

# Module-1

## Introduction to Telecommunication

### Evolution of telecommunications

- Importance and applications in various industries
- Overview of voice, video, and data communication

# Evolution of telecommunications

- **1. Telegraph**
- **Invention:** Electric Telegraph
- **Inventor:** Samuel Morse
- **Year:** 1837
- **Country:** United States
- **Note:** Introduced Morse code for long-distance communication.
- **2. Telephone**
- **Invention:** Telephone
- **Inventor:** Alexander Graham Bell
- **Year:** 1876
- **Country:** United States (Scottish-born Canadian-American inventor)
- **Note:** First device to transmit voice electrically.

# Evolution of telecommunications

- **3. Radio**

- **Invention:** Wireless Radio Communication
- **Inventor:** Guglielmo Marconi
- **Year:** 1901 (transatlantic radio signal)
- **Country:** Italy / United Kingdom
- **Note:** Marconi's work laid the foundation for wireless communication.

- **4. Television**

- **Invention:** Electronic Television
- **Inventor:** Philo Farnsworth
- **Year:** 1927
- **Country:** United States
- **Note:** He transmitted the first electronic TV image.

# Evolution of telecommunications

- **5. Mobile Phone**

- **Invention:** Handheld Mobile Phone
- **Inventor:** **Martin Cooper** (Motorola)
- **Year:** 1973
- **Country:** United States
- **Note:** First public call made in New York.

- **6. Internet**

- **Invention:** ARPANET (foundation of the Internet)
- **Key Contributors:**
  - **Vint Cerf & Bob Kahn** (TCP/IP protocol)
- **Year:** 1983 (TCP/IP adopted)
- **Country:** United States
- **Note:** This is when the modern Internet officially began.

# Importance and applications in various industries

- Telecommunications enables **fast, reliable, long-distance communication**, supporting nearly every modern industry.
- **1. Healthcare**
- **Importance**
- Enables remote medical support.
- Connects doctors, laboratories, and patients in real time.
- Improves emergency response and hospital coordination.
- **Applications**
- **Telemedicine:** Online video consultations.
- **Remote patient monitoring:** Wearables sending health data.
- **Digital prescriptions & EHR sharing.**
- **Example:**  
A patient in a rural village consults a cardiologist in a metro hospital through **video conferencing**, reducing travel and treatment delay.

## Importance and applications in various industries

- **2. Education**
- **Importance**
  - Expands access to quality learning.
  - Supports remote and hybrid learning models.
- **Applications**
  - **Online classes** via Zoom/Google Meet.
  - **LMS platforms** (Moodle, Blackboard).
  - **Virtual classrooms & digital libraries.**
- **Example:**

Colleges conduct **online lectures** and share digital notes, enabling students to learn from home.

## Importance and applications in various industries

- **3. Business**
- **Importance**
- Enables seamless communication between teams, clients, and global branches.
- Supports digital transactions and data exchange.
- **Applications**
- **VoIP calls**, corporate email, video meetings.
- **Cloud communication** (Slack, Teams).
- **Customer support systems.**
- **Example:**  
Companies conduct international meetings using **video conferencing** instead of travelling overseas.

## Importance and applications in various industries

- **4. Retail**

- **Importance**

- Connects sellers and consumers.
- Supports online transactions and supply chain updates.

- **Applications**

- **E-commerce platforms** (Amazon, Flipkart).
- **POS systems**, inventory tracking.
- **Online customer support.**

- **Example:**

A store uses **real-time inventory tracking** to automatically reorder products when stock becomes low.



# Importance and applications in various industries

- **5. Public Safety & Defense**

- **Importance**

- Critical for coordination during emergencies.
- Ensures secure communication between forces.

- **Applications**

- **Wireless radio communication** for police, fire, and ambulance.
- **Disaster management systems.**
- **Surveillance networks.**

- **Example:**

Police use **two-way radios** to coordinate during a city emergency or traffic control

# Importance and applications in various industries

- **6. Financial Services**

- **Importance**

- Enables fast, secure transactions.
- Supports digital banking and ATM networks.

- **Applications**

- **UPI, NEFT, net banking.**
- **Mobile banking apps.**
- **Fraud detection systems.**

- **Example:**

Customers transfer money instantly using **UPI**, which relies on secure telecom networks.

# Importance and applications in various industries

- **7. Manufacturing**
- **Importance**
  - Improves automation and real-time monitoring.
  - Enhances supply chain connectivity.
- **Applications**
  - IIoT (Industrial Internet of Things).**
  - Machine-to-machine (M2M) communication.**
  - Remote control of robots and sensors.**
- **Example:**

Factories use **IoT sensors** to monitor machine health and avoid breakdowns.

# Overview of voice, video, and data communication

- **1. Voice Communication**
- ★ **Global Overview**
- Traditional PSTN (Public Switched Telephone Network) is still used but declining.
- Majority of global voice communication has shifted to **VoIP (Voice over Internet Protocol)**.
- Platforms like **WhatsApp, Skype, Zoom, Google Voice** dominate global voice traffic.
- 5G networks provide **HD voice, VoLTE, and VoNR (Voice over 5G)**.
- **India Overview**
- India has one of the world's **largest voice communication markets**.
- Major telecom operators: **Jio, Airtel, Vi, BSNL**.
- **VoLTE is widely deployed**, enabling high-quality voice calls on 4G.
- Rapid shift away from landlines → almost universal mobile penetration.
- India has some of the **lowest call rates globally** due to telecom competition.

# Overview of voice, video, and data communication

- **2. Video Communication**

- ★ **Global Overview**

- Video communication has become essential across business, education, and personal use.
- Platforms: **Zoom, Microsoft Teams, Google Meet, Webex, FaceTime.**
- 5G enables:
  - Ultra-HD/4K video calling
  - Low latency for real-time video
  - Cloud-based video processing
- Used in telemedicine, remote work, entertainment, and virtual classrooms.
- **India Overview**
- Massive spike in video usage after 2020 due to online learning & work-from-home.
- Adoption of:
  - **Zoom, Google Meet, JioMeet, Webex**
- India is one of the world's largest consumers of **mobile video content** (YouTube, OTT).
- 4G networks enabled widespread HD video calling; 5G expanding this.

# Overview of voice, video, and data communication

- **3. Data Communication**
- ★ **Global Overview**
- Data communication underpins the internet, cloud services, IoT, AI, and global commerce.
- High-speed infrastructure:
  - **Fiber-optic networks**
  - **Submarine cables**
  - **Satellite internet** (Starlink, OneWeb)
- Huge growth of **cloud data centers** (AWS, Google Cloud, Azure).
- **India Overview**
- India is the **world's highest mobile data consumer** (per person per month).
- Affordable data plans → explosive internet penetration.
- Major developments:
  - **Nationwide fiber backbone (BharatNet)**
  - Expansion of **data centers** (Mumbai, Hyderabad, Chennai)
  - Growth of IoT in smart cities, agriculture, logistics
- 5G rollout enabling:
  - Faster mobile broadband
  - Industrial automation
  - Smart infrastructure