HYDRA HD Live Streaming System

A NATIONAL SCIENCE FOUNDATION ENGINEERING RESEARCH CENTER

Hong Zhu, Dwipal A. Desai, Moses Pawar, Kun Fu
Roger Zimmermann

Research Goal

- Low latency, high quality HD capable live streaming system
- Video and audio multi-stream synchronization
- Integrated component of HYDRA recording system

Role in IMSC

- Remote Media Immersion (RMI)
- Distributed Immersive Performance (DIP)
- High Performance Data Recording Architecture (HYDRA)
- High quality video and audio content delivery & rendering

Research Approach

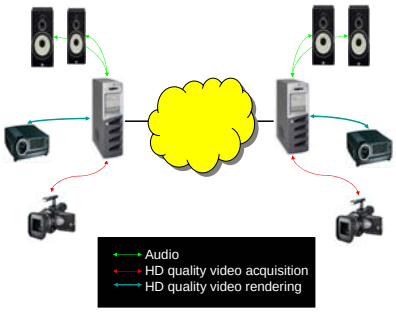
Approach:

- Perform experiments to identify latencies in the system
- Retransmit lost packets to keep content rendering quality
- Timestamp video content at image compression level for synchronization accuracy
- Investigate low latency packet loss recovery techniques

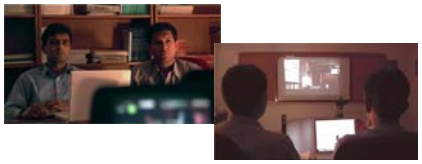
System Components:

- JVC HD 10U Video cameras
- NVIDIA FX 5200 graphics cards
- 3GHz P4 Linux PCs
- Speakers and projectors
- MPEG rendering

System Overview:



Experiment: Hawaii ↔ USC



Local Test at USC

Accomplishments

Demonstrations at Conferences:

- APAN's TIP 2004 conference at University of Hawaii (January 2004)
- CENIC 2004 conference in Marina del Rey (March 2004)

System Implementation:

- Software and hardware integration
- Single packet retransmission implementation
- HD video and stereo audio stream synchronization

DIP 1.0 Experiment

Uniqueness & Related Work

Uniqueness:

- Low latency two-way interactive live HD streaming
- Multi-stream synchronization
- Hardware or software MPEG rendering

Related Work:

- VIC video conferencing tools, commercial tools (non-HD)

5-Year Plan

- Latency reduction in data transmission, acquisition and rendering
- Synchronization accuracy improvement with multiple streams
- Architecture extension to support multiple peers
- Integration with immersive audio