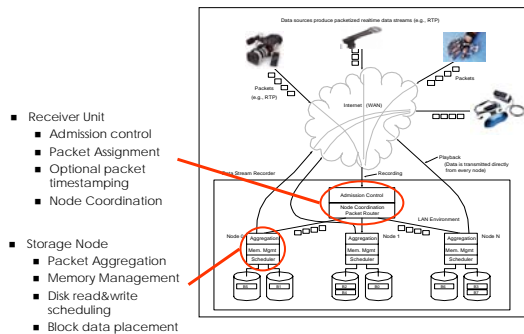


## HYDRA -- High-Speed Immersive Media Stream Recorder

Student: Kun Fu, Dwipal A. Desai, Beomjoo Seo, Moses Pawar, Hong Zhu  
Faculty: Roger Zimmermann

- Goal:** Design and develop a unified architecture for real-time storage and playback of multiple immersive media streams through heterogeneous, scalable and distributed servers utilizing IP networks (e.g., Internet). Enables applications such as video-on-demand, employee training and distance learning on a large scale.
- Role:** HYDRA enables the recording and playback capabilities for immersive applications. For example, in a **Distributed Immersive Performance (DIP)**, it is desirable to record and play back multiple media streams of distributed musical performances.

### HYDRA Architecture



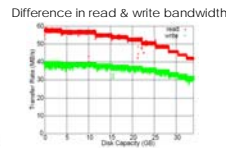
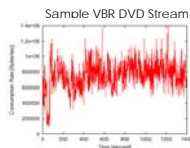
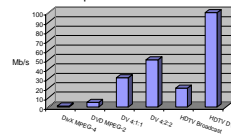
### Distributed Immersive Performance



Single-Node  
HYDRA system

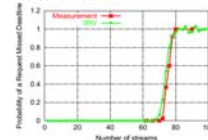
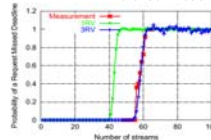
### Challenge: Real-time Media

Bandwidth requirements for different media types



### Statistical Admission Control

- Statistical admission control that models
  - Input stream variability (VBR streams)
  - Read and write latency variability (seek, rotational latency, different bandwidth in different zones)
  - Difference in read and write bandwidth



- Retrieval only experiment
  - MPEG-2: 698,000 bytes/sec (DVD)
  - Disk: Seagate Cheetah X15, disk block size 1 MB
  - 1 % miss-probability
  - 38% improvement (closer to device capabilities)
- Retrieval and recording mix
  - MPEG-2: 698,000 bytes/sec (DVD)
  - MPEG-1: 189,000 bytes/sec (VCD)
  - 1 % miss-probability

### Accomplishments:

- Filed Patents: Yima, SCADDAR, MTFC
- Publications: ACM MM 2003, ICEIS 2004, IEEE Multimedia 2004, MTAP 2004, SP&E 2004, JEI 2004
- In May 2004, we began to conduct experiments for the Distributed Immersive Performance (DIP) project. Vely and Ilia Tosheff of the **Tosheff Piano Duo** have gracefully agreed to help us as test subjects with these experiments. Continuous media data streams, such as video and audio streams, are captured and recorded synchronously by the initial prototype of a single node HYDRA system.

### Industry Cooperation:

- Equipment donated by Intel and Hewlett-Packard; collaboration with the New World Symphony to conduct HYDRA live streaming and Distributed Immersive Performance experiments.

### Five-Year Plan:

- Investigate additional research issues such as the design of a novel disk scheduling algorithm for recording and retrieving of continuous media data and memory buffer management with a limited and unified pool of buffers.
- Prototype implementation of the multi-node HYDRA system.
- Test and evaluate our multi-node HYDRA implementation through a series of new DIP experiments together with several other IMSC investigators.