

# Kazakh British Technical University

## C.F. / Informatics / ICT



"The More You Sweat in Practice,  
the Less You Bleed in Battle."

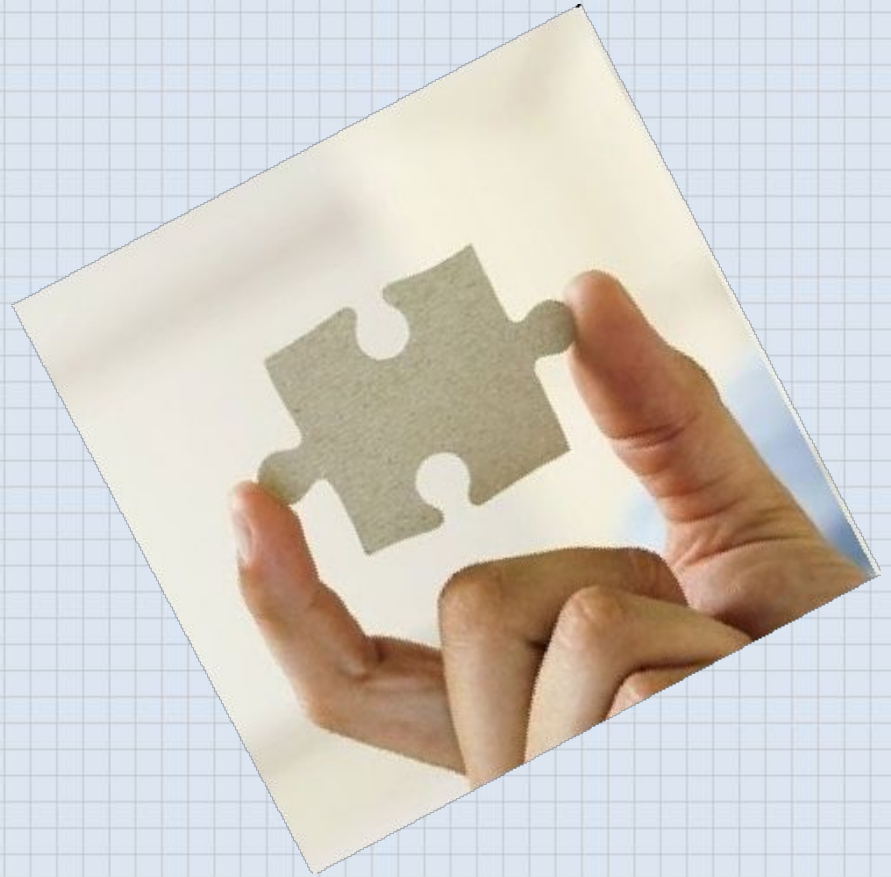
Made  
by:

*V. Popov*

Almaty 2016

# Outline

1. *Introduction*
2. *Body*
3. *Conclusion*

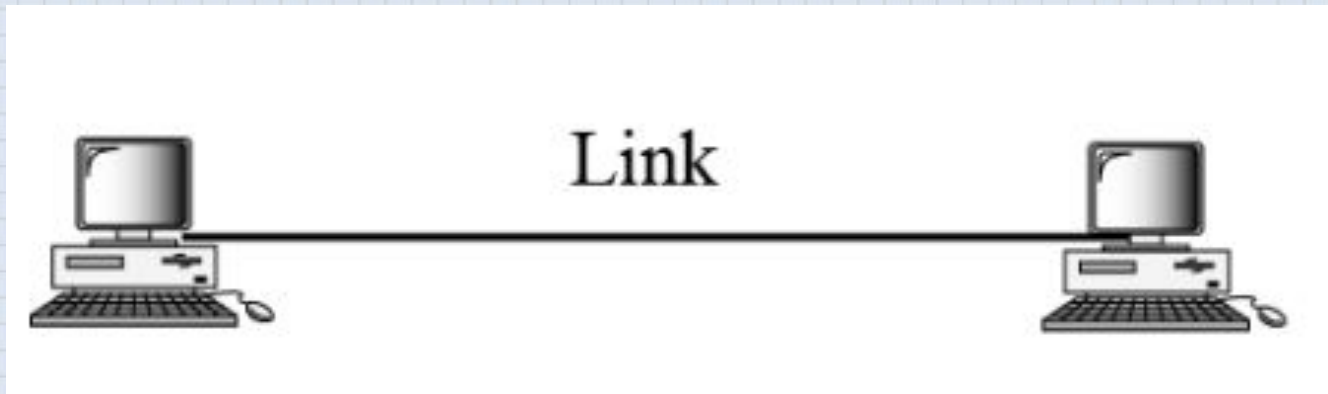


# Introduction

- A **network** is a combination of hardware and software that sends data from one location to another
- The hardware consists of the physical equipment that carries signals from one point in the network to another
- The software consists of instructions that make the services that we expect from a network possible

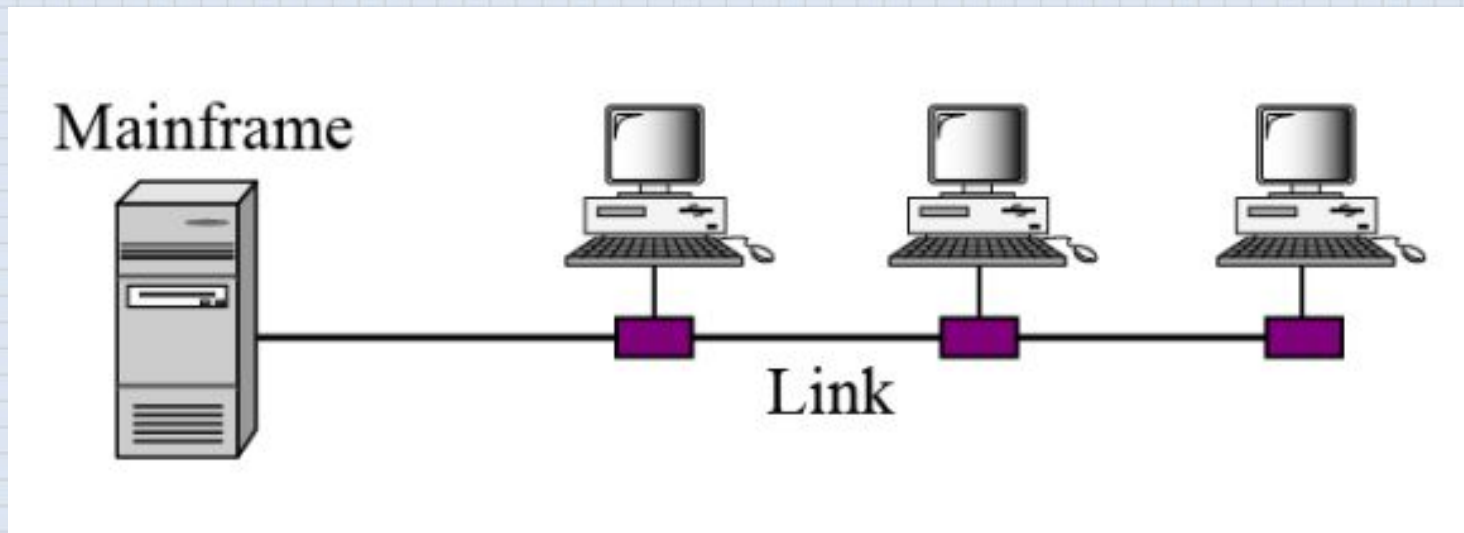
# Introduction: physical structures type of connections

- A **point-to-point connection** provides a dedicated link between two devices, and the entire capacity of the link is reserved for transmission between these two devices



# Introduction: physical structures type of connections

- A **multipoint connection** (also called **multidrop connection**) is one in which more than two specific devices share a single link
- In a multipoint environment, the capacity of the channel is shared, either spatially or temporally



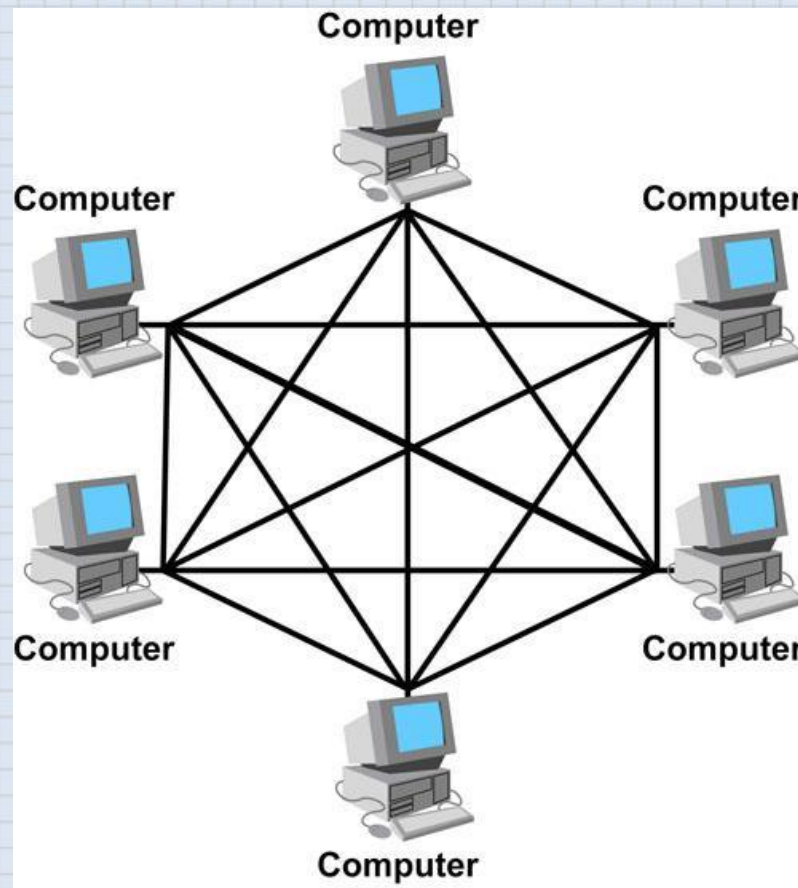
# Introduction: physical structures

## physical topology

- The term *physical topology* refers to the way in which a network is laid out physically
- Two or more devices connect to a link: one or more links form a topology
- The topology of a network is the geometric representation of the relationship of all the links and devices (usually called **nodes**) to one another
- There are four possible topologies:
  - Mesh
  - Star
  - Bus, and
  - Ring

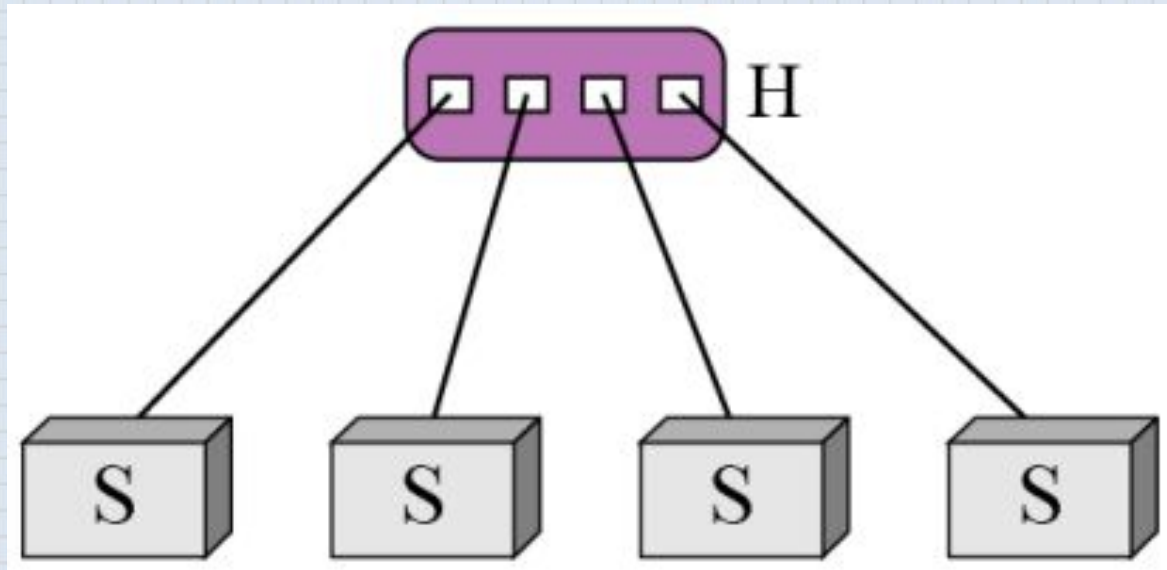
# Mesh topology

- In a **mesh topology**, every device has a dedicated point-to-point link to every other device



# Star topology

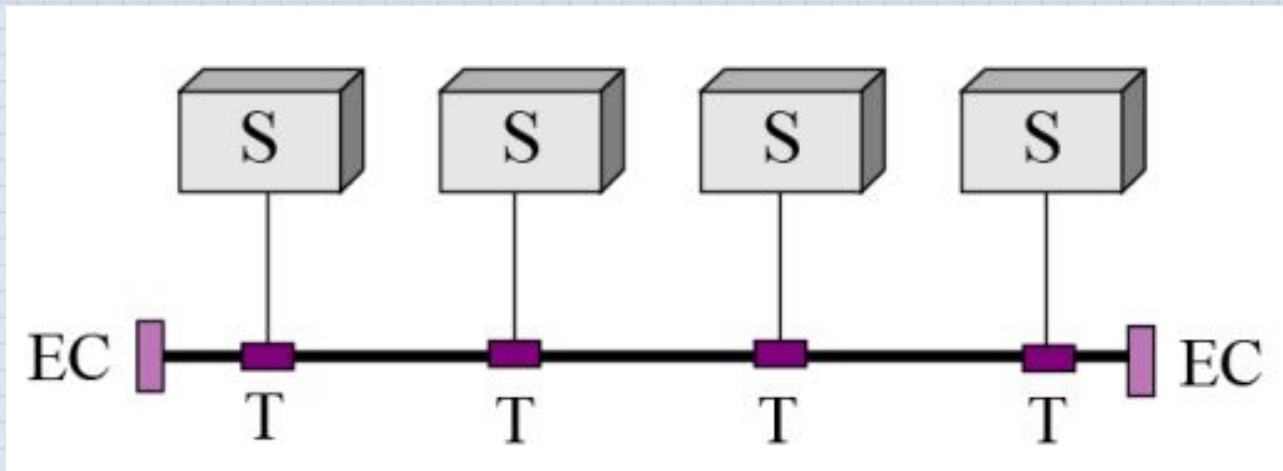
- In a **star topology**, each device has a dedicated point-to-point link only to a central controller, usually called a **hub**





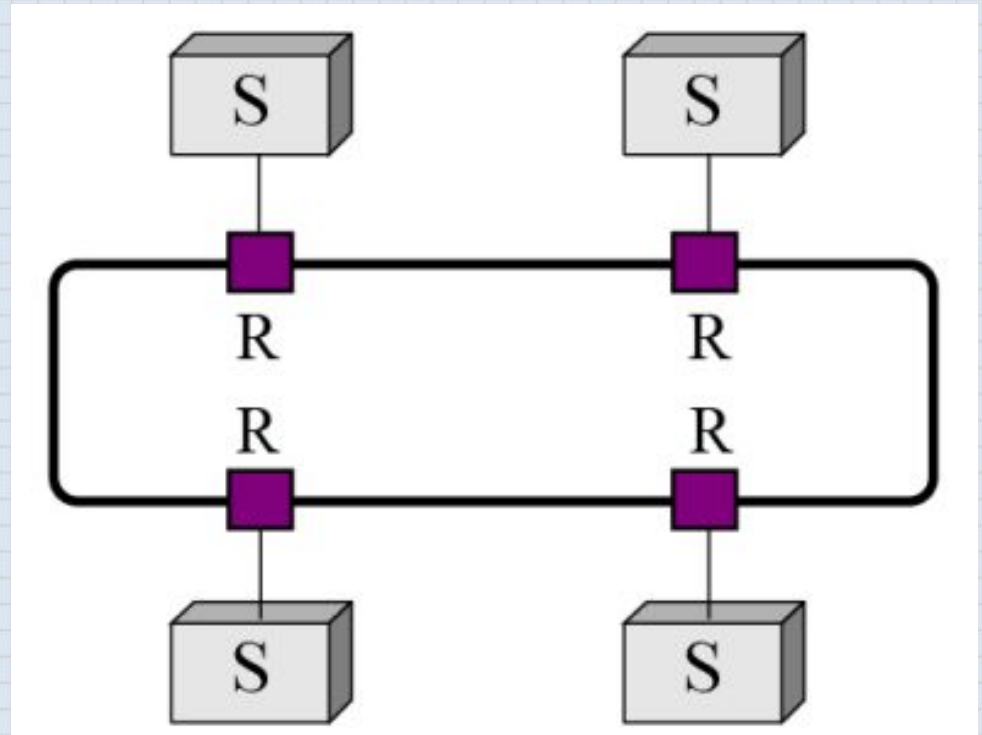
# Bus topology

- A **bus topology** uses a multipoint link
- One long cable, called the *bus*, acts as a **backbone** to link all the devices in a network
- Nodes are connected to the bus cable by drop lines and taps (connectors)



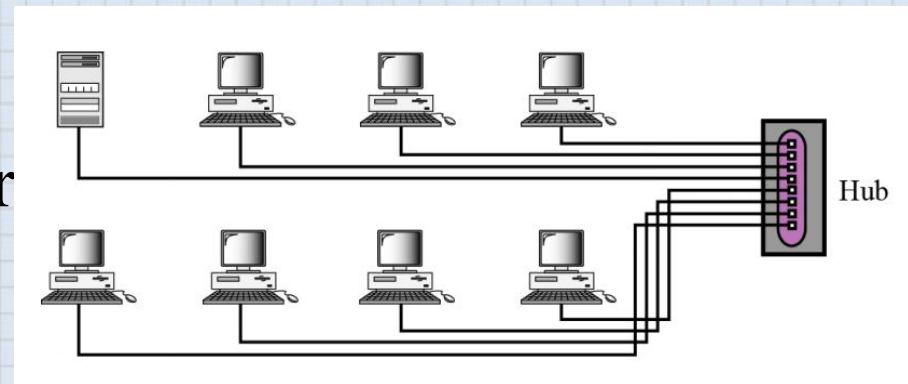
# Ring topology

- In a **ring topology**, each device has a dedicated point-to-point connection with only the two devices on either side of it



# LAN

- A **local area network (LAN)** is usually privately owned and links the devices in a single office, building, or campus
- LAN can be as simple as two PCs and a printer in someone's home office,
- LAN (Ethernet/Wireless Wi-Fi)

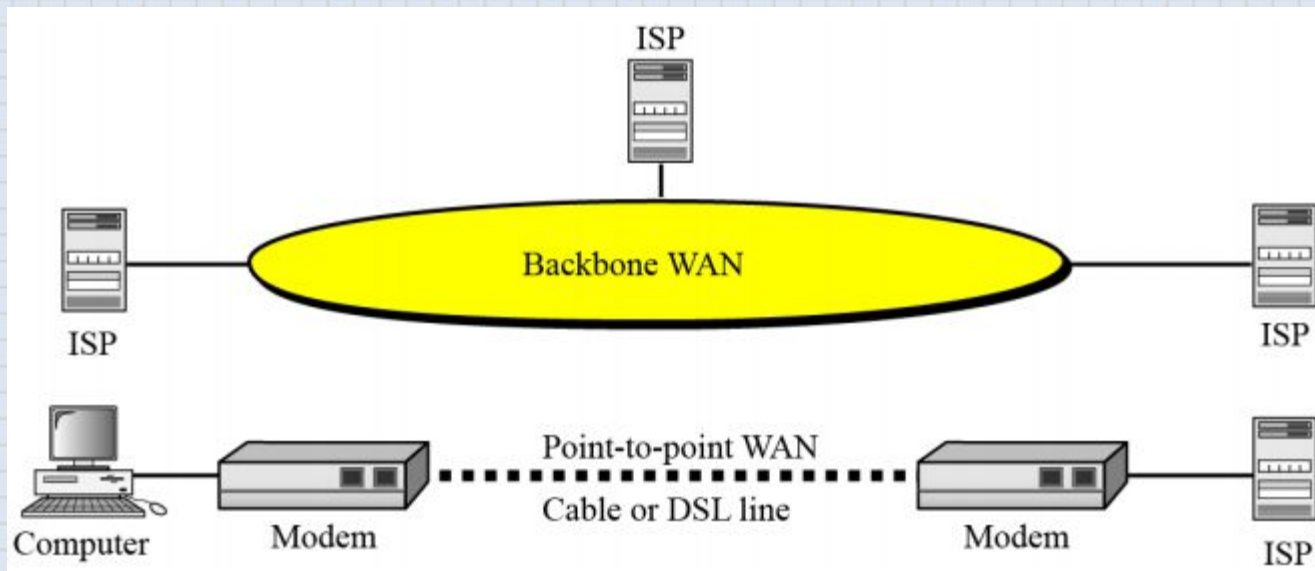


# MAN

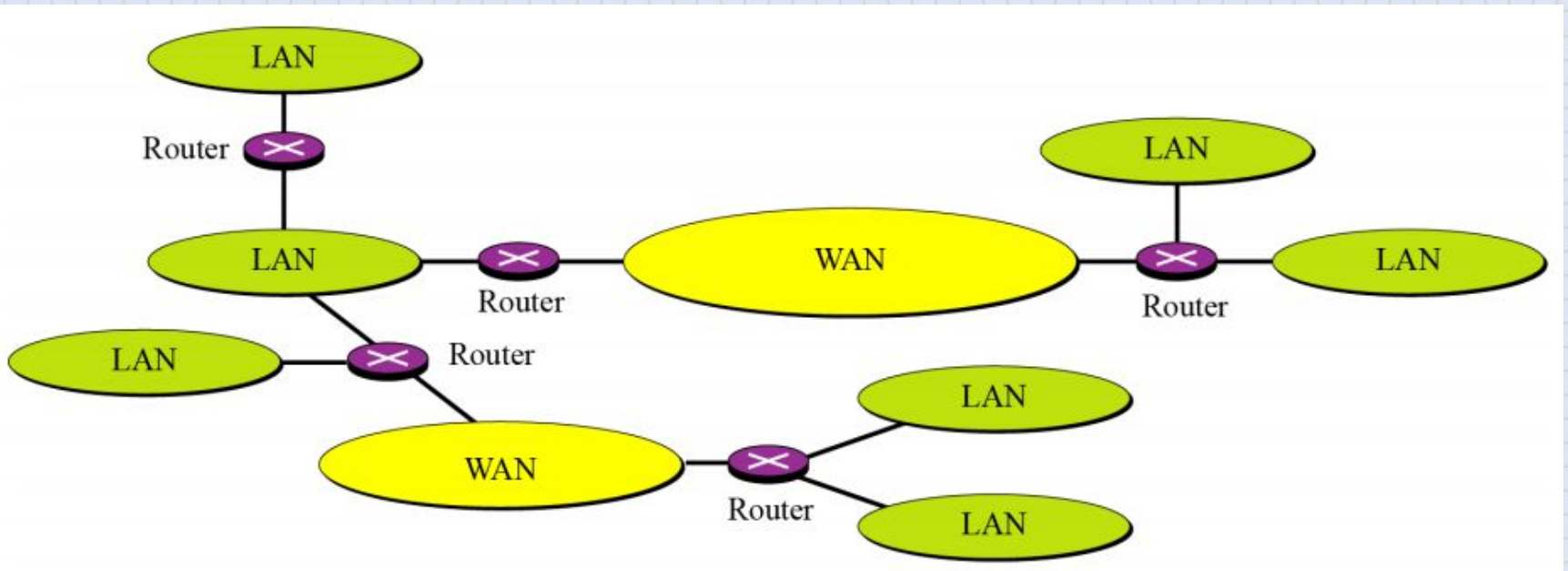
- A **metropolitan area network (MAN)** is a network with a size between a LAN and a WAN
- It normally covers the area inside a town or a city
- It is designed for customers who need high-speed connectivity, normally to the Internet, and has end-points spread over a city or part of city
- A good example of a MAN is that part of a telephone company's network that can provide a high-speed DSL line to the customer
- Another example is the cable network that was originally designed for cable television, but today can also be used for high-speed data connection to the Internet

# WAN

- A **wide area network (WAN)** provides long-distance transmission of data over large geographic areas that may comprise a country, a continent, or even the whole world



# WAN

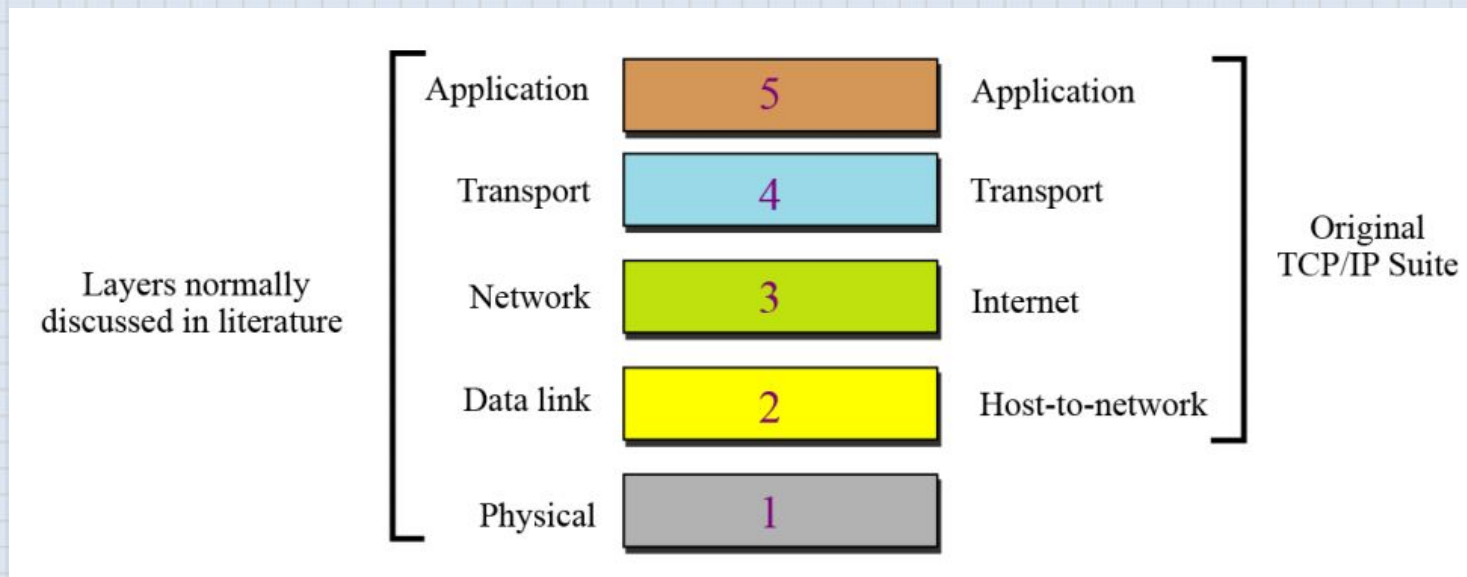


# TCP/IP protocol suite

- To divide the services required to perform a task, the Internet has created *a set of rules* called **protocols**
- These allow different local and wide area networks, using different technologies, to be connected together and carry a message from one point to another
- The set, or *suite*, of protocols that controls the Internet today is referred to as the **TCP/IP protocol suite**

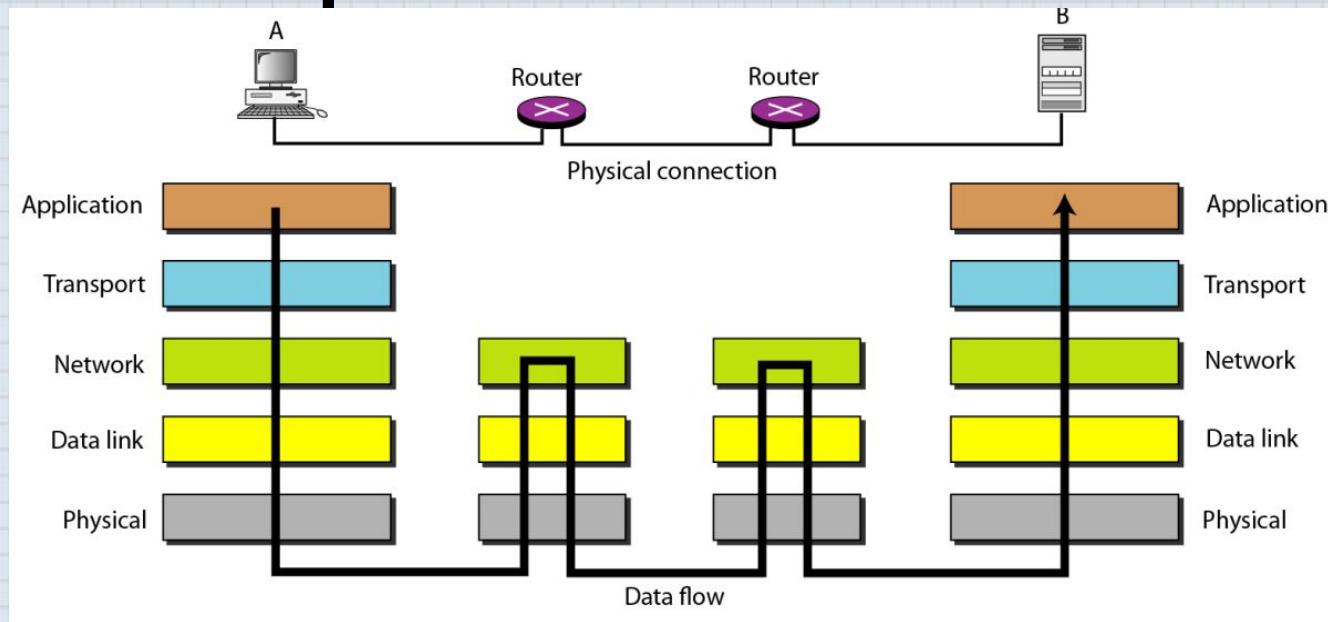
# TCP/IP protocol suite

- The original TCP/IP protocol suite was defined as having four layers: host-to-network (or link), internet (network), transport and application
- However, the TCP/IP protocol suite today is normally considered as a five-layer model:





# TCP/IP protocol suite



- Here we show the layers involved when a message is sent from device A to device B
- As the message travels from A to B, it may pass through many routers
- Routers use only the first three layers

# Transport layer address (port numbers)

- The IP address of the server is necessary for communication, but more is required
- The server computer may be running several processes at the same time, e.g. an FTP server process and an HTTP server process
- When the message arrives at the server, it must be directed to the correct process
- We need another address for server process identification, called a **port number**

# Transport layer protocols: TCP

- **Transmission Control Protocol (TCP)** supports all the duties of a transport layer
- However, it is not as fast and as efficient as UDP
- TCP uses sequence numbers, acknowledgment numbers, and checksums
- It also uses buffers at the sender's site



**The transport layer is responsible for the logical delivery of a message between client and server processes.**

# Network layer: IP

The network layer is responsible for the delivery of individual packets from the source host to the destination host.

- The TCP/IP protocol suite supports one main protocol (IP) and several auxiliary protocols to help IP to perform its duties
- In the TCP/IP protocol suite, the main protocol at the network layer is **Internet Protocol (IP)**
- The current version is IPv4 (version 4) although IPv6 is also in use, although not ubiquitously
- IPv4 is responsible for delivery of a packet from the source computer to the destination computer
- For this purpose, every computer and router in the world is identified by a 32-bit IP address, which is presented in **dotted decimal notation**

# Network layer: network layer protocols

- The notation divides the 32-bit address into four 8-bit sections and writes each section as a decimal number between 0 and 255 with three dots separating the sections
- For example, an IPv4 address

00001010 00011001 10101100 00001111

is written as

10.25.172.15

in dotted decimal notation

# Network layer: network layer protocols


- At a message's source the IPv4 protocol adds the source and destination IP address to the packet passed from the application
- The packet is then ready for its journey
- However, the actual delivery is done by the data link and physical layer
- The address range of IPv4 (32 bits) can define up to  $2^{32}$  (more than 4 billion) different devices
- However, the way in which addresses have been allocated in the past has created *address depletion*

# Data link layer addresses

- The Ethernet protocol, the most prevalent LAN in the use today, uses a 48-bit address, which is normally written in hexadecimal format (group in 6 sections, each with two hexadecimal digits) as shown below

07:01:02:11:2C:5B

- Data link addresses are often called **physical addresses** or **media access control (MAC) addresses**

 The data link layer is responsible for node-to-node delivery of frames.

# Physical layer

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The physical layer is responsible for node-to-node delivery of bits

- The **physical layer** coordinates the functions required to carry a bit stream over a physical medium
- Although the data link layer is responsible for moving a frame from one node to another, the physical layer is responsible for moving the individual bits that make up the frame to the next node
- In other words, the unit of transfer in the data link layer is a frame, while the unit of transfer in the physical layer is a bit



# Read the IT news!!!

- L3 IP-address, router/роутер/маршрутизатор transmits packets (host-to-host communication)
- L2 MAC-address, hub/switch/коммутатор transmits frames (node-to-node)
- L1 transmits bits

# Read the IT news!!!

- G - generation (Поколение)
- 1G -
- 2G - GSM (CSD 9.6Kbit/s)
- 2.5G - GPRS 114 Кбит/с
- 2.75G - EDGE 473,6 Кбит/с
- 3G - UMTS 28 Мбит/с
- 4G - LTE 326,4 Мбит/с

# Read the IT news!!!

- PAN (BlueTooth)
- LAN (Ethernet/Wireless)
- MAN (ADSL/FTTB/GPON)
- WAN ()

# Read the IT news!!!

- Win8.1 change Public Network profile to Private
- Win+R --> regEdit
- HKLM/Software/Microsoft/Windows  
NT/CurrentVersion/NetworkList/Profiles
- "Category" могут быть следующие:
- 0 - "Общедоступная сеть".
- 1 - "Частная сеть".
- 2 - Сеть домена.

# Read the IT news!!!

<http://profit.kz/>

<http://tengrinews.kz/tech/>

<http://www.habrahabr.ru>

<http://www.computerworld.kz/>

<http://xakep.ru>

<http://www.securitylab.ru/>

<http://ictmagazine.kz/> and so on...

- Homework every day.



Thank you for  
attention!