

## **Bridges and Routers**

### **☞ The need for LAN expansion**

#### **» Bridges**

- Mainly used to interconnect LANs of identical protocols at MAC layer
- Some bridges are capable of mapping between different MAC protocols

#### **» Routers**

- Used to connect dissimilar networks and that operates at layers 3 of OSI (L3 switch)

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## **Bridges**

### **☞ Reasons for the use of Bridges**

#### **» Reliability**

#### **» Performance enhancement**

- Generally, LAN's performance declines as the number of connected devices increases

#### **» Security**

- Different types of traffic requires different security needs

#### **» Geography**

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## Bridges (Cont.)

- ✍ **Bridge basic functionality:**
  - » No modification to the content or format of the frames
  - » No additional header
  - » Main function: copy and repeat
- ✍ **Intelligent routing**
  - A frame may have to be routed through several bridges
- ✍ **More complex if it connects between dissimilar networks**

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## Routers

- ✍ **Router must be capable to cope with a variety of differences among networks:**
  - » **Address schemes**
    - IEEE 802 LAN uses 2 or 4 bytes
    - X.25 use 12-digit decimal (4 bits per digit)
  - » **Maximum frame size**
    - 1500 bytes maximum for Ethernet frames
    - 1000 bytes is common for x.25
    - Token ring impose no minimum frame size

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## **Routers (Cont.)**

- ✍ **Interfaces (hardware & software)**
- ✍ **Reliability**

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## **Networking devices**

- ✍ **Gateway**
  - » Provides translation between different networking technologies (e.g. TCP/IP and OSI)
  - » Provides translation between different application layers protocols
- ✍ **Hub**
  - » A multiport repeater
- ✍ **Switch**
  - » A full-duplex hub

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## Networking devices (cont.)

|                | Switch   | Bridge     |
|----------------|----------|------------|
| Implementation | Hardware | Software   |
| Operation      | Parallel | Sequential |

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## Chapter 6: LLC Sublayer

### ✍ LLC services:

- » Unacknowledged connectionless service
- » Acknowledged connectionless service
- » Connection-oriented service

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## Unacknowledged connectionless

- ✍ Services primitives:
  - » Request: to pass a block of data down to LLC
  - » Indication: to pass a block of data up to LLC on the other side
  - » Full source and destination addresses
  - » May include *priority*
- ✍ No flow control
- ✍ No error control
- ✍ Supports individual, multicast and broadcast

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## Connection-mode service (Cont.)

- ✍ LLC users establish a *logical* connection
- ✍ Provides flow control
- ✍ Provides error control
- ✍ Only supports individual addressing (no multicast or broadcast)

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## Connection-mode service

### Services primitives:

#### » Connection establishment:

- DL-CONNECT.request
- DL-CONNECT.indication
- DL-CONNECT.response
- DL-CONNECT.confirm
- It includes source and destination addresses
- May include *priority*

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## Connection-mode service

### Services primitives:

#### » Data transfer:

- DL-DATA.request: to pass a block of data down to LLC
- DL-DATA.indication: to pass a block of data down to LLC on the other side
- No acknowledgment required

#### » Disconnect:

- DL-DISCONNECT.request: this entity wants to terminate the connection
- DL-DISCONNECT.indication:

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## Connection-mode service

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### ✍ Services primitives:

#### » RESET:

- DL-RESET.request
- DL-RESET.indication
- DL-RESET .response
- DL-RESET .confirm

### ✍ Flow control

- » Provides locally by each LLC entity