




# W 6.1

↗ course	 <u>Computer Networks</u>
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## Notes

### Structure of a Switch

#### Circuit Switches

- **Space-Division Switch:** Paths spatially separated, used in analog and digital networks.
  - **Crossbar Switch:** Connects inputs to outputs using micro-switches at each crosspoint.
  - **Multistage Switch:** Combines crossbar switches in multiple stages to reduce crosspoints.
    - Design involves dividing input lines, using crossbars, and calculating total crosspoints.

#### Packet Switches

- **Components:**
  - **Input Ports:** Construct bits from signal, decapsulate packets, error detection, buffering.
  - **Output Ports:** Queue outgoing packets, encapsulate in frames, apply physical-layer functions.
  - **Routing Processor:** Performs network layer functions, finds next hop and output port.

- **Switching Fabric:** Moves packets from input to output queue, affects overall delay.

## Switching Fabrics

- **Crossbar Switch:** Simplest type, connects inputs to outputs directly.
- **Banyan Switch:** Multistage switch with micro-switches at each stage routing packets based on output port binary string.
- **Batcher-Banyan Switch:** Combines Batcher switch for packet sorting and Banyan switch to prevent internal collisions.

## ▼ Chapter 9

### 9.1 Communication at Data-Link Layer

- **Overview:**
  - The Internet is a network of interconnected devices (routers or switches).
  - Data-link layer communication involves logical connections between data-link layers.
  - Each router communicates with two data-link layers.
- **Nodes and Links:**
  - Communication is node-to-node, passing through LANs and WANs connected by routers.
  - Nodes refer to hosts and routers, while links represent the connections between them.
- **Services:**
  - The data-link layer provides node-to-node services for encapsulating and decapsulating datagrams.

### 9.2 Link-Layer Addressing

- **Overview:**
  - Link-layer addresses are essential for communication within a network.

- These addresses complement IP addresses and facilitate data transmission.
- **Address Resolution Protocol (ARP):**
  - Converts IP addresses to link-layer addresses for routing.
  - ARP requests are broadcasted, and responses are unicast, improving efficiency.
- **Caching:**
  - ARP requests minimize broadcast frames, enhancing network efficiency.
- **Packet Format:**
  - ARP packets contain hardware and protocol type fields, source and destination addresses.

## 9.2.1 Three Types of Addresses

- **Unicast Address:**
  - Enables one-to-one communication.
- **Multicast Address:**
  - Supports one-to-many communication within a local network.
- **Broadcast Address:**
  - Facilitates one-to-all communication within a network.

## 9.2.2 Address Resolution Protocol (ARP)

- **Overview:**
  - ARP resolves IP addresses to link-layer addresses for efficient data transmission.
- **Caching:**
  - Minimizes broadcast frames, improving network performance.
- **Packet Format:**
  - ARP packets contain hardware and protocol type fields, source, and destination addresses.

### 9.2.3 Example of Communication

- **Communication Process:**
    - Communication involves multiple nodes and routers, with ARP facilitating address resolution.
  - **Activities at Each Site:**
    - Details the steps involved at Alice's site, Router R1, Router R2, and Bob's site in a data transmission scenario.
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