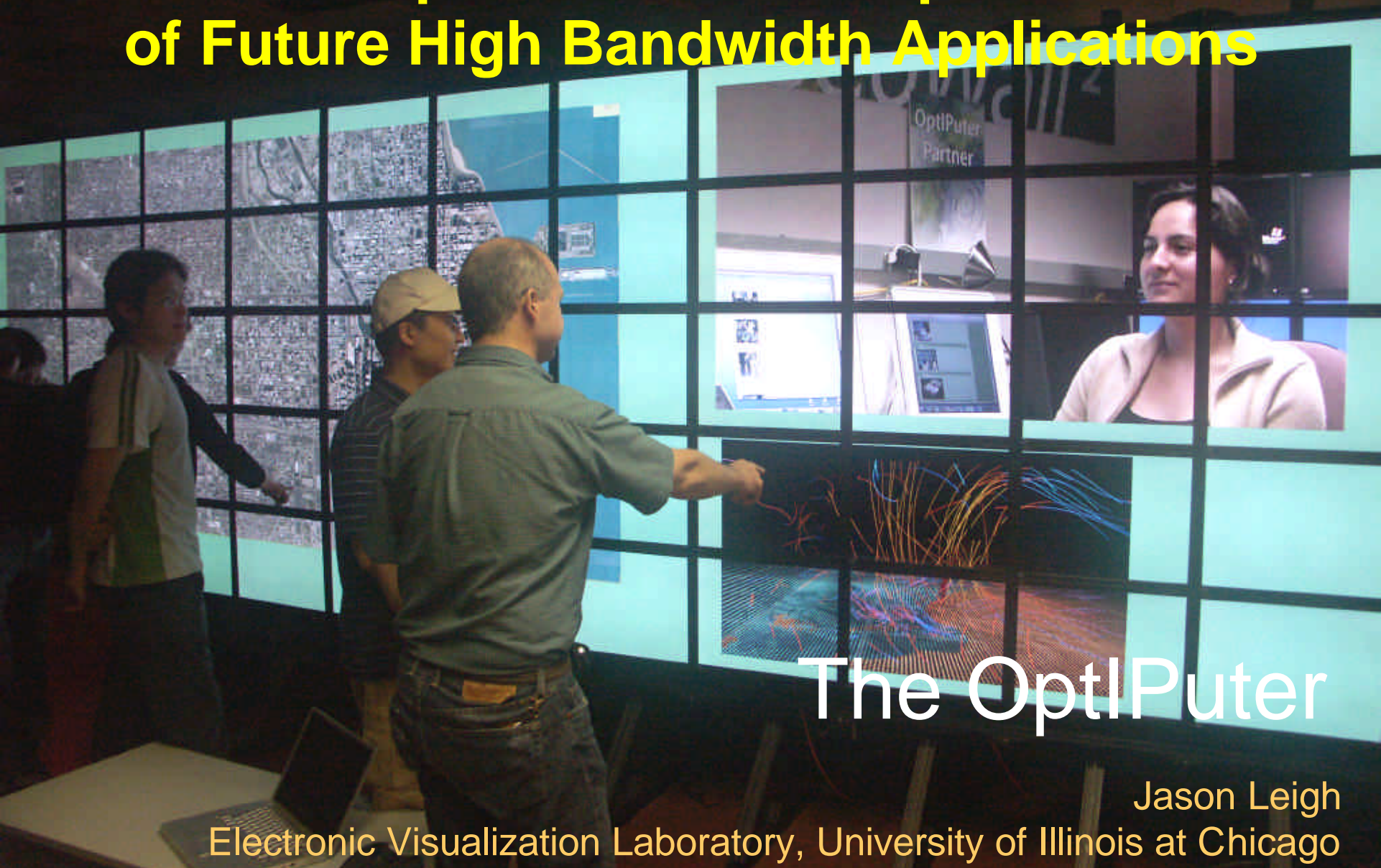


PFLDNet 2006 Panel on Transport Protocol Requirements of Future High Bandwidth Applications

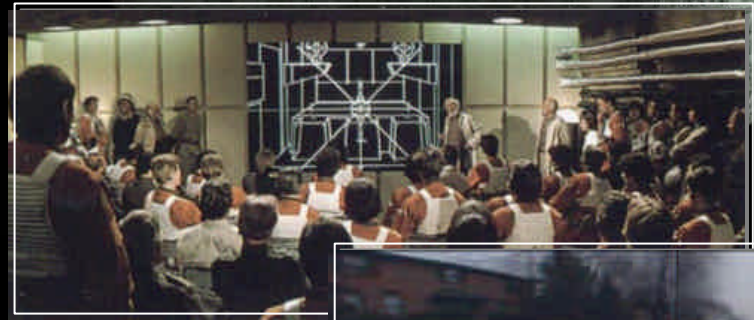


The OptlPuter

Jason Leigh
Electronic Visualization Laboratory, University of Illinois at Chicago

A long time ago in a laboratory not far away...

- Established in 1973
- 3 Co-directors: Tom DeFanti, Dan Sandin, Jason Leigh
- 10 full time staff
- 40 students, 30 funded students, 50% Art and CS
- Research in: advanced display systems, visualization, high speed networking, and collaboration & human computer interaction.
- 30 years of collaboration with artists and scientists to apply new computer science techniques to these disciplines.
- Funded mainly NSF, ONR, NIH, NTT, Microsoft.



The OptlPuter

- The Optiputer is an NSF Information Technology Research project to examine a new model of computing whereby **ultra high speed networks form the backplane** of a, planetary scale computer.
- The projects partners include UCSD, UIC, NU, SDSU, TAMU, UCI, UIUC/NCSA, USC/ISI; affiliate partners are USGS EROS Data Center, UvA, NASA, SARA, KISTI, AIST, RINCON.
- OptlPuter research focuses on developing technology to enable the **real time collaboration and visualization of very large time-varying volumetric data-sets for the earth sciences and the biosciences.**
- We achieve this by building: **A virtual computer** from clusters of computers that act as giant storage/compute/visualization **peripherals attached to a backplane** that consists of ultra high speed **deterministic networks.**

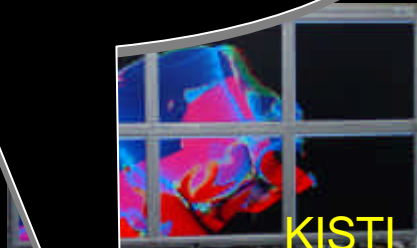
OptIPuter Scalable Display Appliances

Currently displays are driven by large powerful PC clusters

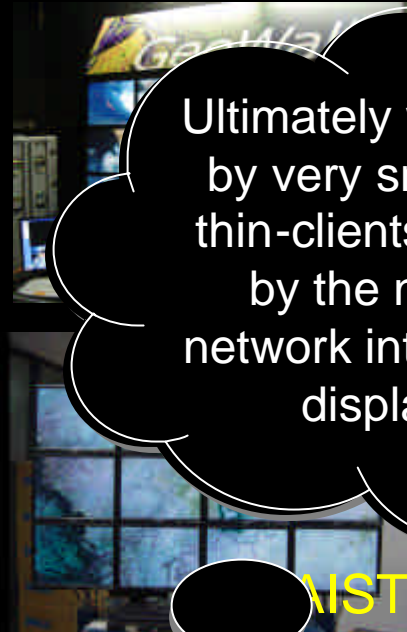
Ultimately will be driven by very small PCs as thin-clients directly fed by the network or network interface in the display itself



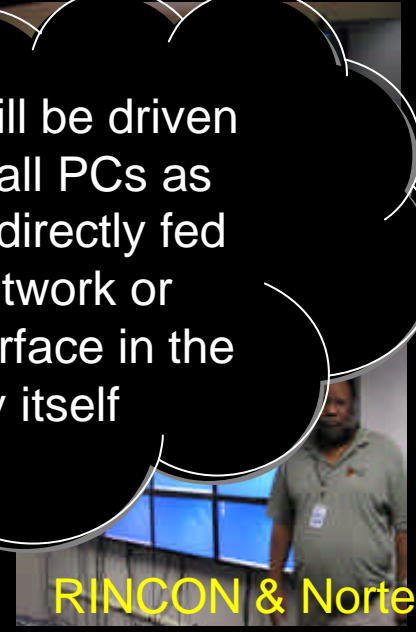
SARA



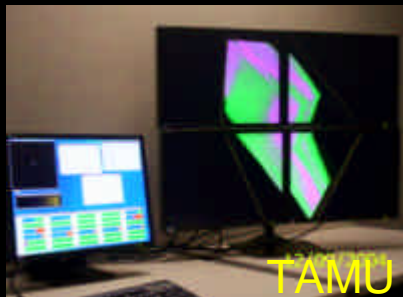
KISTI



NIST



RINCON & Nortel



TAMU



UCI

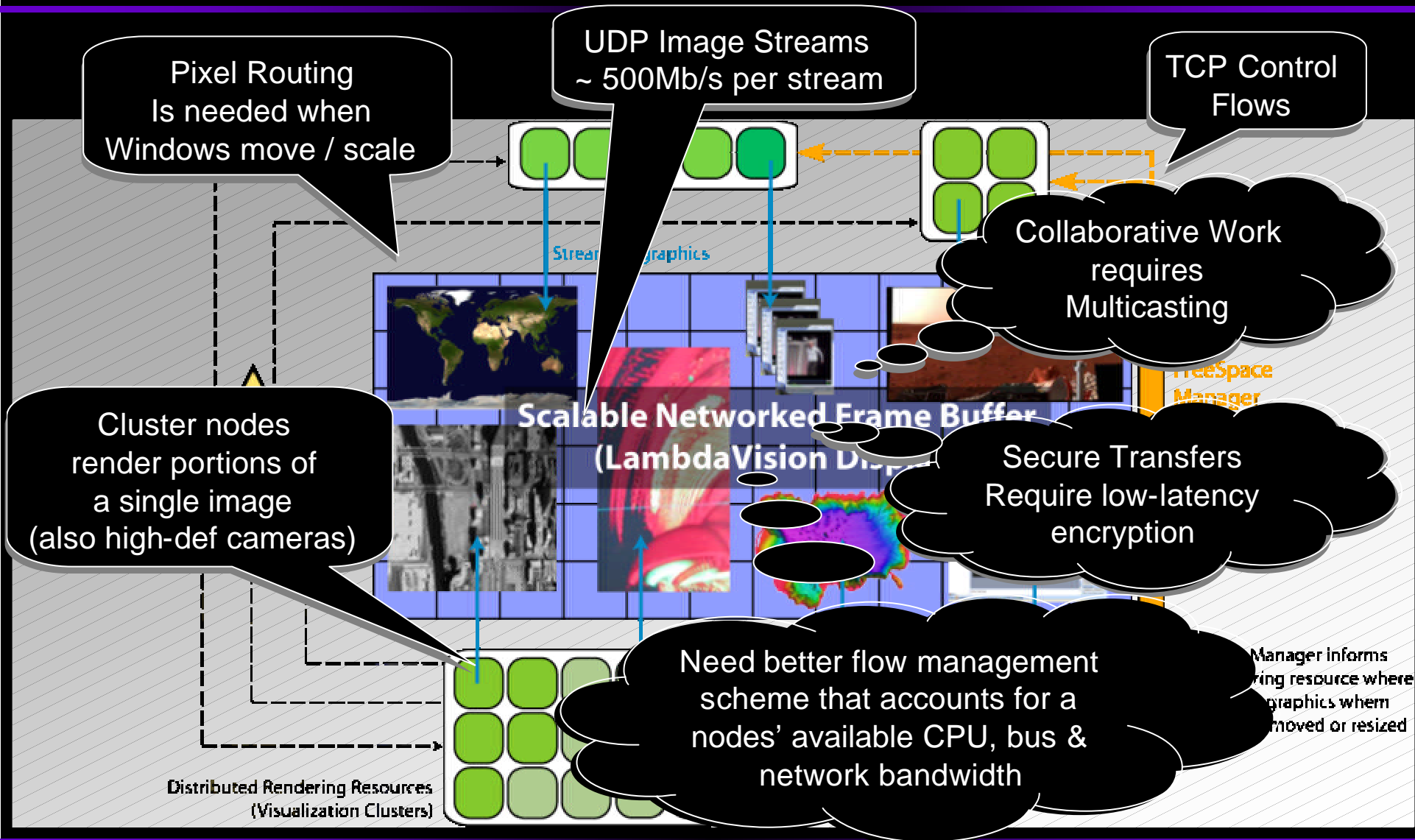


UIC



CALIT2

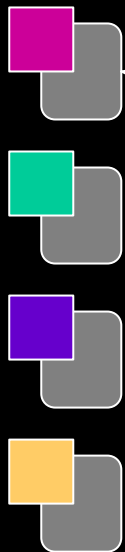
Scalable Adaptive Graphics Environment



The Multicasting Problem



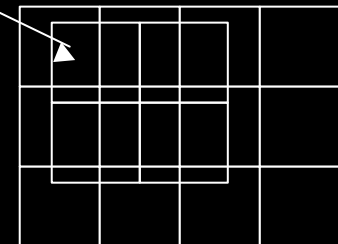
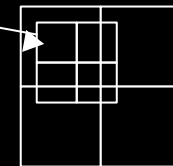
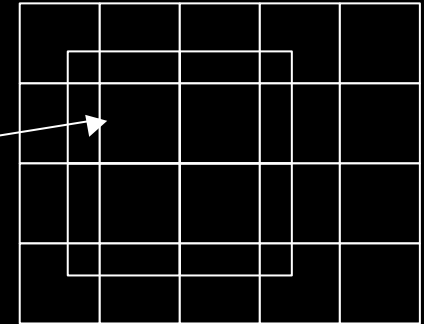
Sample image



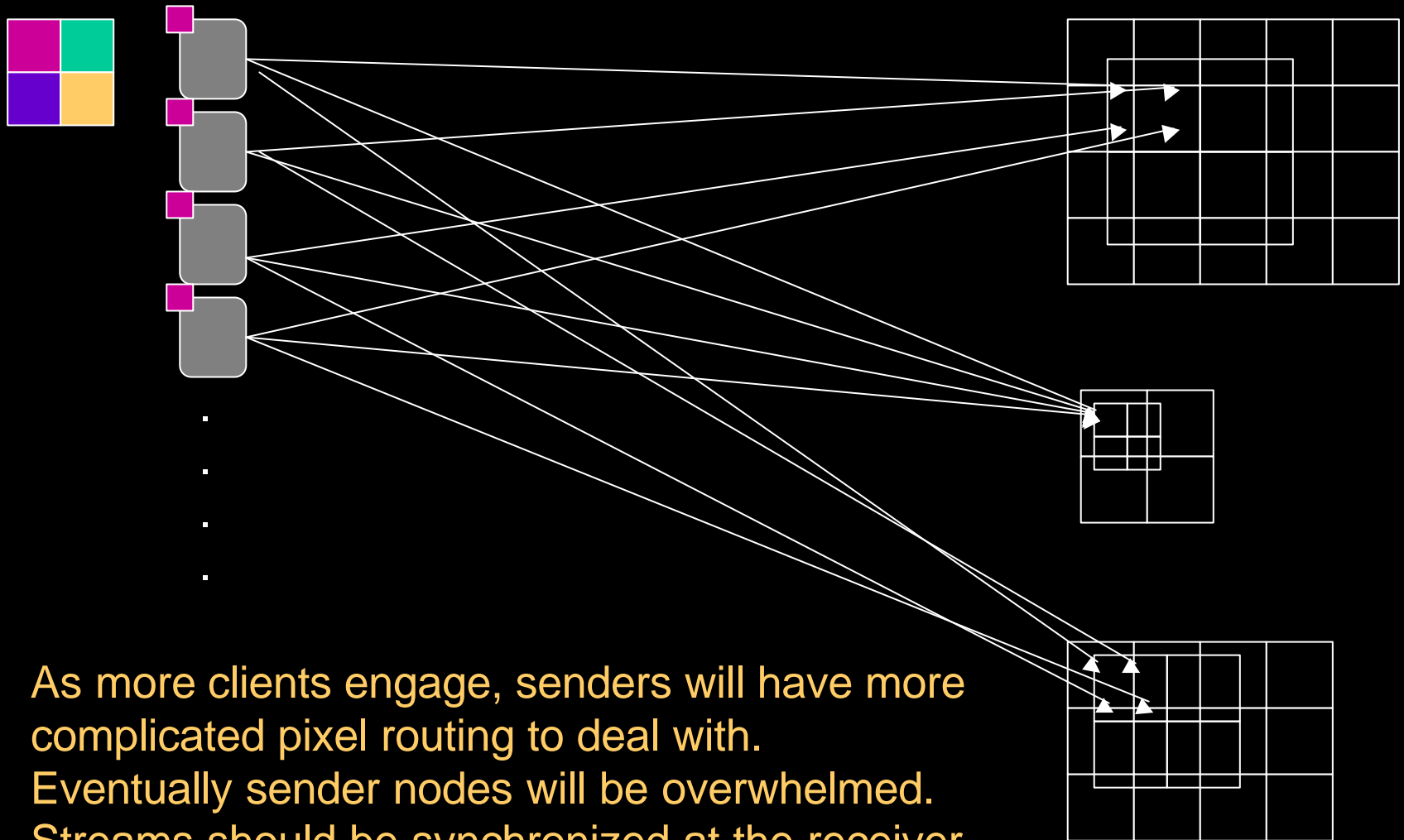
Cluster rendering
nodes render a
portion of the
image

Bandwidth needed may be
on the order of 1 Gb per stream

Tiled displays

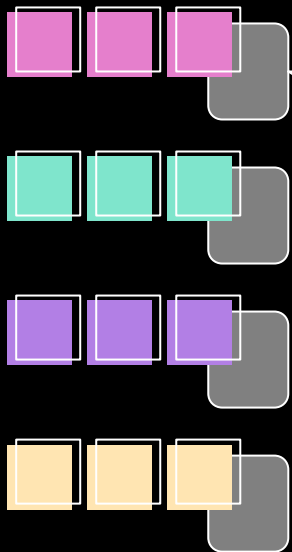


Broadcast Solution: Partition Image Into Smaller Pieces



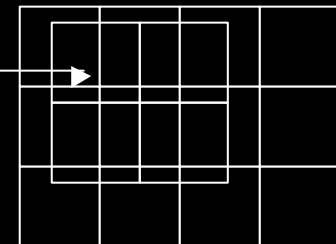
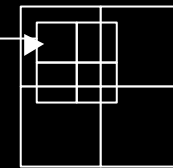
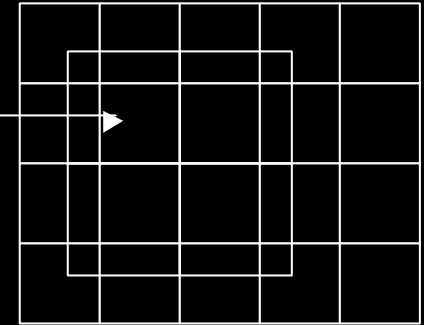
1. As more clients engage, senders will have more complicated pixel routing to deal with.
2. Eventually sender nodes will be overwhelmed.
3. Streams should be synchronized at the receiver.

Layered Multicasting Solution



Multicast interleaved versions onto different addresses (each version only occupies 1/3 of the required bandwidth)

Clients listen on multicast addresses to retrieve the needed resolution versions



How to support IP multicast on the order of tens of Gb/s?