ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ

ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

Multimedia Technology

Section # 2: Multimedia Applications

Instructor: George Xylomenos

Department: Informatics

Contents

- Multimedia application types
- Synchronous applications
- Asynchronous applications
- Interactive applications
- Distribution applications

Multimedia application types

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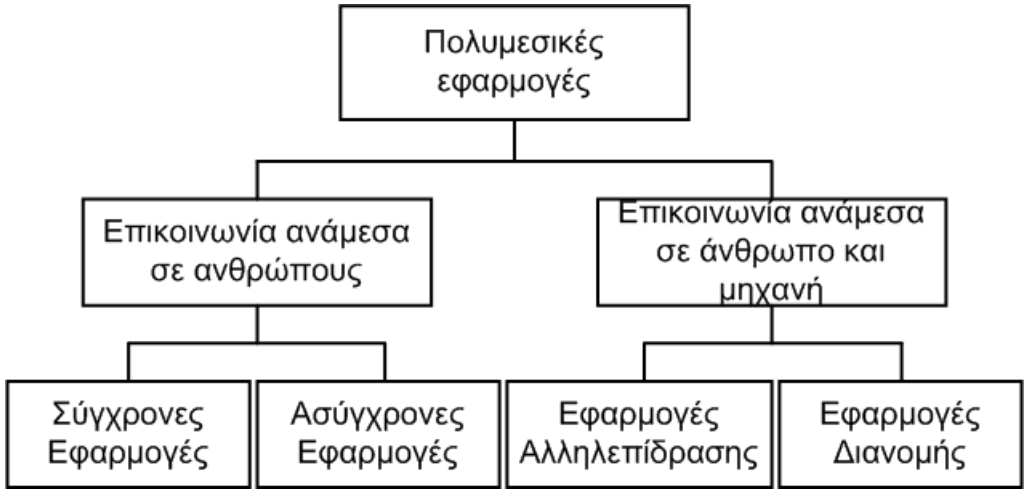
Applications

- Multimedia application
  - A way of using a multimedia **system**
  - Combines multimedia **services**
  - Involves one or more **users**
- Service <> application
  - Services: voice & video transport
  - Application: videoconference
    - This distinction comes from the telcos

Application categories



- Application categories
  - User to user communication
    - Synchronous or asynchronous
  - User to machine communication
    - Interaction or distribution

Synchronous applications

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Teleconferencing (1 of 2)

- Communication between multiple users
  - Requires low delay
- In circuit-switching networks
  - Circuit leasing or dialup (ISDN p*64Kbps)
  - Terminal interconnection via MCU
- In packet-switching networks
  - Many one-to-one connections
  - Single one-to-many connection
  - One-to-one connections with server

Teleconferencing (2 of 2)

- User interconnection server
  - Required when no multicasting is available
- MCU (Multipoint Conference Unit)
  - The server decodes each incoming streams
  - Creates an output stream per participant
- SFU (Selective Forwarding Unit)
  - The server only forwards some packets
  - Incoming streams must be appropriately coded

Floor control

- Floor control policy
  - Who controls shared resources (e.g. screen)
    - Required in teleconferencing and other apps
  - No control
  - Implicit locking
  - Explicit locking
  - Co-Ordinator control

Live streaming

- One (live) media source, many receivers
  - No interaction (like IPTV, but live)
- One-to-one transmission
  - Sender needs many connections
- One-to-many transmission
  - Requires multicasting
- Server mediated
  - Many connections, but not from the sender

Security and privacy

- How do we secure conferencing?
  - Simple with two participants
  - But how to do it with groups?
- Closed user groups
  - Need network support
- Media encryption
  - Does not rely on the network
  - But, it requires key distribution

Heterogeneity (1 of 2)

- Received heterogeneity
  - User heterogeneity
    - Difference in preferences
  - Network heterogeneity
    - Different speeds
    - Different traffic loads
  - Terminal heterogeneity
    - Smartphone, laptop, desktop

Heterogeneity (2 of 2)

- Using multiple communication channels
  - Different channel per user
  - One channel per quality level
    - Simulcast of many quality levels
  - One channel per quality subset
    - Use of layered coding
    - Lower layers reach more users
    - Saves on data transmission

Asynchronous applications

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Asynchronous applications

- Multimedia discussion groups
  - Like multimedia e-mail (mostly junk!)
- Multimedia documents
  - Complex relationships between elements
- Not that challenging any more!
  - Tons of storage space in the cloud
  - Lax delay requirements
    - Synchronization during editing of common documents

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Interactive applications

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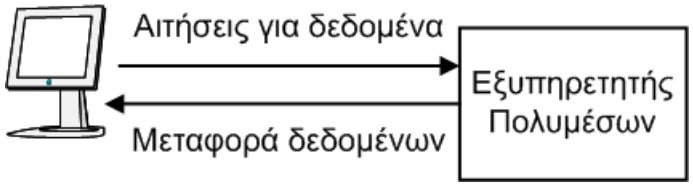
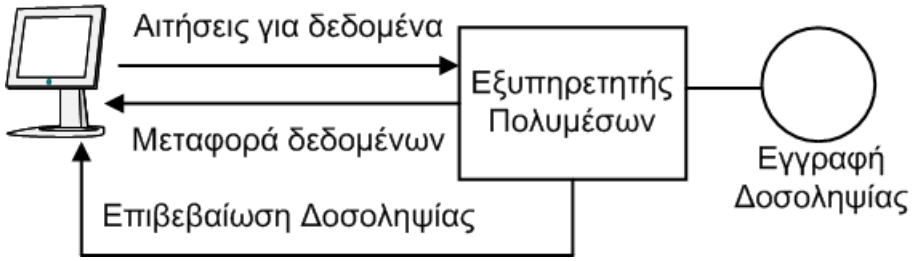
Interaction with a server





- Information retrieval
  - Example: multimedia library
  - Read only
- Transactional applications
  - Example: e-shop
  - Read/write
- Not terribly challenging
  - We just need decent response times

Distribution applications

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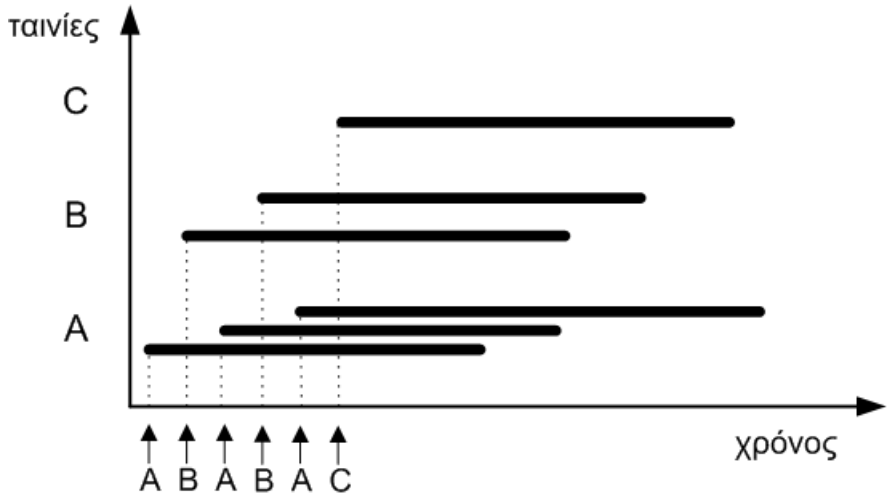
Video distribution (1 of 4)

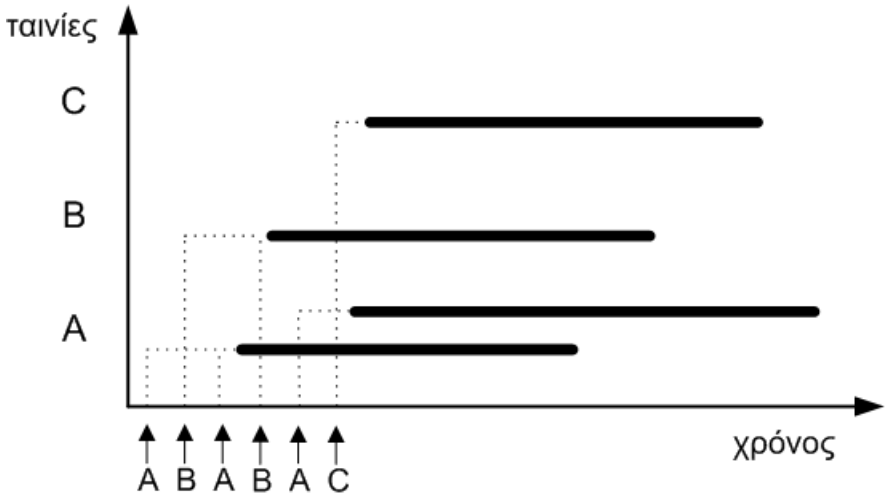
- IPTV
  - Users choose a channel
  - The only interaction is channel change
    - Which is not as easy as it sounds!
  - Users are handled in per channel groups
    - Multicast for each channel
    - Which requires special support
    - Normally offered by the ISP

Video distribution (2 of 4)



- Video on demand (VOD)
  - Large (Netflix) or small videos (YouTube)
  - Every request is different
    - Requires lots of bandwidth
  - Real interaction (pause, move, play)

Video distribution (3 of 4)



- Near video on demand (NVOD)
  - Combination of multiple requests
  - No interaction possible
    - Only by changing the group
  - Tradeoff between delay and cost

Video distribution (4 of 4)

- Main distinction
- Live transmission -> IPTV
  - We see what's on (even if it is not live)
  - No caching
- Stored content -> VOD
  - Push content to servers (CDN)
  - Exploit adaptation (DASH)
  - Group receivers (NVOD)

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End of Section #2

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