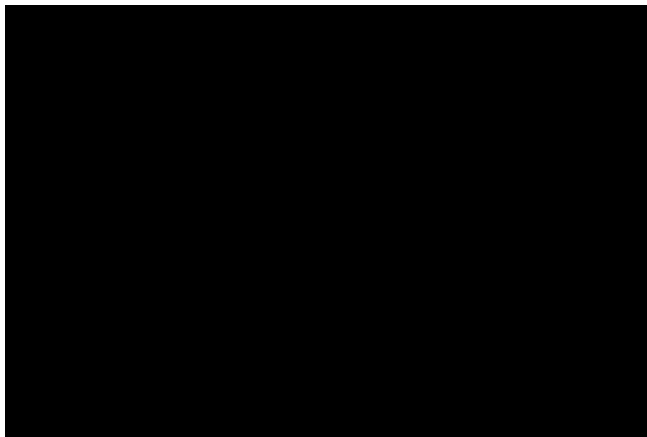
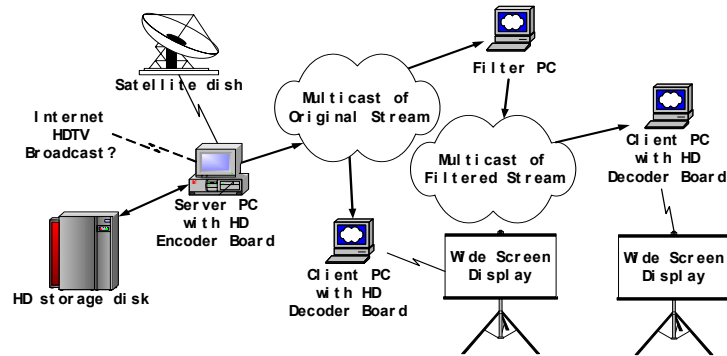

Future Multimedia-rich Network Applications

Klara Nahrstedt
University of Illinois at Urbana-Champaign
klara@cs.uiuc.edu
<http://cairo.cs.uiuc.edu>

Interactive HDTV (Current Status)



Interactive HDTV (2020)



Interactive HDTV (Network Challenges)

■ Application Requirements

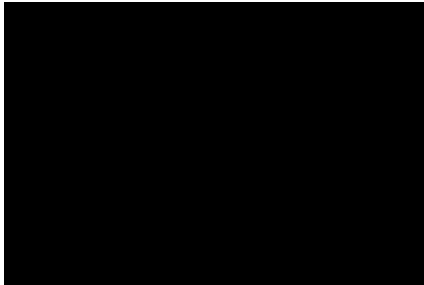
- Internet-based
- Receivers TV Devices
- HDTV Streams
 - 1920x1080, 30fps, 20Mbps, MPEG2 format
- Customization of Content
 - Configurable content (movie, email, web, games)
 - Distributed Content Production
 - Content Protection
- Interactivity and Flexibility

■ Overlay Network Challenges

- QoS Provision
 - Response time 20 ms for Interactivity
 - High bandwidth to Homes/Campuses
- Overlay Reverse Multicast and Integration with Source-based Multicast
- Asynchrony of Content
- Heterogeneity of peers/proxies/end systems
- Real-time Software Solutions

Collaborative Spaces

Current Status



■ **2020 Application Requirements**

- Large Visualization Spaces for Distributed Simulations
- Distributed Grid and Parallel Computation and Storage in Order of Hexa-bytes
- Conferencing with 1000 and more participants to view and augment distributed experiments
- Heterogeneity of Devices and Networks
- Holography

Collaborative Spaces (Network Challenges)

- Throughput of end protocols such as TCP, SOAP, HTTP
- Provision of very different QoS guarantees on Grid as on-demand, conversational, interactive application requirements meet
- Real-time services for data processing inside network (e.g., scaling, trans-coding, low-pass filtering services) to deliver data over wired/wireless networks to large and small devices
- Service routing, service composition

Composite Near and Distance Education (Current Status)



Composite Near and Distance Education

■ **2020 Application Requirements**

- Composition of Smart Seminar and Lecture Rooms into distributed infrastructure to serve large number of on-campus and off-campus students
- Interactivity in Hot Spot Situations
- Device and Network Heterogeneity
- Mobility
- Multiple Educational Applications ranging from
 - Multiple coordinated power-point presentations/video/votes/questions
 - quizzes, electronic voting
 - Office hour conferencing
 - lecture on-demand retrieval
 - electronic TA, Q&A

■ **Network Challenges**

- Wireless Hot Spots in lecture and seminar rooms (addressing, resource allocation)
- Provision of QoS (bandwidth, delay guarantees) in Wireless Rooms
- Interference (infrared cameras, bluetooth mice and wrist-watches, 802.11 iPAQs)
- Programming of Networks, Devices and Applications in these environments
- End-to-end Delay and Bandwidth Provision to Remote Students
- Seamless switching between wire-line and wireless network protocol stacks and seamless switching between different wireless protocol stacks
- Network Security