

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**

- IHoT (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