# INTRODUCTION TO TCP/IP

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# TCP/IP STACK

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|---|
| APPLICATION |
| TRANSPORT |
| NETWORK |
| MAC (Media Access Control) |
| LLC (Logical Link Control) |
| PHYSICAL |

INTERFACES
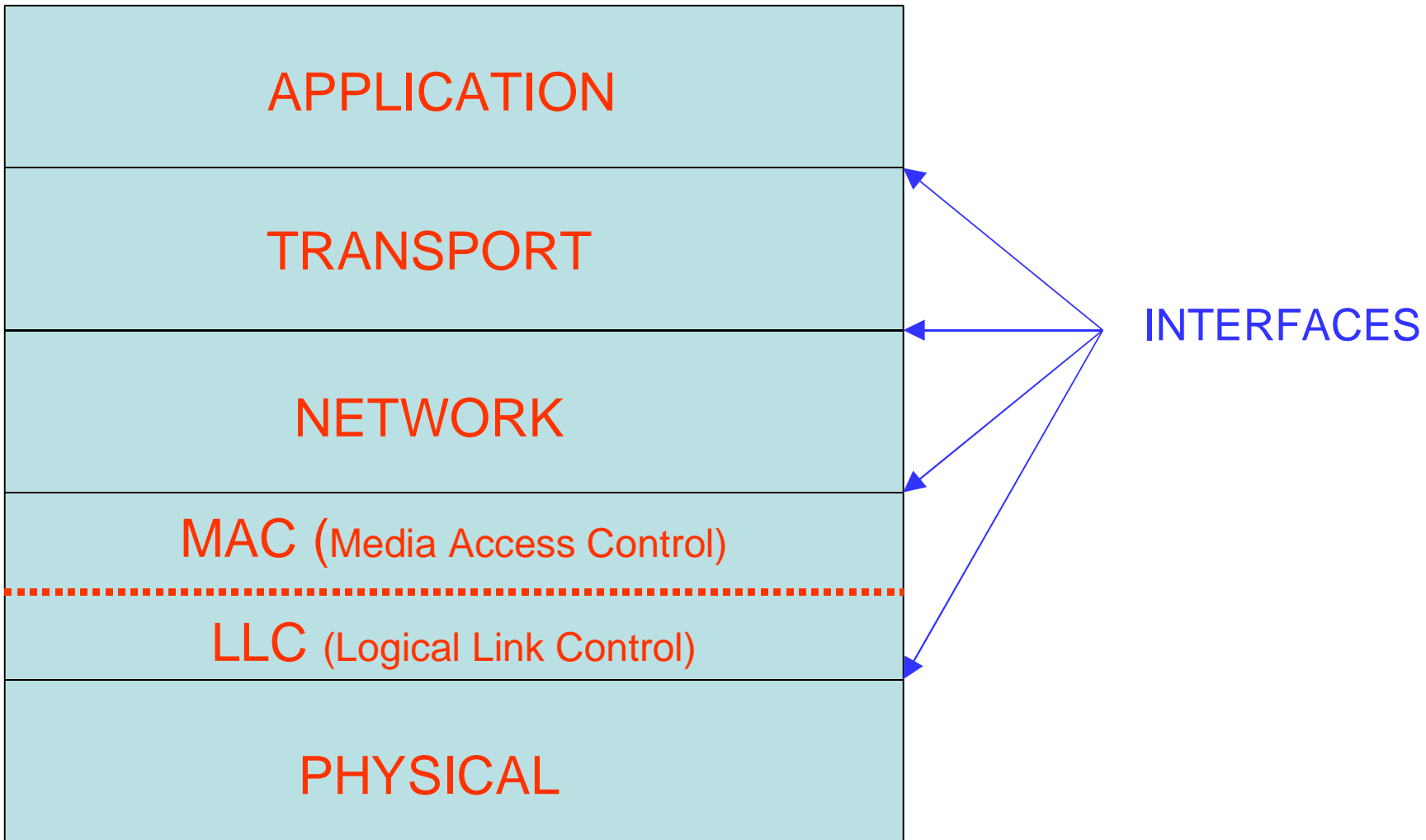
# TCP/IP STACK OVER ETHERNET

| | | | |
|---|---|---|---|
| APPLICATION | | ↔ | APPLICATION |
| TRANSPORT | | ↔ | TRANSPORT |
| IP | | ↔ | IP |
| ETHERNET | | ↔ | ETHERNET |

| ETHERNET | IP | TRANSPORT | DATA |
|---|---|---|---|
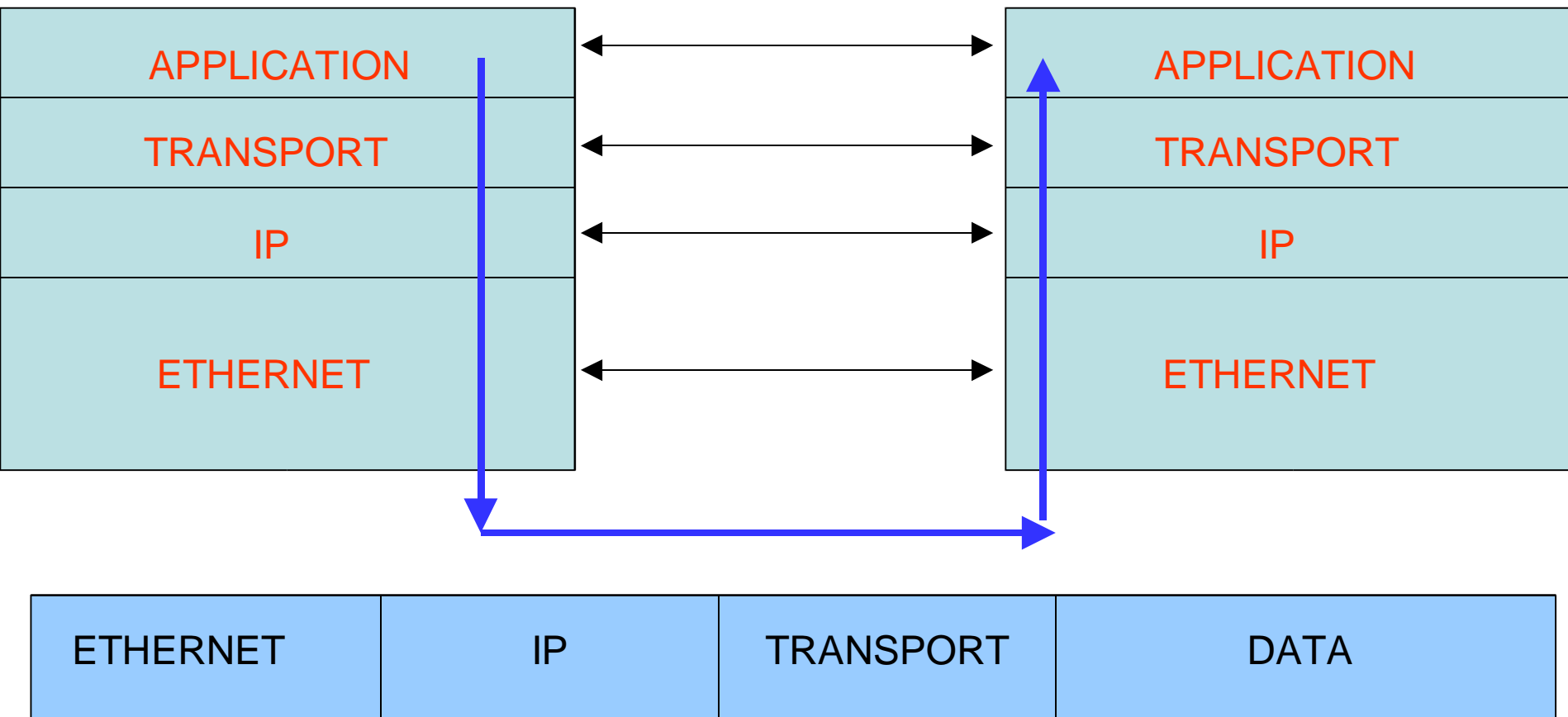
# ETHERNET LAYER

➢ In charge with communication between 2 adjacent hosts

- Connected on the same LAN
- Using MAC address (8 bytes)
  - Physical address attached to the hardware
  - Unique identifier
- Ifconfig command
  - List the network interfaces (Ethernet, serial, etc,…)
    - Example eth0, eth1,… are Ethernet interfaces
  - Brings them up or down

# IP LAYER

➢ **Sending packets to the destination host**

  ▪ Identified by IP address (4 bytes)

    • Logical address

    • Network address + host address

  ▪ Establish a route to the distant peer

  ▪ Using several intermediary machines (routers)

    • Packet Forwarding

      – Linux router ( echo 1 > /proc/sys/net/ipv4/ip_forward )

    • Use of routing table

      – Indicates next hope to use to reach a host or a network

      – Linux command <route>

        » Shows the routing table of the machine

# IP LAYER

- Adding or removing a route to a network
  - » route add –net IP1 gw IP2  /* to reach IP1 go to IP2*/
  - » route del –net IP1 gw IP2
- Adding or removing a route to a host
  - » route add –host IP1 gw IP2
- Adding a default route
  - » route add default gw IP1
- Using a specific interface to go out
  - » route add –host/net IP1 dev eth1
  - /* to reach IP1 the frame is sent using eth1 interface */

# TRANSPORT LAYER

➢ Transfers data to the distant host (end to end)

- Identified by IP address (to reach the right host)
- And a port number (to reach the right application)

➢ 2 protocols UDP and TCP

- User Datagram Protocol (UDP)
- Transmission control protocol (TCP)

➢ UDP

- Best effort protocol
  - No connection, not reliable

➢ TCP

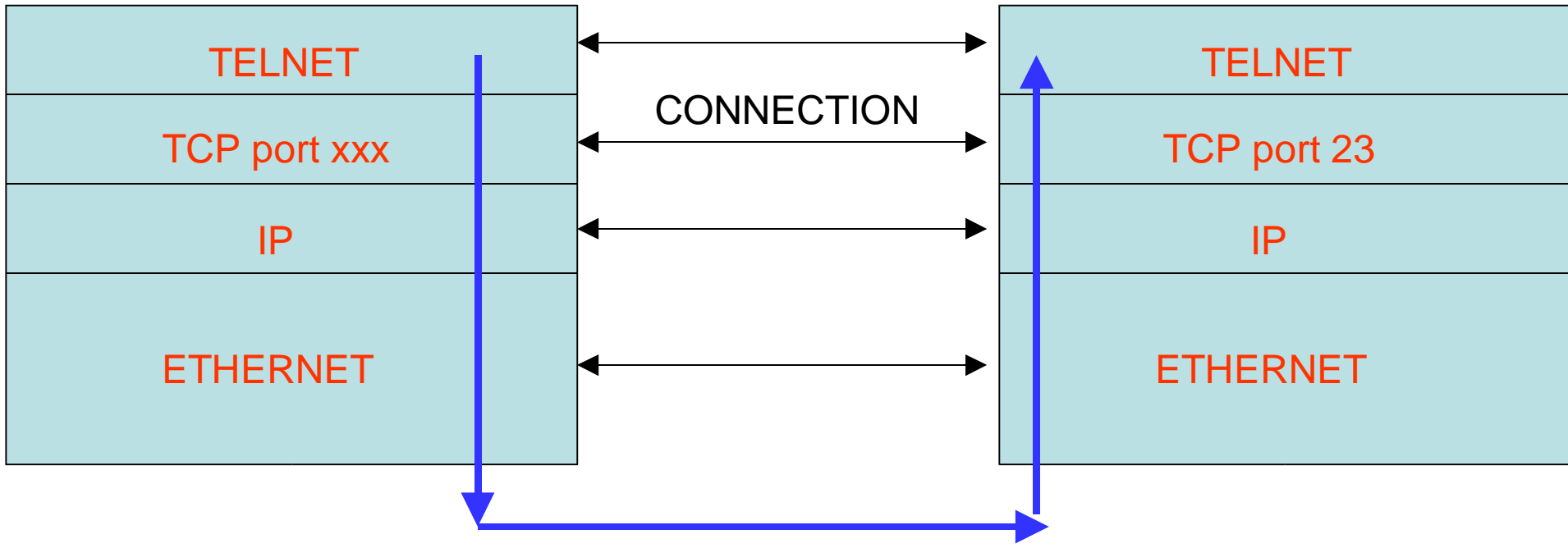- Reliable, connection oriented protocol

# TRANSPORT LAYER

- Need to establish a connection before data can be sent
- Flow control
- Congestion avoidance algorithms
  - Adapt the throughput to the charge of the network
  - Avoid flooding a high loaded network
- netstat command
  - Shows the TCP connections established on the machine
  - The applications waiting for connections on a port (TCP)
  - The application waiting for data (UDP)

# EXEMPLE (TELNET)

CLIENT

SERVER

| | |
|---|---|
| TELNET | TELNET |
| TCP port xxx | TCP port 23 |
| IP | IP |
| ETHERNET | ETHERNET |

CONNECTION

| ETHERNET | IP | TCP | TELNET |
|---|---|---|---|

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ANY QUESTION   !!!