Multimedia Technology (IT-204-F)

Section A
Introduction to multimedia

LECTURE 5
DISTRIBUTED MULTIMEDIA SYSTEM

Distributed Multimedia Systems

- **Distributed multimedia applications**
  - Networked video library, Internet telephony, videoconference
- **Characteristics of multimedia applications**
  - Timely delivery of streams of multimedia data to end-users
    - Audio sample, video frame
- **To meet the timing requirements**
  - QoS(quality of service)

Existing distributed multimedia Apps. without QoS

- **Web-based multimedia**
  - Extensive buffering
  - Best-effort
- **Network phone and audio conference**
  - Relatively low bandwidth
  - Efficient compression techniques
  - High interactive latency
- **Video-on-demand services**
  - Require sufficient dedicated network bandwidth

ATM-Asynchronous Transfer Mode

- **First developed in mid-1980s**
- **1990's/00 standard for high-speed**

(155Mbps to 622 Mbps and higher) *Broadband*

Integrated Service Digital Network architecture

- Goal: *integrated, end-end transport of carry voice, video, data* meeting timing/QoS requirements of voice, video (versus Internet best-effort model) "next generation" telephony: technical roots in telephone world packet-switching (fixed length packets, called "cells") using virtual circuits

- **ATM Characteristics**
- ATM standard defines a full suite of communication protocols

from application level-API to Physical layer

- ATM service model includes : constant bit rate (CBR), variable

bit rate (VBR), available bit rate (ABR) and unspecified bit art

(UBR) services

- **ATM Characteristics (contd)**
- ATM uses packet switching with fixed length packet of 53 bytes – CELLs. Each cell has a 5-byte header and 48-byte payload
- ATM uses Virtual Circuits
- No retransmission on a link-by-link basis
- ATM can run over any physical layer. Often runs over fiber optics using the SONET standard at speeds of 155.52 Mbps,
- 622 Mbps and higher

- **ATM Characteristics (contd)**

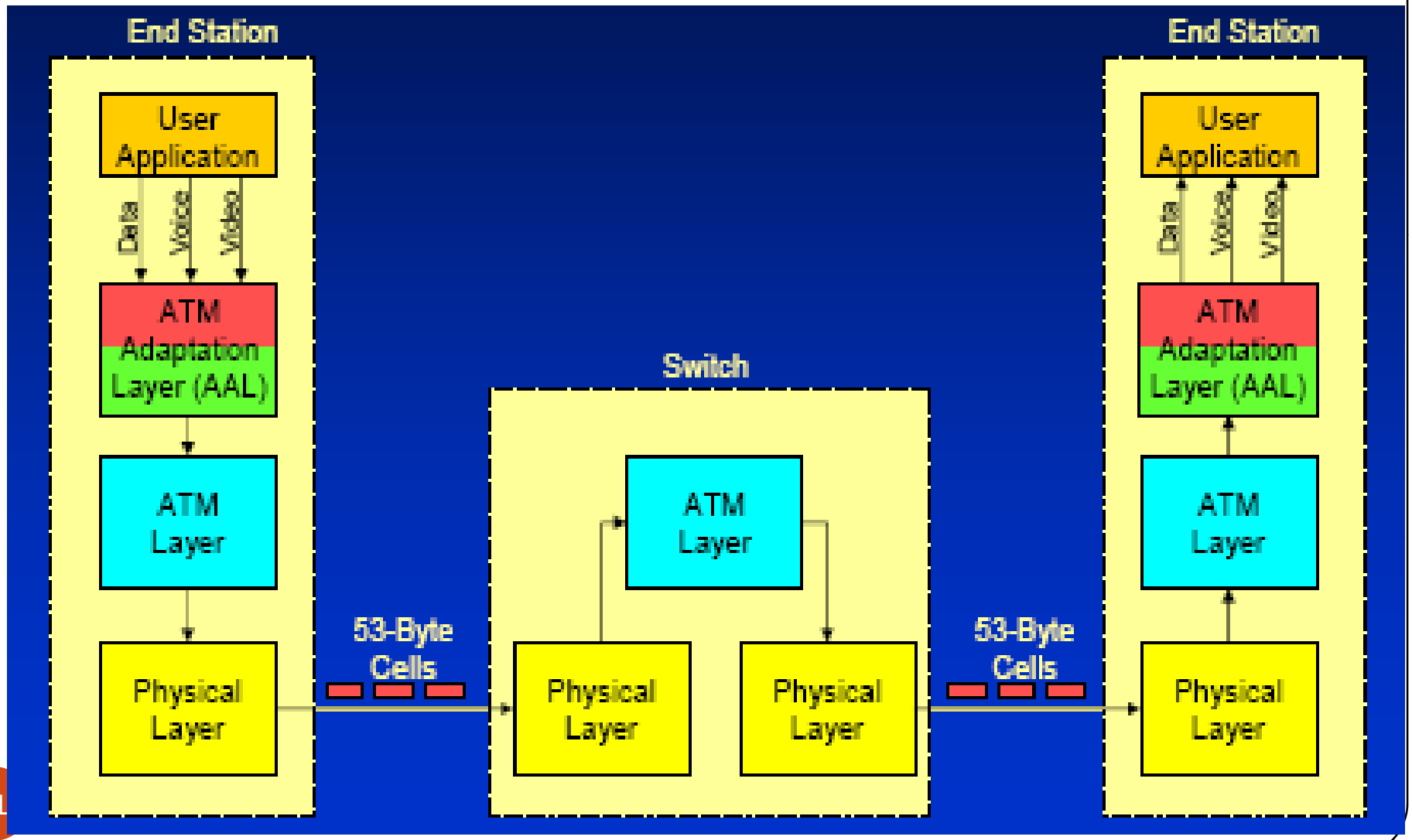
- A Cell network uses the cell as the basic unit of data exchange. A cell is defined as a small, fixed-sized block of information
- ATM uses asynchronous TDM – to multiplex cells coming from different channels. Uses fixed slots (size of cells) Architecture : ATM is a switched network.
- User access devices (“endpoints”) are connected through User-to Network Interface (UNI) to switches inside the network.
- The switches are connected through Network-to-Network Interfaces (NNI)

- ***Asynchronous Transfer Mode (ATM)***
- ***ATM Quick Highlights***
- The Telecom Industry's thrust into multi-media data networking Comm unit is small, fixed-sized "cell" (53 bytes)
- Built to provide Quality-of-service
- Connection-oriented
- Designed to run over SONET/SDH
- ***Why?***
- Why a small cell instead of a large packet?
- Queue delays tend to grow as packet size grows. A small cell helps maintain streamlined flows.
- No/little performance loss due to padding large fields
- Small cells better for voice
- No need for in-route fragmentation

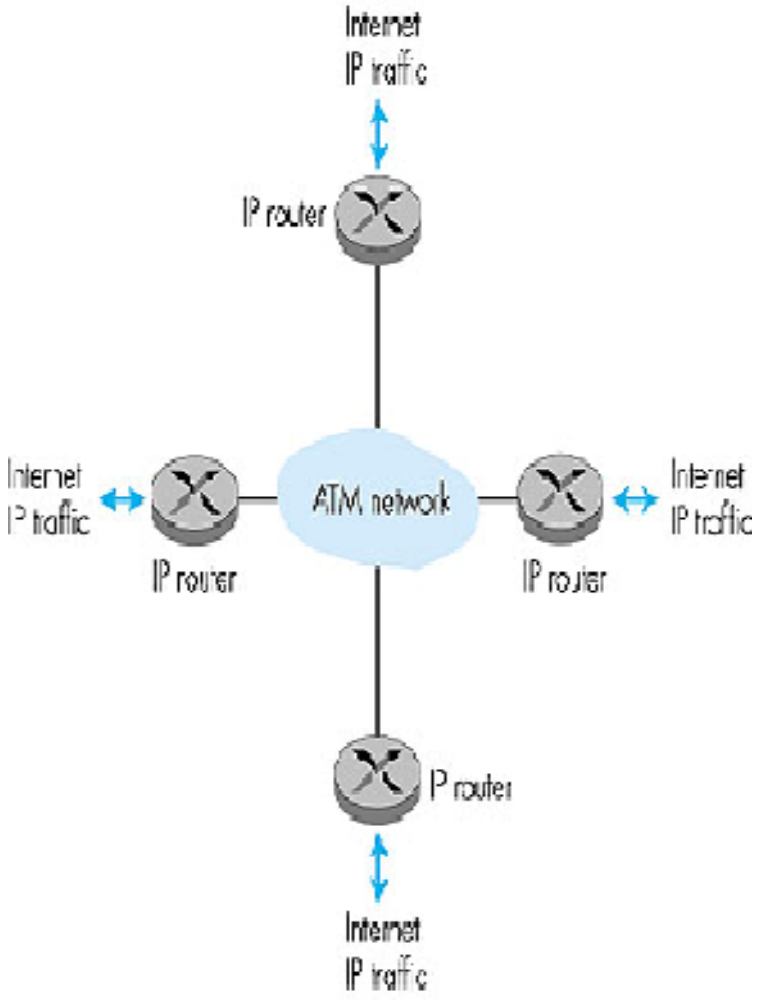
- Why a fixed cell size instead of variable-size packets?
- Switch architecture can be optimized to the fixed size, so switching can be done in hardware Scalable parallel switch designs
- Why 53 bytes?
- US wanted 64 payload bytes, Europe wanted 32, Compromised on 48
- +5 header = 53

- ***ATM + and –***
- **+**
- QoS-packet loss, bandwidth, Multimedia Support
- Hardware Switching -> High Speed, Connection-Oriented (-?)
- **-**
- IP Support, LAN arena dominated by huge installed Ethernet base
- Ethernet growing toward MAN, WAN
- Connection-Oriented (+?), Living up to the hype of the early 90’s
- Cost, Lack of exposure, Standards are still evolving
- IP applications can’t talk to the network
- Requires emulation to integrate with legacy LANs

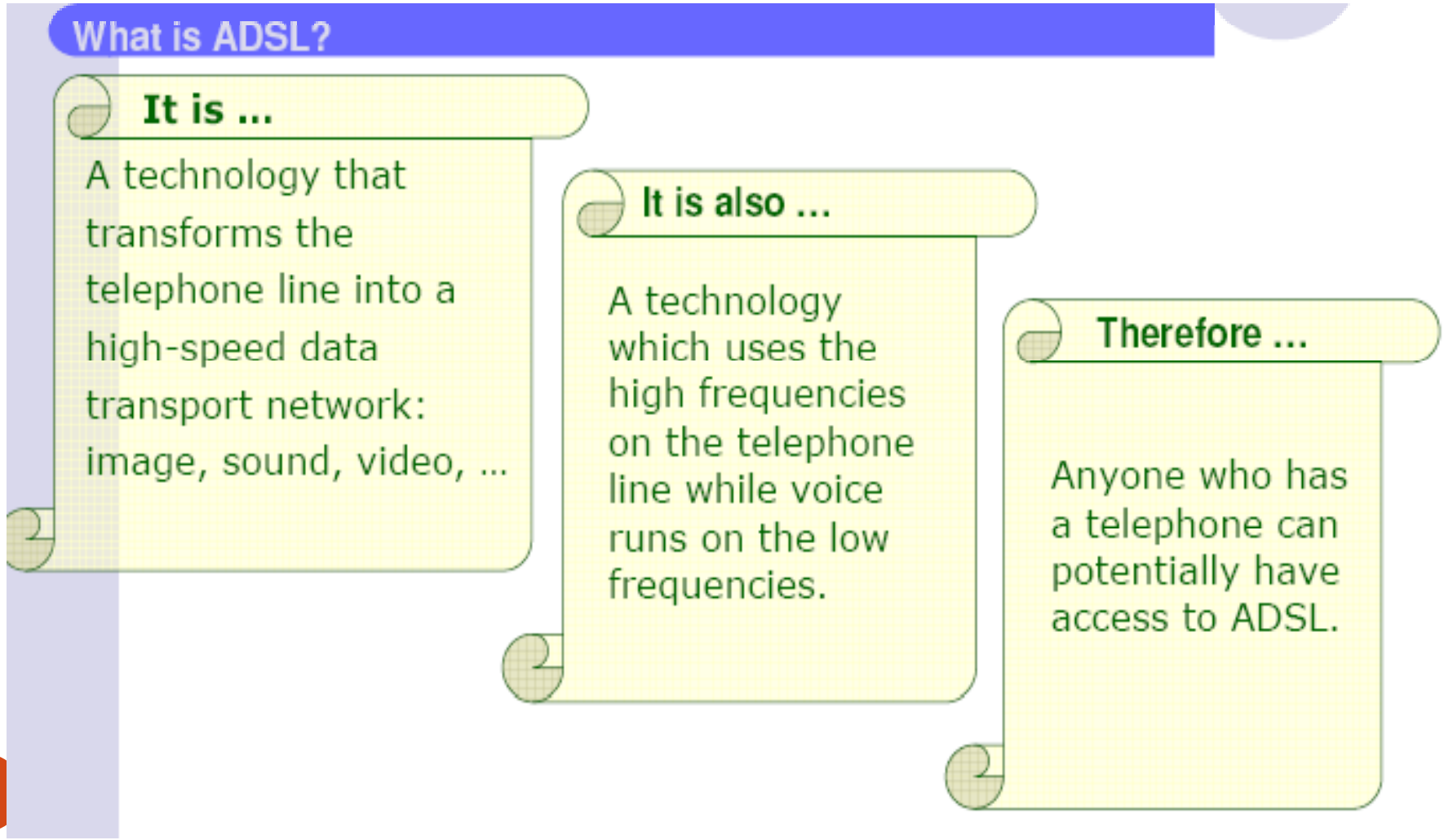
ATM Architecture



- **ATM: network or link layer?**
- Vision: end-to-end
- transport: “ATM from desktop to desktop”
- ATM *is a network* technology
- Reality: used to connect IP backbone routers
- “IP over ATM”
- ATM as switched link layer,
- connecting IP routers



ADSL- Asymmetric Digital Subscriber Line

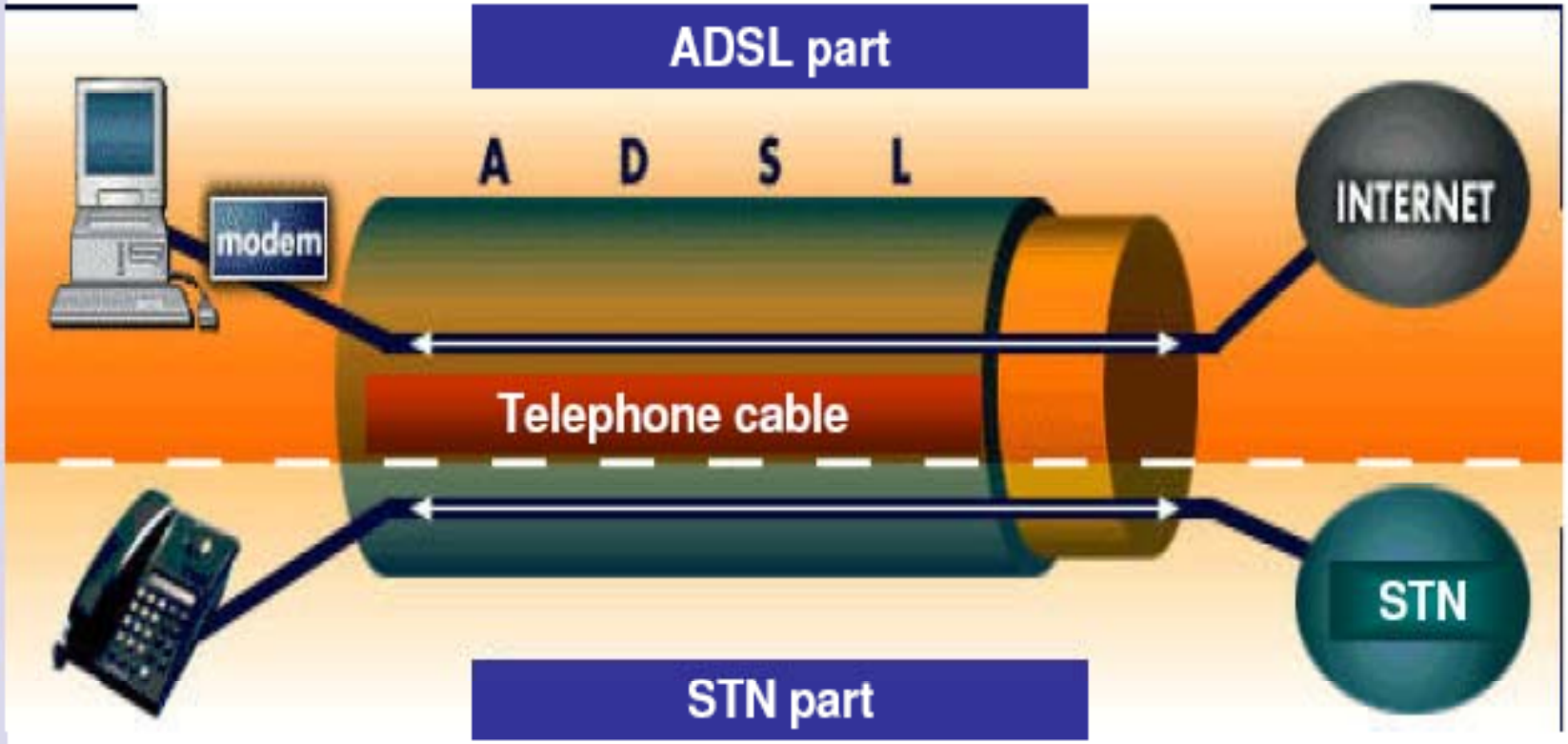


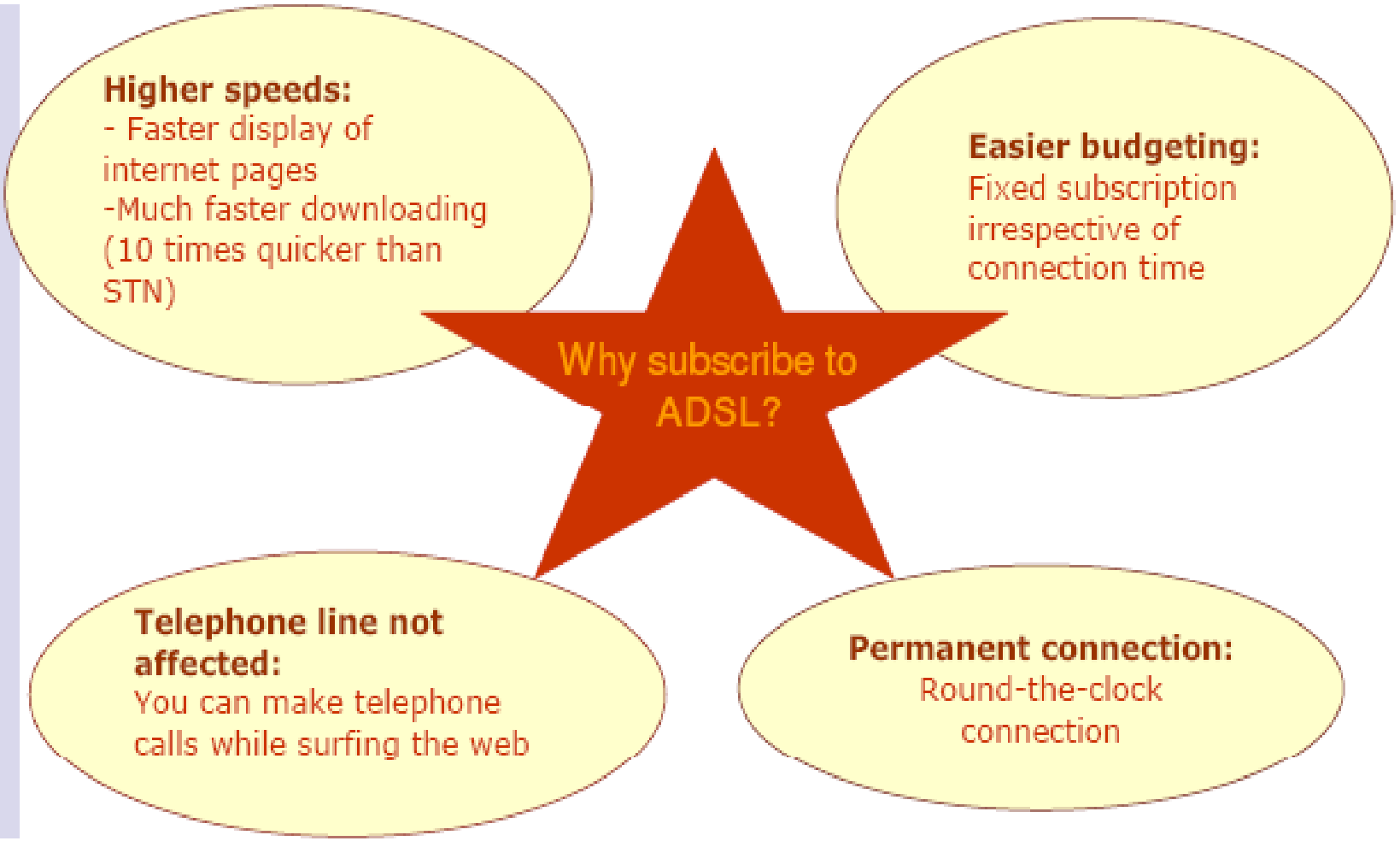
Asymmetric Digital Subscriber Line (ADSL)

- High speed data link.
- Pure network connection.
- Coming with different schemes:

  CAP, QAM, and DMT.
- Using special modems called endpoints
- ADSL is a high speed access to internet.

How does ADSL work? In the phone line …




Higher speeds:
- Faster display of internet pages
-Much faster downloading (10 times quicker than STN)
Easier budgeting:
Fixed subscription irrespective of connection time
Why subscribe to ADSL?
Telephone line not affected:
You can make telephone calls while surfing the web
Permanent connection:
Round-the-clock connection

Advantages

- Connectivity – always connected
- Ease of use
- Reliability
- Security
- Speed

Drawbacks

- Availability
- Signal leaking
- Cost of installation and equipment
- Not standardization

Future Prospects

TV over telephone line

- **What is this?**
  - New means of broadcasting digital television
  - Access to several TV channel packages on the television set
- **How does it work?**
  - All you need is an ADSL modem, a digital decoder and remote control, cabling and a filter
  - Everything is transmitted over the telephone line, no new installations required

Voice over IP

- VoIP is a technology whereby speech can be transported over a data network (intranet or internet).
- The purpose of VoIP is to treat speech in exactly the same way as the other types of data circulating on the internet (thanks to the IP protocol) by transporting it in the form of data packets.

Video on Demand

- VOD Issues:
- VOD includes audio and rich media on demand.
- VOD will bring the Internet to a new level of service that will dramatically change higher education by providing lecture and learning objects on demand.
- It will disrupt the economic model for Broadcast Television and DVD/Video Tape Distribution.
- It will consume large amounts of computer storage and network capacity.

- Campus Uses of VOD Services
- The number of digital video files on campus is exploding.
- Campus Services include:
  - Lectures posted on web sites for replay
  - Video clips from educational video producers
  - Student Presentations
  - Research Presentations
  - Simulations and Visualizations
  - Rich Media attached to Web-CT.

- VOD Committee Issues
- Network Demands
- Digital Asset Management Systems
- Content acquisition
- Storage
- Role Assignments
- Standards of Best Practice
- Training
- Budget

APPLICATIONS

- Image Processing
- Image Enhancement
- Medical Imaging

Scope of Research

- Multimedia Database
- VOD