*Course: Computer and Communication Networks*

# *Topic: Asynchronous Transfer Mode (ATM) and Softswitch Architecture*

*Presentation by*


## *Ajay Kakkar*

*Assistant Professor*

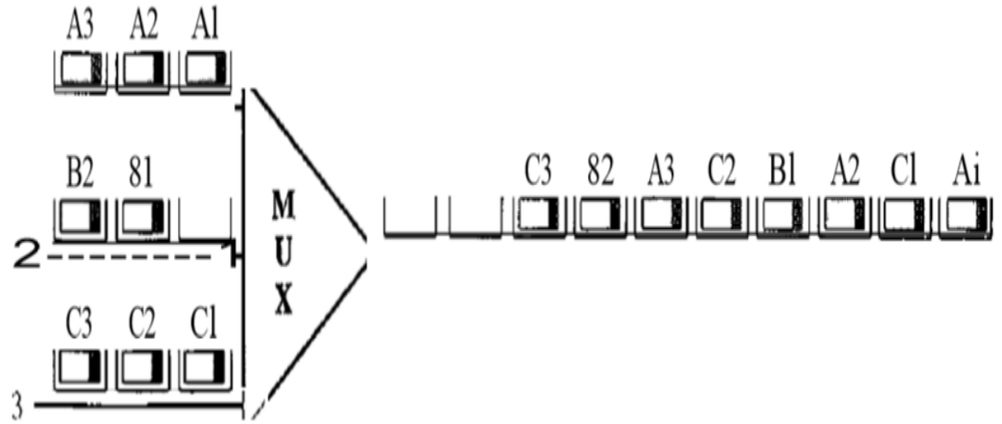
*Department of Electronics and Communication Engineering,*

**Thapar Institute of Engineering & Technology**
**(Deemed to be University)**
Bhadson Road, Patiala, Punjab, Pin-147004
Contact No. : +91-175-2393201
Email : info@thapar.edu


THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
(Deemed to be University)

# ATM: Design Goals

- seamless connection to wired ATM, an integrated services high-performance network supporting different types a traffic streams
- ATM networks scale well: private and corporate LANs, WAN
- B-ISDN uses ATM as backbone infrastructure and integrates several different services in one universal system
- mobile phones and mobile communications have an ever increasing importance in everyday life
- current wireless LANs do not offer adequate support for multimedia data streams



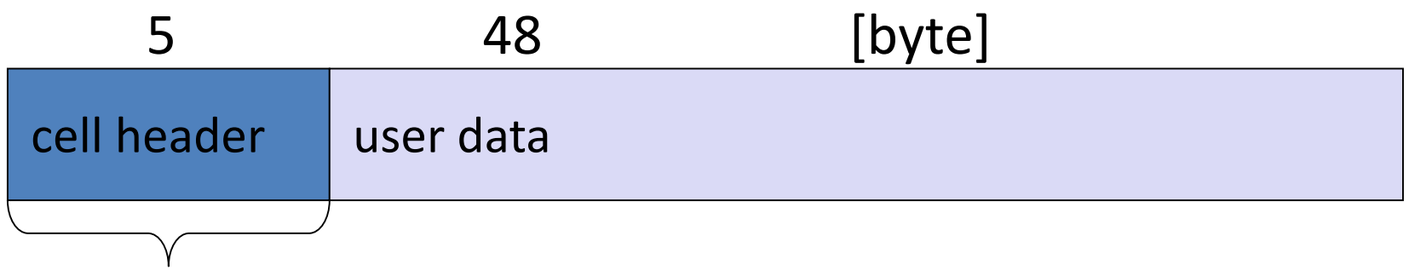

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

# ATM - basic principle

- statistical (asynchronous, on demand) TDM (ATDM, STDM)
- cell header determines the connection the user data belongs to
- mixing of different cell-rates is possible

  different bit-rates, constant or variable, feasible
- interesting for data sources with varying bit-rate:
  - e.g., guaranteed minimum bit-rate
  - additionally bursty traffic if allowed by the network

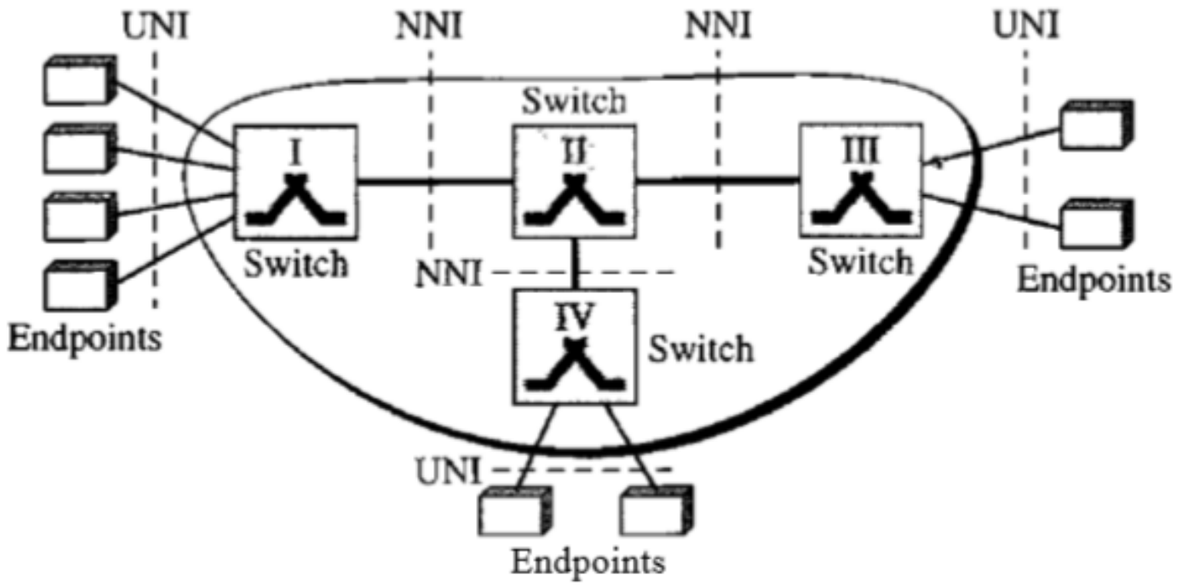
**ATM cell:**




connection identifier, checksum etc.

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

# ATM Architecture



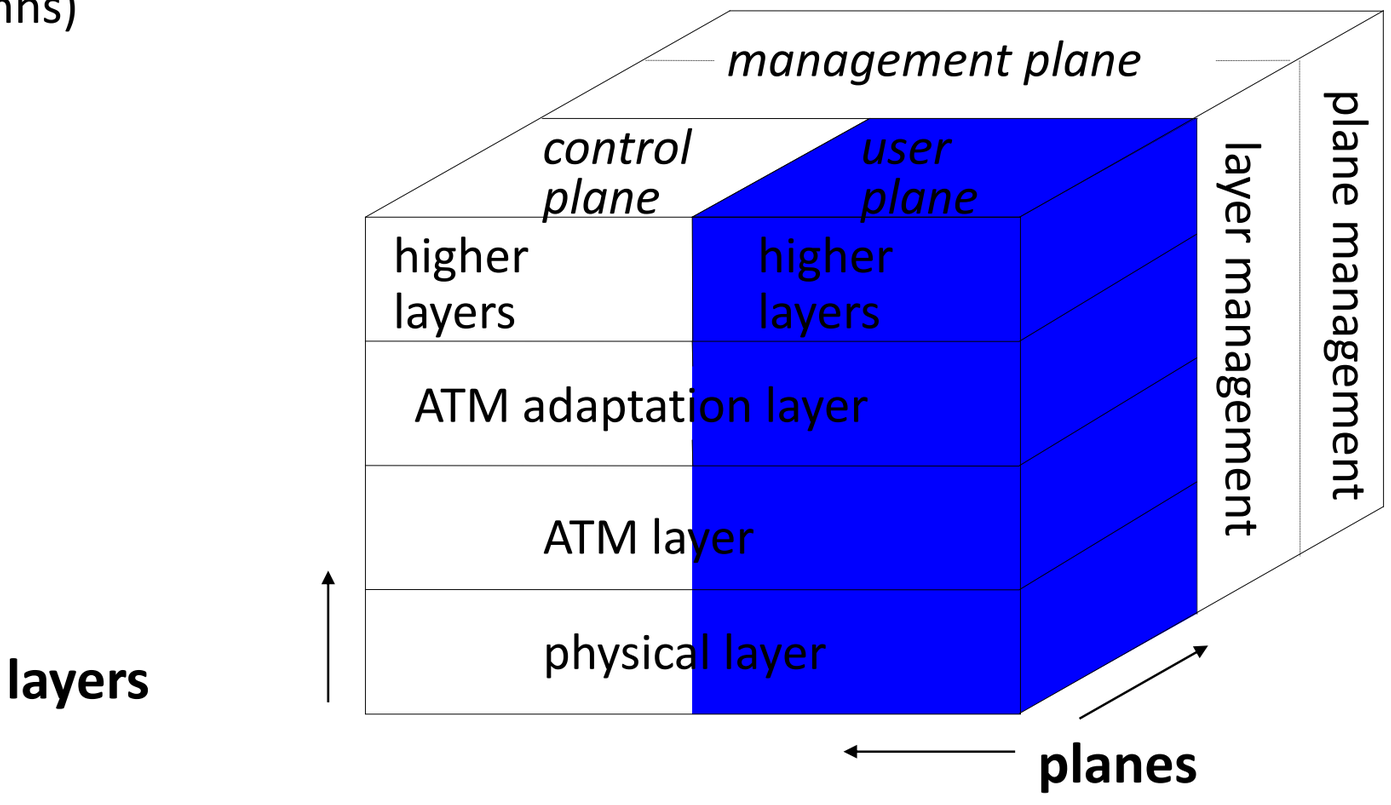

- asynchronous, cell-based transmission as basis for ATM, continuous cell-stream
- additional cells necessary for operation and maintenance of the network (OAM cells; Operation and Maintenance)
- OAM cells can be inserted after fixed intervals to create a logical frame structure
- if a station has no data to send it automatically inserts idle cells that can be discarded at every intermediate system without further notice

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

# ATM

3 dimensional reference model

- three vertical planes (columns)
  - user plane
  - control plane
  - management plane
- three hierarchical layers
  - physical layer
  - ATM layer
  - ATM adaptation layer




Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

# ATM layers

Physical layer, consisting of two sub-layers

- physical medium dependent sub-layer
  - coding
  - bit timing
  - transmission
- transmission convergence sub-layer
  - HEC (Header Error Correction) sequence generation and verification
  - transmission frame adaptation, generation, and recovery
  - cell delineation, cell rate decoupling

ATM layer

- cell multiplexing/demultiplexing
- VPI/VCI translation
- cell header generation and verification
- GFC (Generic Flow Control)

ATM adaptation layer (AAL)

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

# ATM adaptation layer (AAL)

Provides different service classes on top of ATM based on:

- bit rate:
  - constant bit rate: e.g. traditional telephone line
  - variable bit rate: e.g. data communication, compressed video
- time constraints between sender and receiver:
  - with time constraints: e.g. real-time applications, interactive voice and video
  - without time constraints: e.g. mail, file transfer
- mode of connection:
  - connection oriented or connectionless

AAL consists of two sub-layers:

- Convergence Sublayer (CS): service dependent adaptation
  - Common Part Convergence Sublayer (CPCS)
  - Service Specific Convergence Sublayer (SSCS)
- Segmentation and Reassembly Sublayer (SAR)
- sub-layers can be empty

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

# ATM services

## Office environment

- multimedia conferencing, online multimedia database access

## Universities, schools, training centers

- distance learning, teaching

## Industry

- database connection, surveillance, real-time factory management

## Hospitals

- reliable, high-bandwidth network, medical images, remote monitoring

## Home

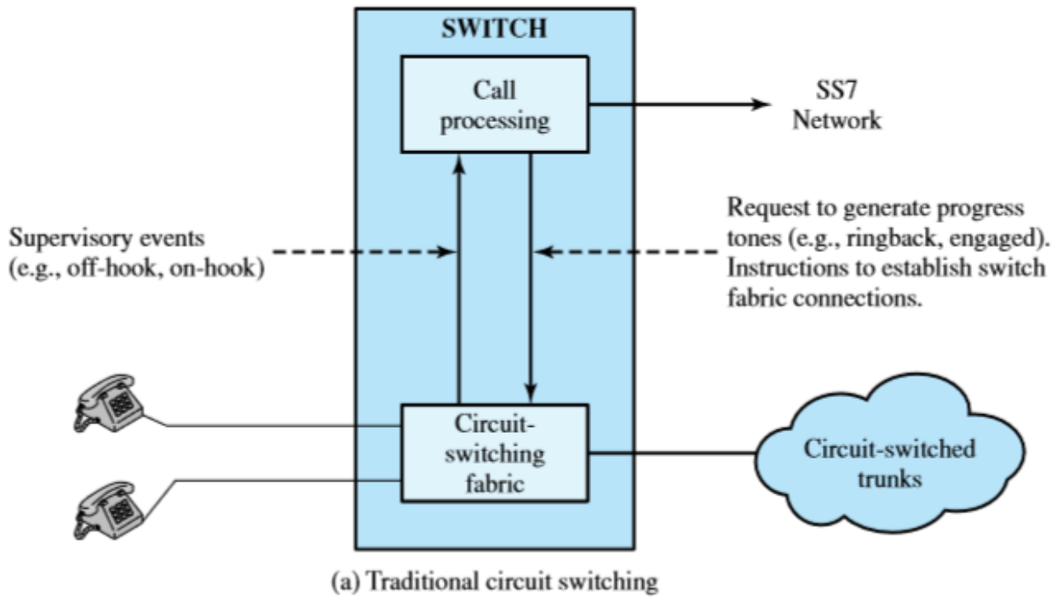
- high-bandwidth interconnect of devices

## Networked vehicles

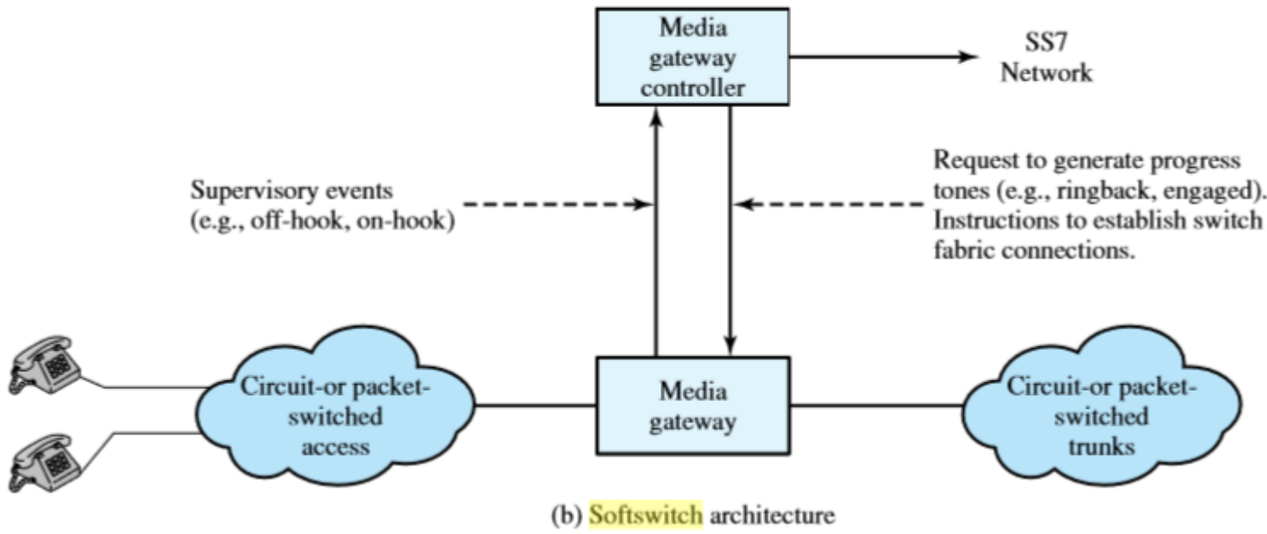
- trucks, aircraft etc. MANET

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

# Circuit switching and Soft Switch Architecture



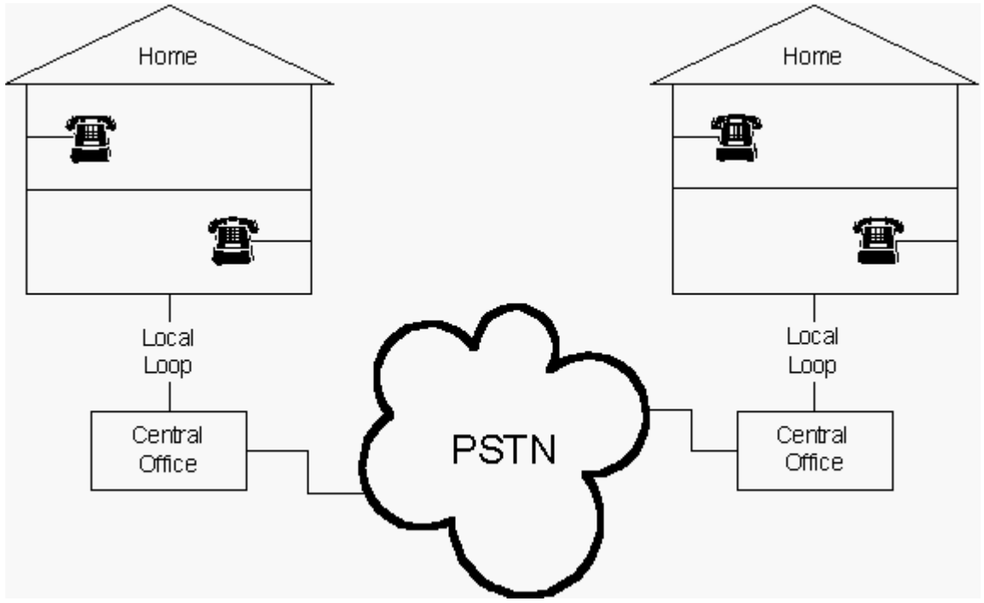

(a) Traditional circuit switching




(b) Softswitch architecture

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

# Telephone networks

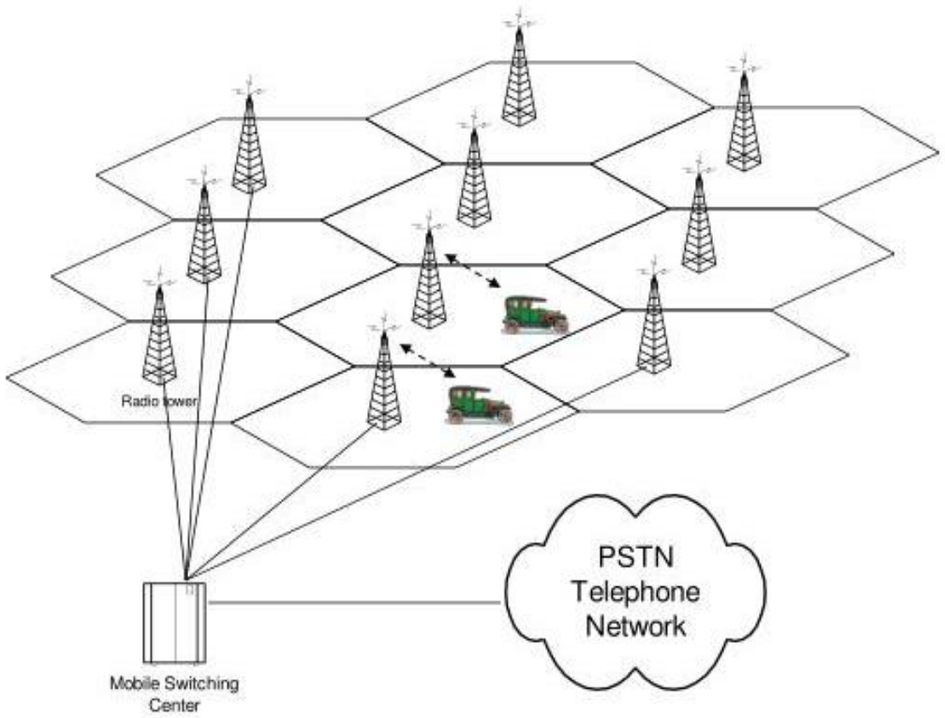


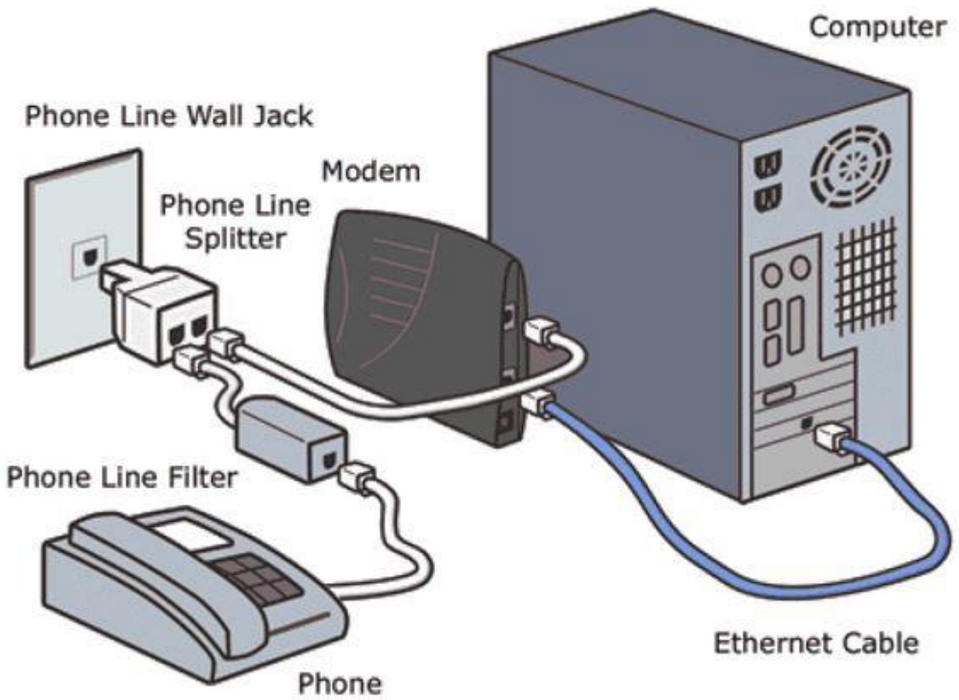

| Base station transmission band | 869 to 894 MHz |
|---|---|
| Mobile unit transmission band | 824 to 849 MHz |
| Spacing between forward and reverse channels | 45 MHz |
| Channel bandwidth | 30 kHz |
| Number of full-duplex voice channels | 790 |
| Number of full-duplex control channels | 42 |
| Mobile unit maximum power | 3watts |
| Cell size, radius | 2 to 20 km |
| Modulation | FM |
| Data transmission rate | 10 kbps |
| Error control coding | BCH |

Advanced Mobile Phone Service (AMPS)

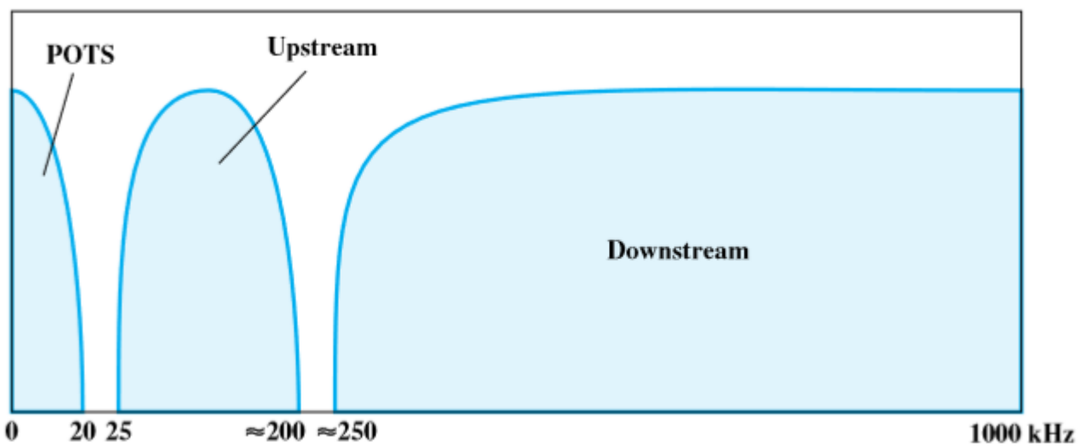
Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

# Cellular telephony




X-DSL




Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org