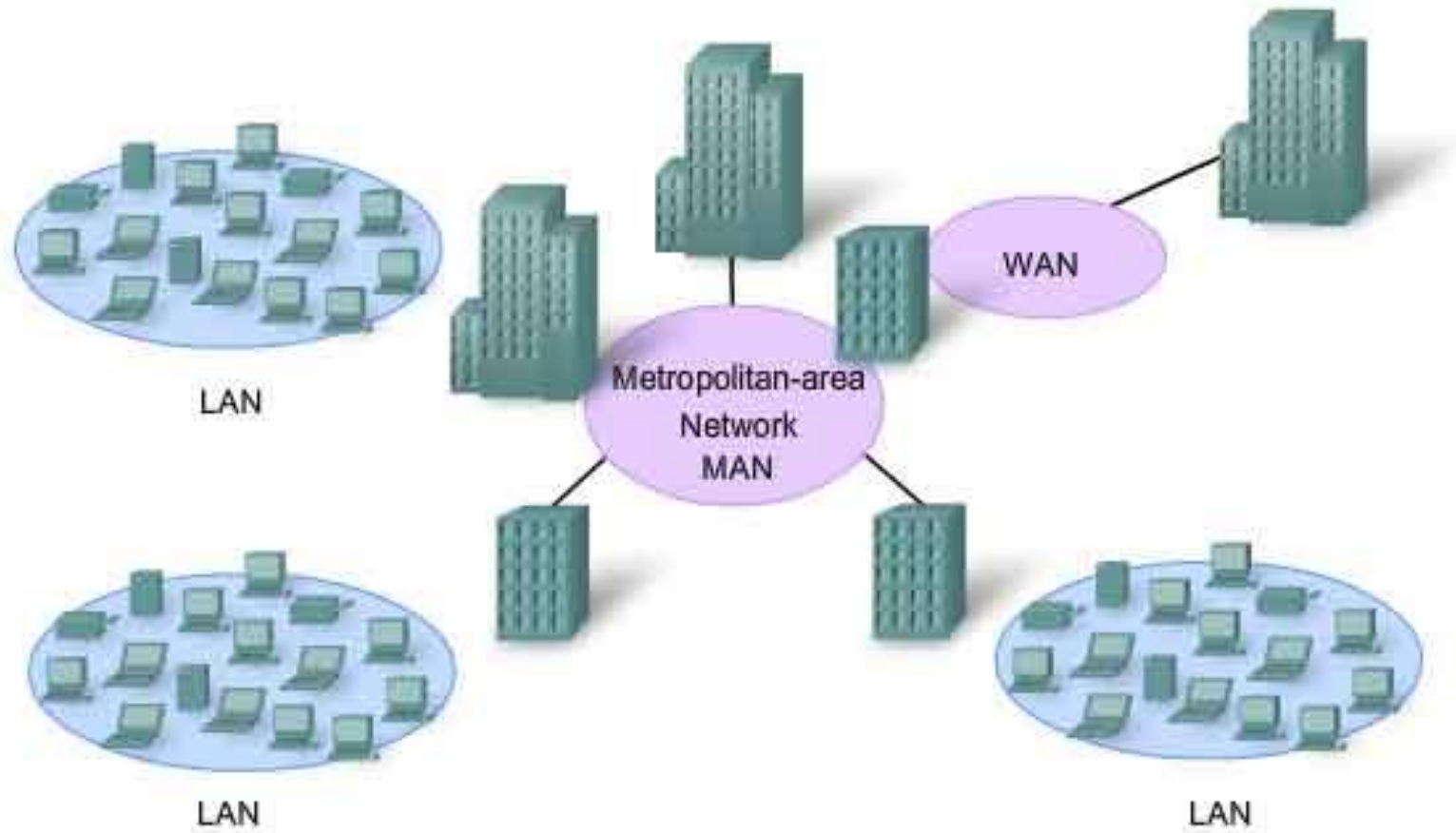
- Networks are categorized by:
 - Distance (المسافة)
 - Capacity (السعة)

Understanding Local Area Networks (LANs)



Gigabit Ethernet

Gigabit Ethernet technology is applied beyond the enterprise LAN to MAN and WAN-based networks.

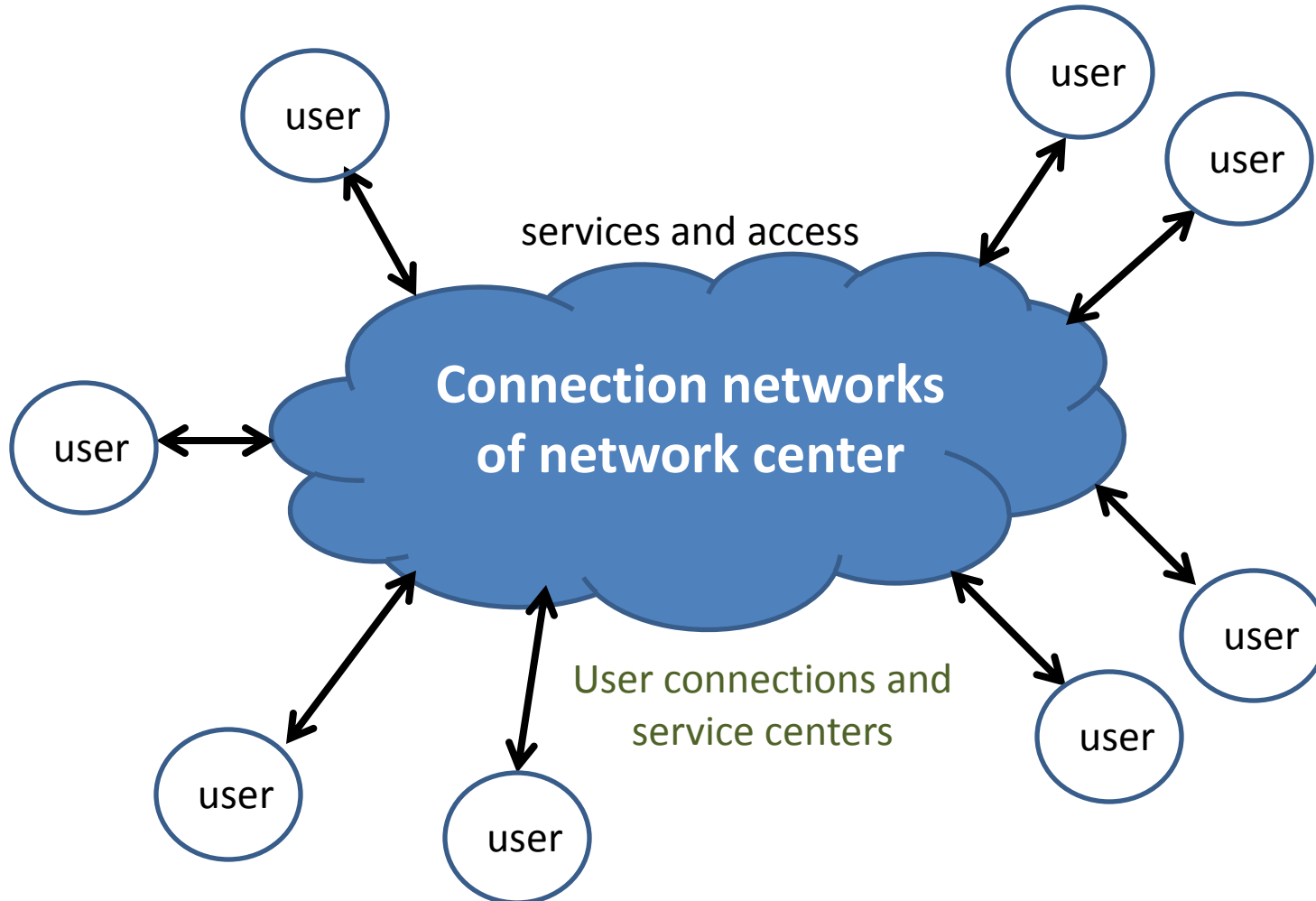


Understanding Local Area Networks (LANs)

Local Area Network(LAN): is a computer network within a small geographical area such as a home, school, computer laboratory, office building or group of buildings.

- Local is “close” (قريب)
 - 10m – 1000m
- Using high speed, high capacity transmitter mediums with low cost
- Capacity and traffic can be balanced (يوازن) easily

General LAN Structure



Sending Data Through LAN Types

Baseband: send one signal through wire medium connection



Broadband: send more than one signal through medium connection using supporting hardware



LAN Connectivity

LAN Connectivity

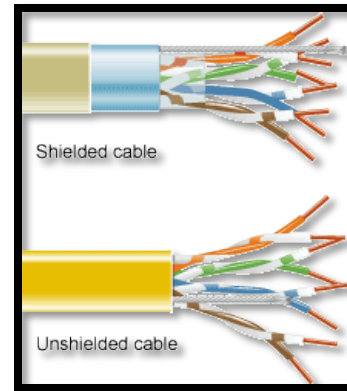
- LAN Channels
- Network Topology
- Structured Cabling



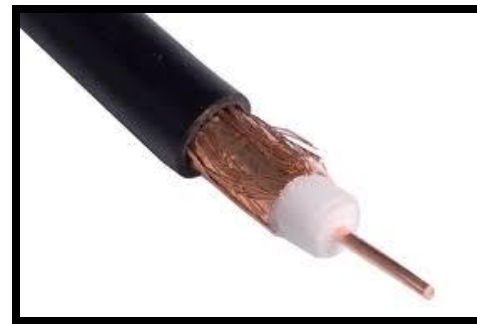
LAN Channels

- Wire channels:

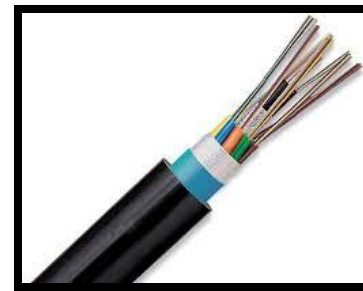
- Twisted Pair:
 - Shielded
 - Unshielded



- Coaxial Cable:
 - Baseband
 - Broadband



- Fiber optical cables
 - Different types
 - High speed networks



LAN Channels

- Wireless channels:
 - Microwave: 900 MHz- 20 GHz
 - Infrared: 10^3 GHz - 10^5 GHz

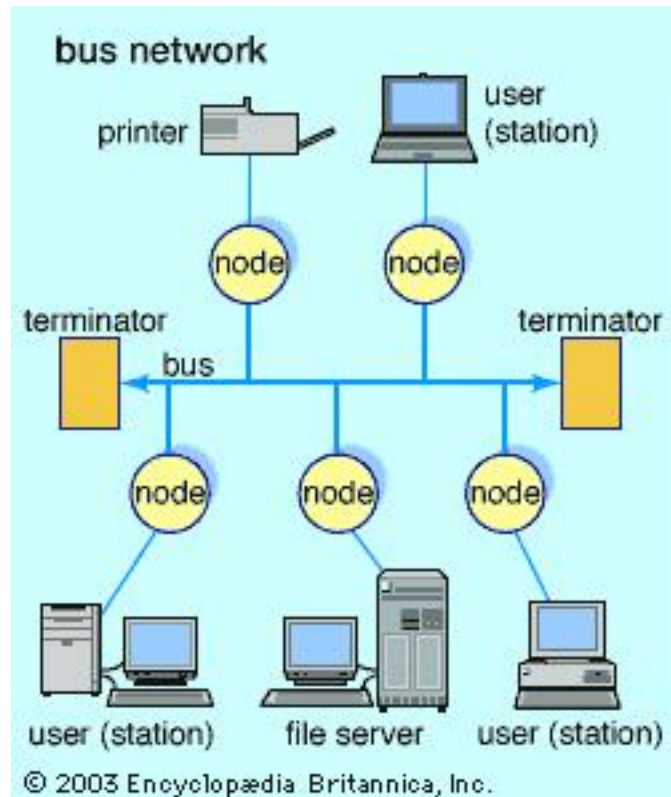
LAN Topology

LAN Topology

- Bus topology
- Ring topology
- Star topology

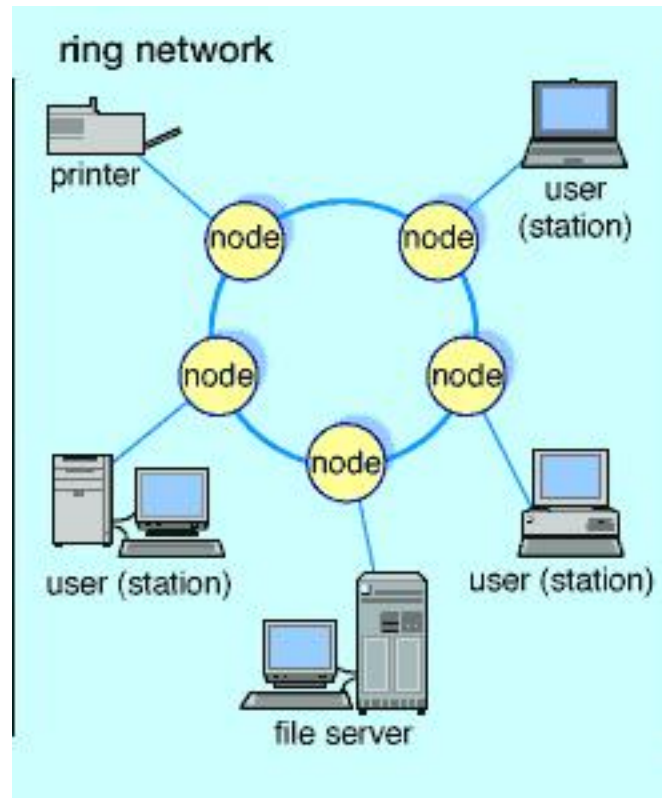
LAN Topology

- Bus topology



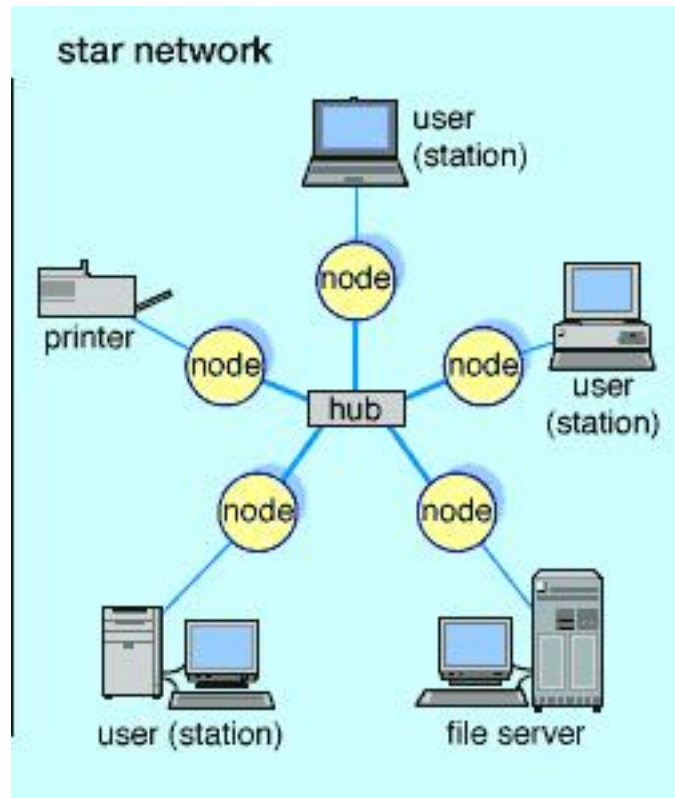
LAN Topology

- Ring topology



LAN Topology

- Star topology



Structured Cabling

Network cabling has to be fixable(مرنة)

To change the structure cabling to meet the organization's need

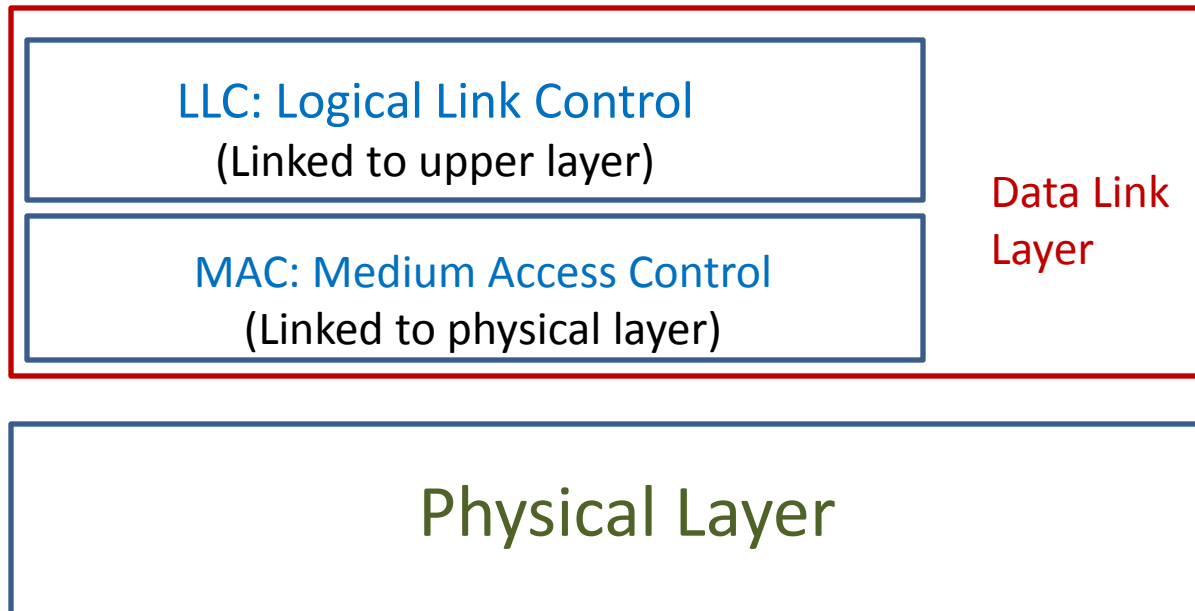
- Cabling types:
 - Horizontal: between room at the same floor
 - Vertical: between floors

LAN Protocols

LAN Protocols:

Basic Elements

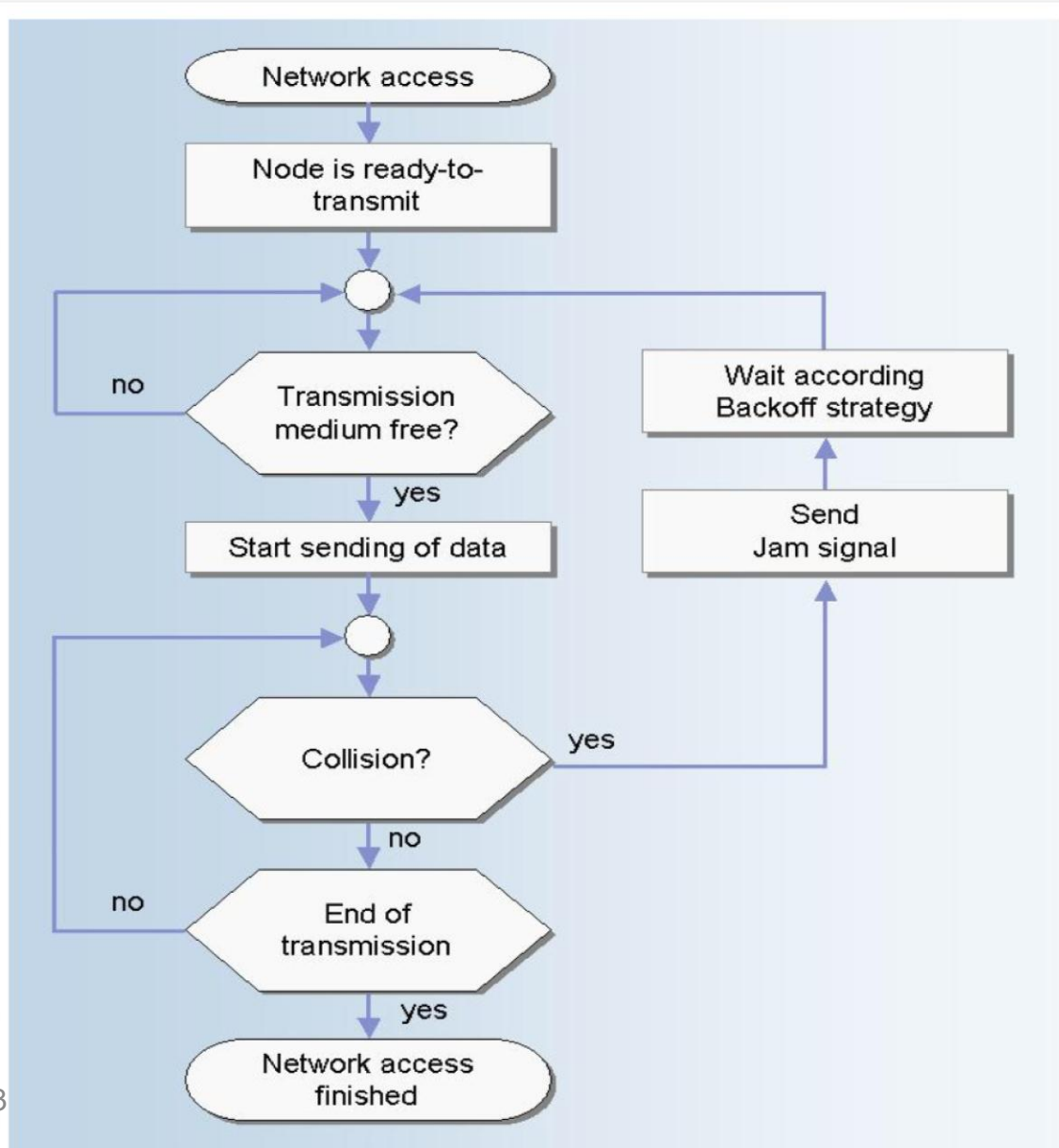
- ISO-OSI Protocols
- Set on Data Link Layer
- Two parts:
 - LLC: Logical Link Control
 - MAC: Medium Access Control



MAC (Medium Access Control)

- CSMA-CD: Carrier Sense Multiple Access with Collision Detection
- Token Detection

MAC: CSMA-CD



MAC: CSMA-CD

- **Collision**(تصادم): is the result of two devices on the same Ethernet **network** attempting to transmit data at exactly the same time.
- The **network** detects(يكشف) the "**collision**" of the two transmitted packets and discards(يتجاهل) them both.
- **Jam signal**: is a **signal** that carries a 32-bit binary pattern sent by a data station to inform the other stations that they must not transmit.

MAC: Token Detection

- **Token Detection:** no message can be access the network unless get “Token”(إذن)
- **LAN Network** gives tokens to number of users at one time to avoid collision

Standard Specifications

Table 5-1 illustrates the standard specifications of LAN networks known as “IEEE 802”, missions and achievement.

Number	Topic	Status
802.1	Overview and architecture of LANs	Used
802.2 ↓	Logical link control	Inactive
802.3 *	Ethernet	Active
802.4 ↓	Token bus (was briefly used in manufacturing plants)	Inactive
802.5	Token ring (IBM's entry into the LAN world)	Used
802.6 ↓	Dual queue dual bus (early metropolitan area network)	Used
802.7 ↓	Technical advisory group on broadband technologies	Used
802.8 †	Technical advisory group on fiber optic technologies	Canceled
802.9 ↓	Isochronous LANs (for real-time applications)	Inactive
802.10 ↓	Virtual LANs and security	Inactive
802.11 *	Wireless LANs	Active
802.12 ↓	Demand priority (Hewlett-Packard's AnyLAN)	Inactive
802.13	Unlucky number. Nobody wanted it	Rejected
802.14 ↓	Cable modems (defunct: an industry consortium got there first)	Inactive
802.15 *	Personal area networks (Bluetooth)	Inactive
802.16 *	Broadband wireless	Active
802.17	Resilient packet ring	Active

Network Inter-Connectivity

Network Inter-Connectivity

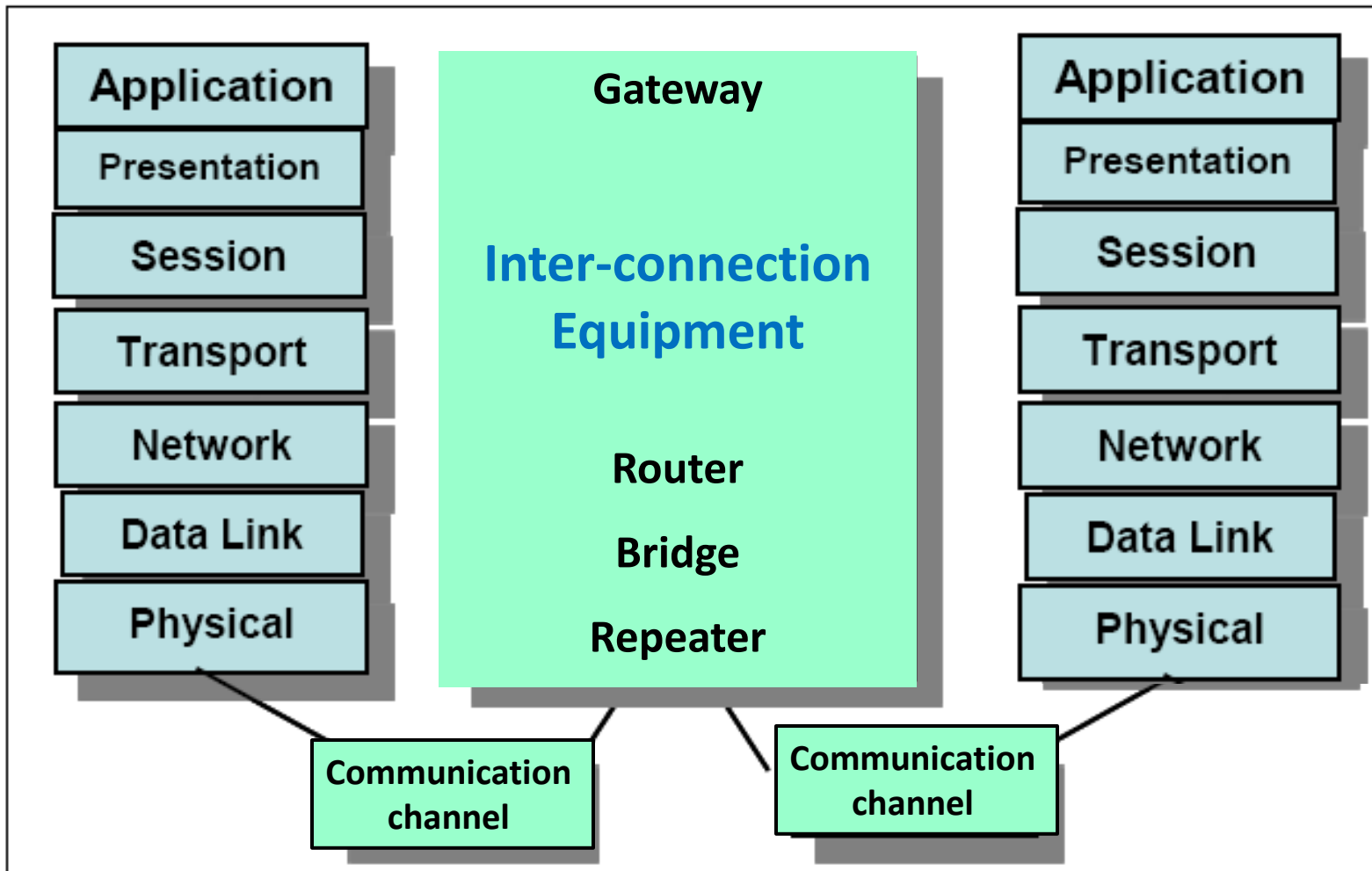
- “Adaptation” (التوافق) is necessary between protocols to connect two networks

LANs		ATM	Internet	ISO-OSI
Higher Protocols			Service Protocols	Application
				Presentation
				Session
			TCP	Transportation
			IP	Network
IEEE 802	Interface	Adaptation	Connections protocols	Data Link
	LLC MAC	ATM		
Physical Layer				
Communication Medium				

Inter-connection Equipment

- **Repeater:** Physical layer level
- **Bridge:** Data link layer level
- **Router:** Network layer level
- **Gateway:** Application layer level

Inter-connection Equipment



Thank you!

