NRC · CNRC

From Discovery to Innovation...

Quality of Experience in Advanced Collaborative Environments

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NRC (National Research Council of Canada, Ottawa)

WestGrid (Western Canada Research Grid) & SFU (Simon Fraser U)

CRC (Communications Research Centre, Ottawa)

University of Ottawa

National Research Council Canada | Conseil national de recherches Canada

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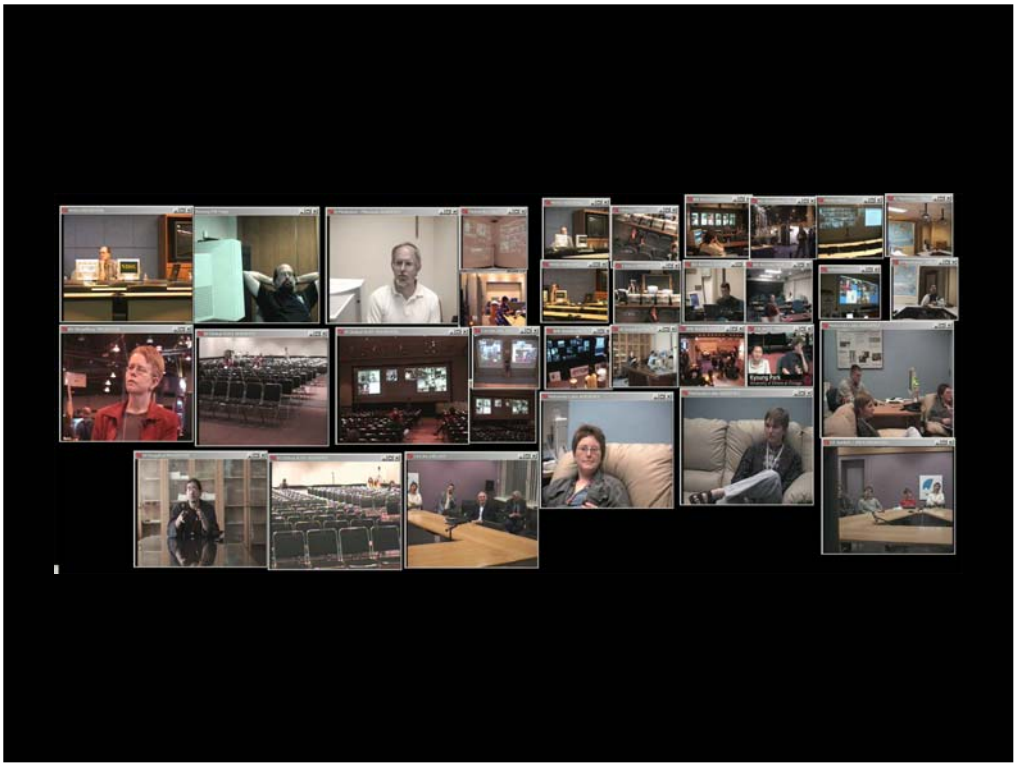
Canada

- 3-year, top-down funding

Core Technology

- Access Grid (AG)

- a collection of components that support collaboration
- standard PC hardware with multimedia peripherals (e.g., video capture, sound)
- open-source software
- cameras, microphones, echo canceller, projectors, …



… and it is really hard to work with large groups, and yet large collaborations are more and more important because of the global economy and the need to involve people with different skill sets, often from different organizations, in projects.

Photo: Motorola Labs

http://internet2.motlabs.com/pics/user/scglobal/scglobal01.jpg

This is multi-disciplinary, multi-site project involving computer science, engineering, psychology, art, etc. It is an example of the large-group collaboration that is common in today's projects.

Photo: Argonne National Laboratory

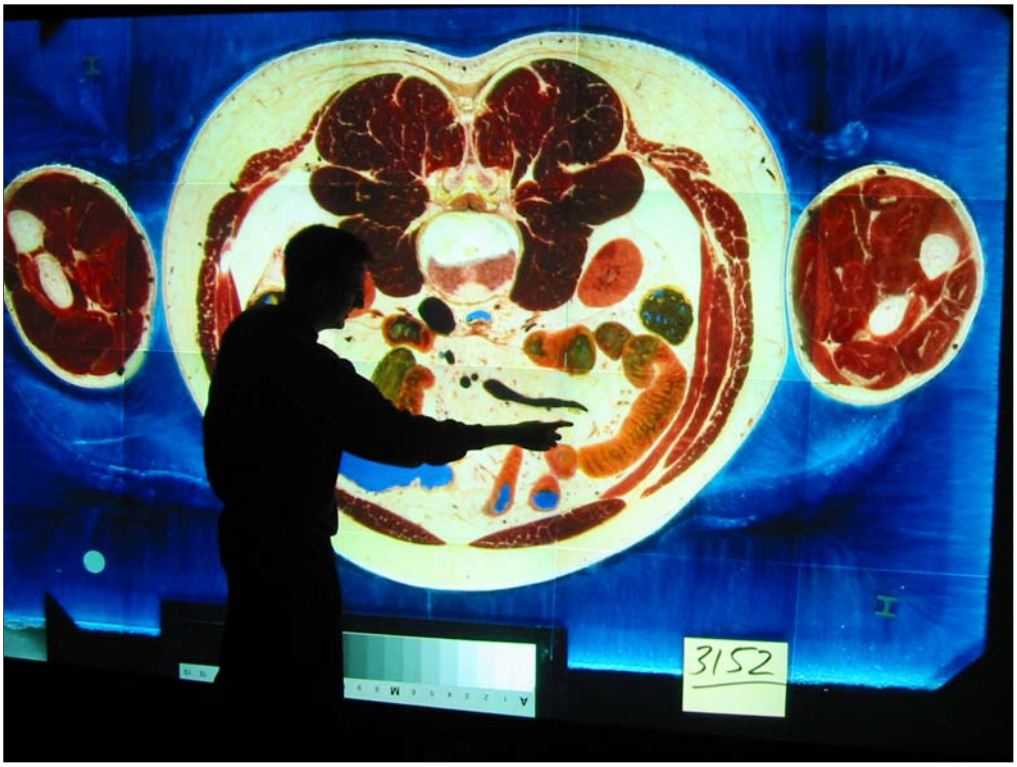
http://www-unix.mcs.anl.gov/~fritsch/fritsch-images/AM_ANL1d.jpg

AG Venues


Venue Client
Venue Preferences My Venues Help
https://iit130033.iit.nrc.ca:8000/Venues/default
Go
NRC Venue Server Lobby (2.3)
Exits
Advanced Collaborative Environments
e-Learning
High Performance Computing
QOE Development
Participants
Andrew Patrick
MMRL - wucha
MMRL Node, NRC
MMRL PIG, NRC
NRC eLearning Display
Data
AVC Demo Intro.ppt
doc.zip
Services
Application Sessions
AVC-0.2 - 09:26:56 AM November 18, 2004
Shared Browser - 12:45:49 PM November 08, 2004
Shared Presentation - 01:31:29 PM November 23, 2004
Shared Question Tool - 01:31:23 PM November 23, 2004
-- Entered venue NRC Venue Server Lobby (2.3) (Tue, 23 Nov 2004, 14:22:10)
NRC's Venue Server Lobby located in the Mutual Media Reseach Laboratory in Ottawa, Canada
-- Entered venue ACE Room (Tue, 23 Nov 2004, 14:46:45)
Room for the Advanced Collaborative Environments project
-- Entered venue NRC Venue Server Lobby (2.3) (Tue, 23 Nov 2004, 14:52:14)
NRC's Venue Server Lobby located in the Mutual Media Reseach Laboratory in Ottawa, Canada
Display
Add your personal data to venue

Key Services

- video communication (multi-camera, multi-screen)
- audio communication (multi-microphone)
- shared workspaces
  - data repository
  - Internet browsing
  - Powerpoint presentations
  - question tool
  - shared desktop (for arbitrary applications)
- tools under development
  - shared movie viewer
  - HDTV
  - shared visualizations (Westgrid)



We examined how people interact with information

Photo: State University of New York at Buffalo
http://www.buffalo.edu/news/hires/AccessGrid.jpg

QoE: Quality of Experience

"The characteristics of the sensations, perceptions, and opinions of people as they interact with their environments"

- **Measure of human experience, not technology**
- **The "touchy-feely" part of collaboration**
  - **Pleasing and enjoyable VERSUS displeasing and frustrating**
- ***User satisfaction requires a good experience!***

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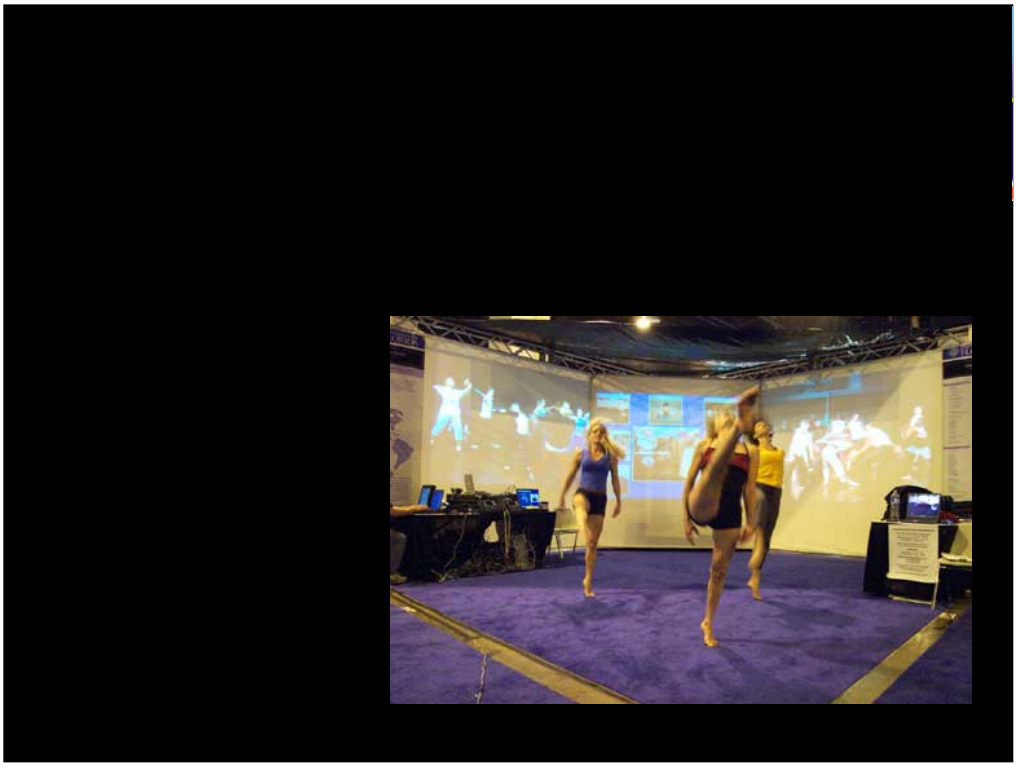
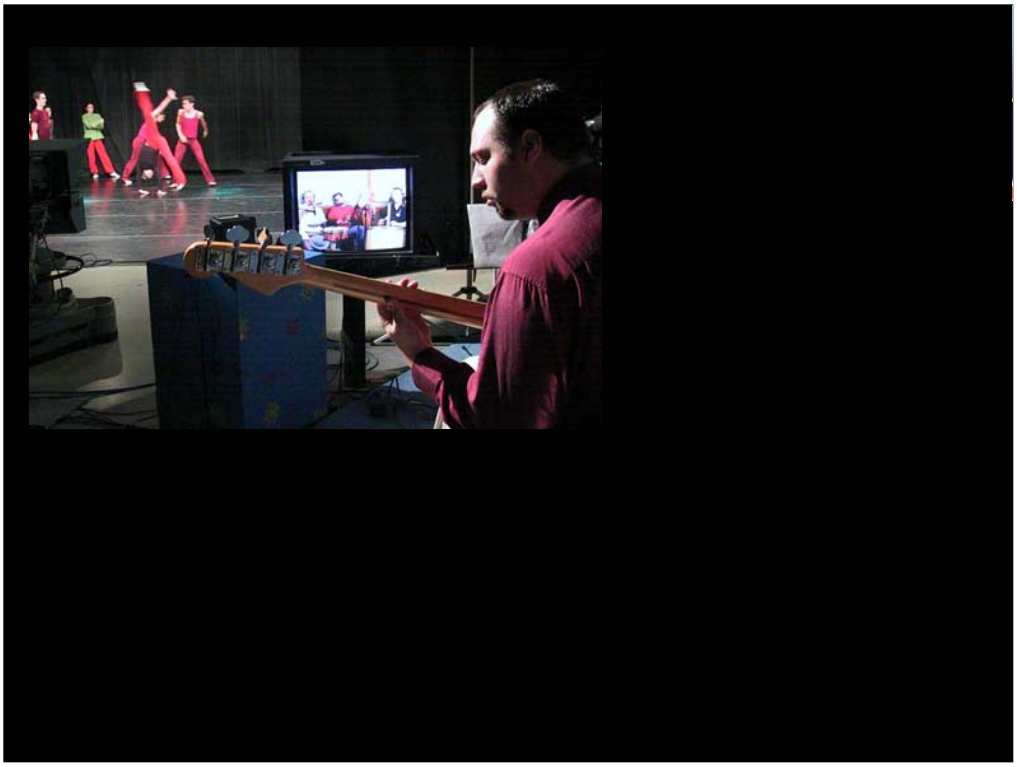


and all of the ways we can interact with others…

Photo: Digital Worlds Institute, University of Florida



and how to be creative at a distance.

Photo: Digital Worlds Institute, University of Florida

Characteristics of QoE

- QoE is not QoS
  - QoS: technical approaches to improve data flow
    - Diffserv, RSVP, MPLS
  - QoT: characteristics of the data flow
    - Throughput, packet loss, latency, jitter
  - Goal is to maximize QoE
    - Need to understand QoE to use QoS and QoT effectively
    - Good QoS ⇒ good QoT ⇒ good QoE

- QoE-drivers are different for different tasks
  - Task: Streamed audio lecture
    - Fidelity is most important for QoE
  - Task: Interactive business meeting
    - Latency is most important for QoE

Quality of Experience and Access Grid

- **Identifying tasks and needs**
  - **What is the user trying to accomplish?**
- **Create task-specific AG venues**
  - **Populate venue with services that meet needs**
  - **Services are ranked based on importance to task**

- **Deploying task specific AG services**
  - **Configure node services appropriate to the task**
  - **Start/stop/configure node services "auto-magically"**

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Task: Earth Magneto-Hydro Dynamics

Needs: Talk, see collaborators, see visualization, link computation

Services: Configure AG node services (and shared apps)

Technologies: Start node services as appropriate


Visual Media Research Laboratory

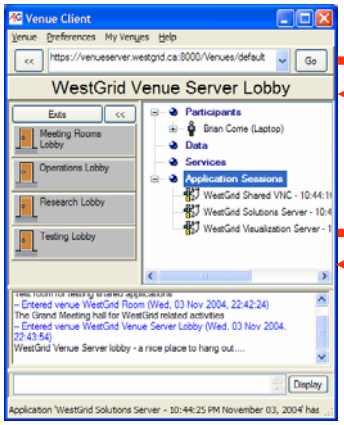
and how to transform experiences. What happens when technology is moved out of the lab and onto the lawn? What happens when computers are used for things other than business?

Photo: IIT

Ken Emig & Alexis Andrew
Transnet Conference on Performance and Technology
Simon Fraser University, June 2005

AG Venue Customizer (AVC)
The AVC Process

Add Shared App



AVC Manager

Choose task
Choose bandwidth

Store Task and Services

AVC User

Download task
Configure services

Change Task

VideoService

VisService

AudioService

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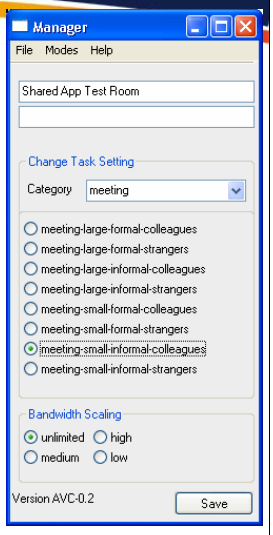
AVC Features

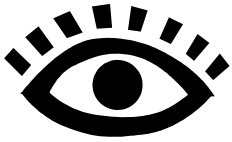
- Set of common tasks provided
  - Services configured based on CSCW research
- User customizable tasks available
  - Users can add their own tasks
- Controls node services through venue client
  - Works on multi-machine nodes
- Adapts services based on bandwidth
  - Adaptation sensitive to task



AVC Effects

- control the launching and settings of AG node services
- currently controls audio service via RAT parameters
  - audio encoding (L16, PCM, DVI, GSM)
  - audio sampling rate (16 kHz, …)
  - silence suppression (off, …)
  - lecture mode (off, …)

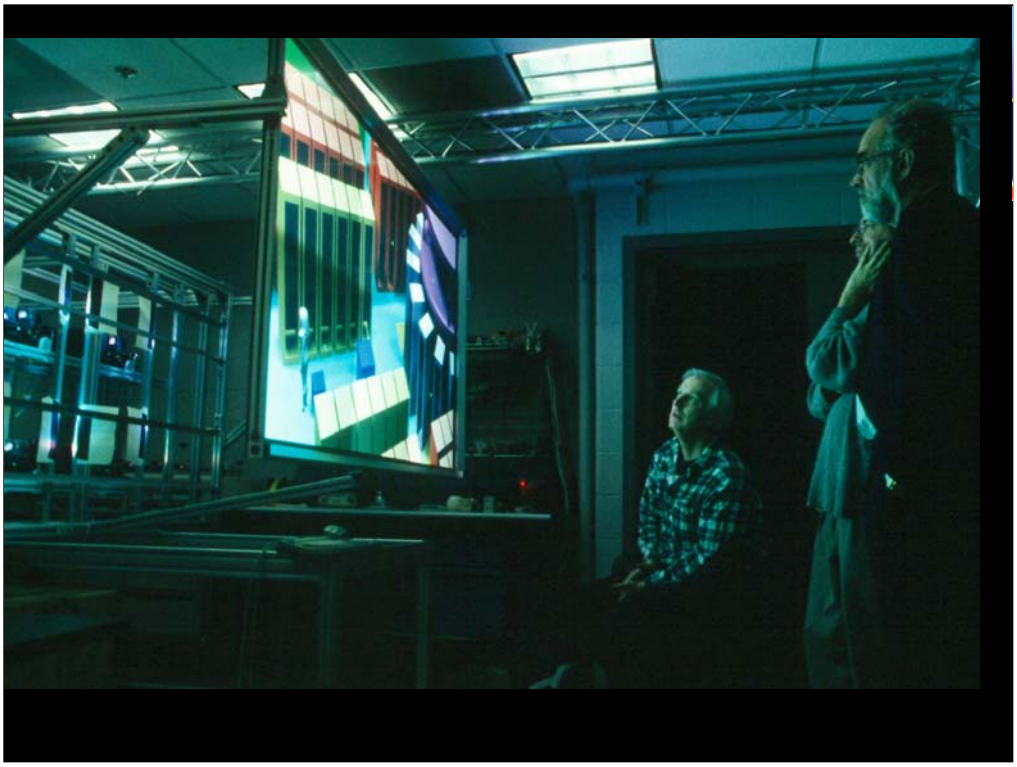
- currently controls video service via VIC parameters
  - frame rate (24, …)
  - video size (normal, …)
  - video encoding (H.261, …)
  - bandwidth (64 – 4096)
  - max bandwidth (256 – 4096)
  - quantization quality (71 – 100)



AVC Uses

Typical uses for AVC are:

- **configure an important business meeting for the highest possible audio and video quality when all participants have high bandwidth**
- **configure a distance education event where some students will have limited bandwidth to give relatively high priority to video (because of the visual materials being used in the lesson), and relatively low priority to audio**
- **scale a meeting to take into account the minimum bandwidth available to the participants (e.g., someone is connecting from home)**



… industrial tools and processes …

Photo: Argonne National Laboratory
http://www-unix.mcs.anl.gov/~fritsch/fritsch-images/scan34.jpg

… and new forms of expression and entertainment.

Photo: Digital Worlds Institute, University of Florida

Future Work

- implement control of other node/shared services
  - shared work spaces
  - presentation spaces
  - turn-taking support
  - decision support
  - privacy controls
  - meta-communications

- what do quality settings mean for these services?

- deal with limitations of AG system
  - media tools
  - multicast/unicast
  - centralize task descriptions

Open Questions

- concept testing
  - can users describe their tasks and classify their meetings?
  - can we determine the needs for these tasks?
  - is the matrix correct?
  - are customized venues better than default venues?

- usability testing
  - installation
  - integration
  - ease-of-use