

A Course on Internetworking &
Network-based Applications

CS 6/75995
Internet-based →


Kent State University
Dept. of Computer Science
LECT-5

Applications & Systems

Multimedia over internet

3

Classification of Multimedia




Continuous space-time based	Sound	Moving Images	Scrolls	Animation
	Discrete space based		Still Images	Text Graphics

Captured from real world Synthesized by computers

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Taxonomy of Multimedia Applications



INTERNET APPLICATION & SYSTEM DESIGN

```


    graph TD
      Root[Communications between people] --> Async[Asynchronous]
      Root --> Sync[Synchronous]
      Async --> Async11[1-1]
      Async --> Async1m[1-m]
      Async --> Asyncmm[m-m]
      Sync --> Sync11[1-1]
      Sync --> Sync1m[1-m]
      Sync --> Syncmm[m-m]
  
```

Videophone
Live broadcast
group conference/
shared whiteboard

Email
Bulletin board
Group conference/
News groups

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Taxonomy of Multimedia Applications



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```

    graph TD
      Root[Communications between people and systems] --> Dist[Distribution]
      Root --> Inter[Interactive]
      Dist --> DistAsync[Asynchronous]
      Dist --> DistSync[Synchronous]
      Inter --> InterDist[To closed group]
      Inter --> InterOpen[To open group]
      Inter --> InterRet[Retrieval (interactive playback)]
      Inter --> InterTrans[Transaction (interactive content)]
  
```

Image Database
News channel
Video-on-demand
3D Navigation

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Media Demo Sites

- Radio Disney
- Mars Panorama
- Cog in Wheel
- Florida Estuary
- Media Ring Telephone
- G2 Compound Media
- Real Audio Library

- Synchronous?
- 1-1, 1-m, m-m?
- Human-to-human vs. human-to-machine?

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Bandwidth Consumption

Content & Format	Video Resolution	Uncompressed Bit rate	Compressed Bitrate
Film	480x480x24Hz	133 Mbits/sec	3-6 Mbits/sec
NTSC video	480x480x29.97 Hz	168 Mbits/sec	4-8 Mbits/sec
PAL video	576x576x25 Hz	199 Mbits/sec	4-9 Mbits/sec
HDTV video	1920x1080x30 Hz	1493 Mbits/sec	18-30 Mbits/sec
HDTV video	1280x720x60 Hz	1327 Mbits/sec	18-30 Mbits/sec
ISDN videophone (CIF)	352x288x29.97 Hz	73 Mbits/sec	64-1920 kbits/sec
PSTN videophone (QCIF)	176x144x29.97 Hz	18 Mbits/sec	10-30 kbits/sec
Two-channel stereo audio		1.4 Mbits/sec	128-384 kbits/sec
Five-channel stereo audio		3.5 Mbits/sec	384-968 kbits/sec

- Massive bandwidth needed for multimedia future.
- Compression and time synchronization will be vital.

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Bandwidth Supply

Medium	Bitrate
PSTN modems	Up to 56 kbits/sec
ISDN	64-1920 kbits/sec
LAN	10-100 Mbits/sec
ATM	135-622 Mbits/sec or more
CD-ROM (normal speed)	1.4 Mbits/sec
Digital Video Disk	9-10 Mbits/sec
Over-the-air Video	18-20 Mbits/sec
CATV	20-40 Mbits/sec

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Compound Multimedia

The diagram shows four horizontal axes: Audio Stream, Video Stream, Text Stream, and Image Stream. Three vertical dashed lines mark the start of three 'Audio/Video/Text sequence' blocks. The Audio Stream shows continuous data. The Video Stream shows data blocks that are delayed relative to the audio. The Text Stream shows data blocks that are also delayed. The Image Stream shows data blocks that are further delayed. This illustrates the need for synchronization in compound multimedia.

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Multimedia Streaming

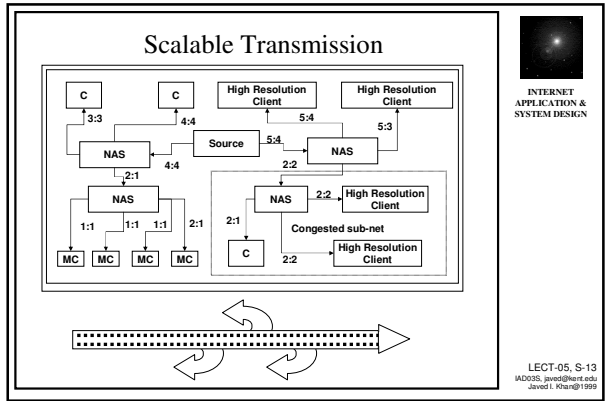
The diagram shows four horizontal axes: Audio Stream, Video Stream, Text Stream, and Image Stream. Three vertical dashed lines mark the start of three 'Audio/Video/Text sequence' blocks. The Audio Stream shows continuous data. The Video Stream shows data blocks that are delayed relative to the audio. The Text Stream shows data blocks that are also delayed. The Image Stream shows data blocks that are further delayed. This illustrates the need for synchronization in multimedia streaming.

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Download and Streaming

The diagram shows two horizontal axes: Video Download and Video Stream. The Video Download axis shows a curve that starts at the origin and increases over time, representing the cumulative data received. The Video Stream axis shows a horizontal line that starts at a point on the time axis, representing the delay before streaming begins. The time axis is labeled 'Time'.

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- ### Research Challenges (we will investigate papers on)
- Network Issues
 - Scalable multimedia delivery
 - Temporal QoS provisioning
 - Congestions management.
 - Synchronization
 - Multimedia distribution network
 - Multimedia caching
 - Streaming & Multicasting

 - Information handling
 - Content-based search
 - Efficient compression, coding & transcoding.
 - Quality vs. rate tradeoff.
 - Composite Object handling
 - Spatial temporal object definition.
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