

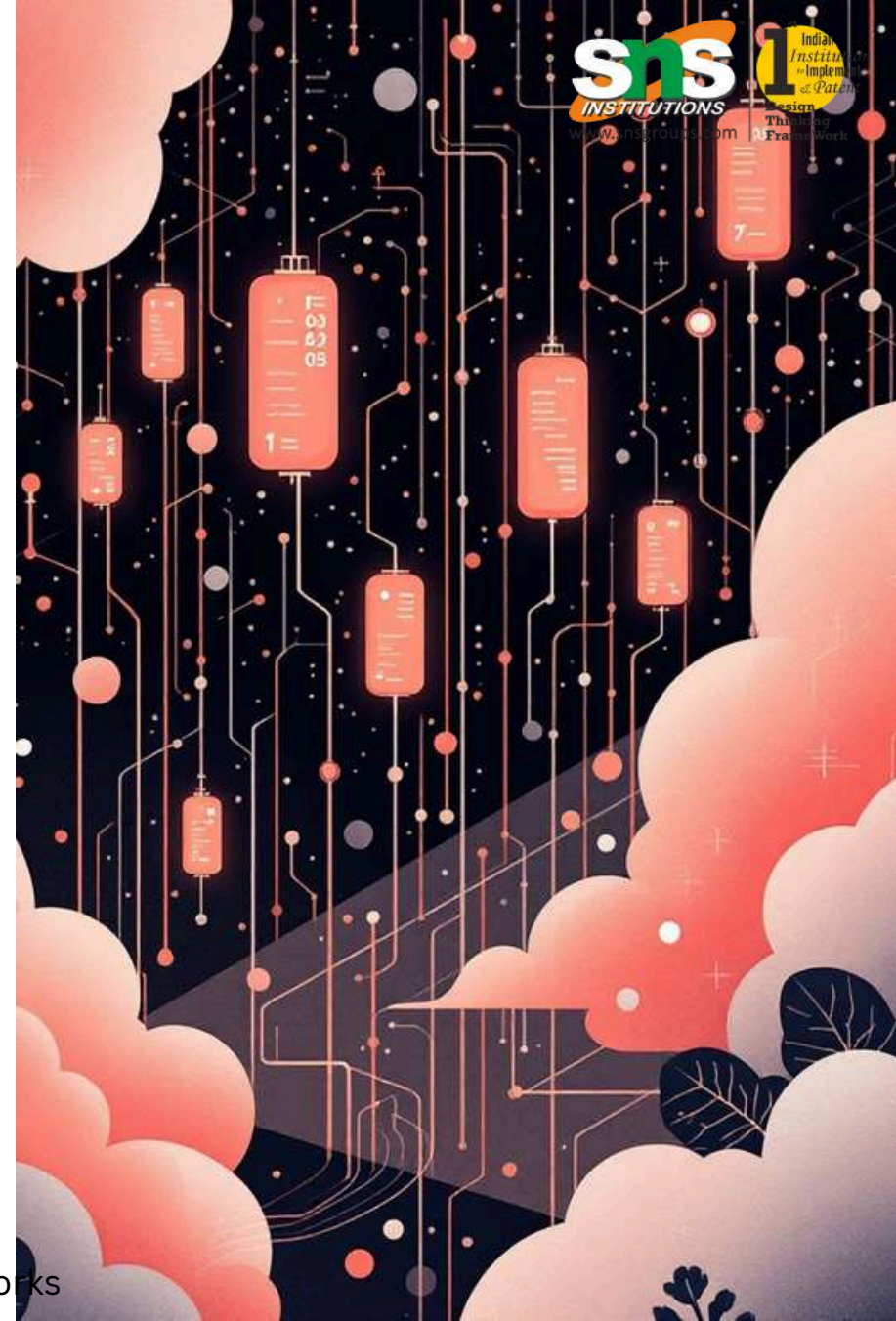
# 23ITT204 - COMPUTER NETWORK

## UNIT 2 - TRANSPORT LAYER

### Transport Layer Protocols TCP AND UDP

# Transport Layer Protocols: TCP vs UDP

Understanding the fundamental protocols that power modern internet communication and data transfer across networks.



# TCP: Reliable, Connection-Oriented Communication

TCP establishes a secure connection through a three-way handshake before any data transfer begins, ensuring both parties are ready to communicate.

The protocol guarantees ordered, error-checked delivery with automatic retransmission of lost packets, making it the gold standard for accuracy-critical applications.

## Perfect for:

- Web browsing and HTTP requests
- Email and file transfers
- Online banking and financial transactions
- Database operations



- Real-world example:** When you load a webpage, TCP guarantees all HTML, CSS, JavaScript, and images arrive intact and in the correct order for proper rendering.

⚡ FAST

# UDP: Fast, Connectionless Communication

## Live Streaming

UDP delivers video frames rapidly, accepting minor packet loss for smooth real-time playback without buffering delays.

## Online Gaming

Game servers use UDP for instant player movement updates, where speed matters more than receiving every single packet.

## VoIP Calls

Voice data streams via UDP to minimize latency, ensuring natural conversation flow even if occasional audio snippets drop.

UDP sends independent data without connection setup or delivery guarantees, trading reliability for minimal overhead and ultra-low latency. This makes it ideal for real-time applications where speed trumps perfection.

# TCP vs UDP: Choosing the Right Protocol

## TCP Characteristics

- **Connection-oriented:** Three-way handshake required
- **Reliable delivery:** Ordered, error-checked packets
- **Higher overhead:** More bandwidth and processing
- **Congestion control:** Adapts to network conditions
- **Common uses:** FTP, HTTP, SMTP, SSH

## UDP Characteristics

- **Connectionless:** No handshake, immediate transmission
- **Best-effort delivery:** No guarantees or ordering
- **Minimal overhead:** Faster, more efficient
- **No flow control:** Sends at maximum rate
- **Common uses:** DNS, DHCP, VoIP, gaming, streaming

**The fundamental tradeoff:** TCP prioritizes data integrity and reliability, while UDP prioritizes speed and efficiency. Understanding these differences is essential for optimizing network performance and delivering excellent user experiences.

