The LabSpace Project

Building the National Electronic Laboratory

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How Would Work/Life be Different if Travel was Free and Instantaneous ?

How Would Work and Life be Different if Travel was Free and Instantaneous ?

- You would live where you want to.
- You and your colleagues would meet in interesting places.
- You would leave your things where you need them for the task at hand (assuming some security).
- You would need to "arrange" to meet people in certain places at certain times.
- You would need mechanisms to "locate" people and things.
- You would develop habitual places for gathering to discuss science and life.
- Physical space limitations would still exist (i.e. 1 million people will not fit into a single room).

The Need for Persistent Electronic Spaces

Adding the concept of **Persistent Electronic Spaces** to the current suite of computer supported collaborative work tools can provide the virtual equivalent of instant and (almost) free travel.

- Persistence is needed to build electronic communities
- Persistence is needed to map the real world to virtual environments
- Persistence is needed to lead us away from the phone call model for collaborations towards the "**Cafe**" model
- Persistence is needed to improve navigation and discovery processes for the NII

The LabSpace Project

- Technology (ANL, NEU, IBM, Xerox)
- Testbed (ANL Futures Laboratory Project)
- Trials (Materials, HEP, Structural Biology)
- Demonstration (Supercomputing 1995)
- Pilot (Advanced Photon Source 1996)
- Deployment (DOE NII 1997)

Foundation Technologies

- LabSpace relies on a number of enabling technologies including:
    - TB-MuVE (MOOs)
    - Parallel media servers (SIO)
    - Workstation audio/video tools (Multimedia)
    - Multicast and advanced networking (ATM)
    - Portable parallel computing environments (HPCC)
    - Immersive virtual environments (CAVE)

LabSpace Components

- Elab server
- Broker
- Session browser
- Multistream archiver
- End user (client) modules
- Filters

Elab Server

- **Text based- multiuser virtual environment**
- Based on Lambda MOO server technology from Xerox PARC (e.g. BioMOO, AstroVR, InfoPark, WaterfallGlen, JHM, Lambda)
- Provides virtual environment "**context**"
- **Manages Database** of virtual locations, attributes, access mechanisms, users and objects
- Extensible and Object Oriented
- Scalable and portable

Broker

- Manages connections
- Provides security, access control, authentication
- Management and coordination of modules
  - format conversion identification
  - flow control
- Module invocation (see modules)
- Negotiates for services (e.g. archiving)

Session Browser

- Navigation and discovery
- Resource reservation and cataloging
- Local capabilities database
- User registration
- Metadata

Multistream Archiver

- **Multipoint, Multistream** input/output
- **Parallel record and playback engine**
- Video, audio, text, data, gesture, vector, t-mesh and pixel streams
- **Time coded interleaved data streams**
- Search and browse functions
- Multiple **indexing engine** support
- Format conversion, compression

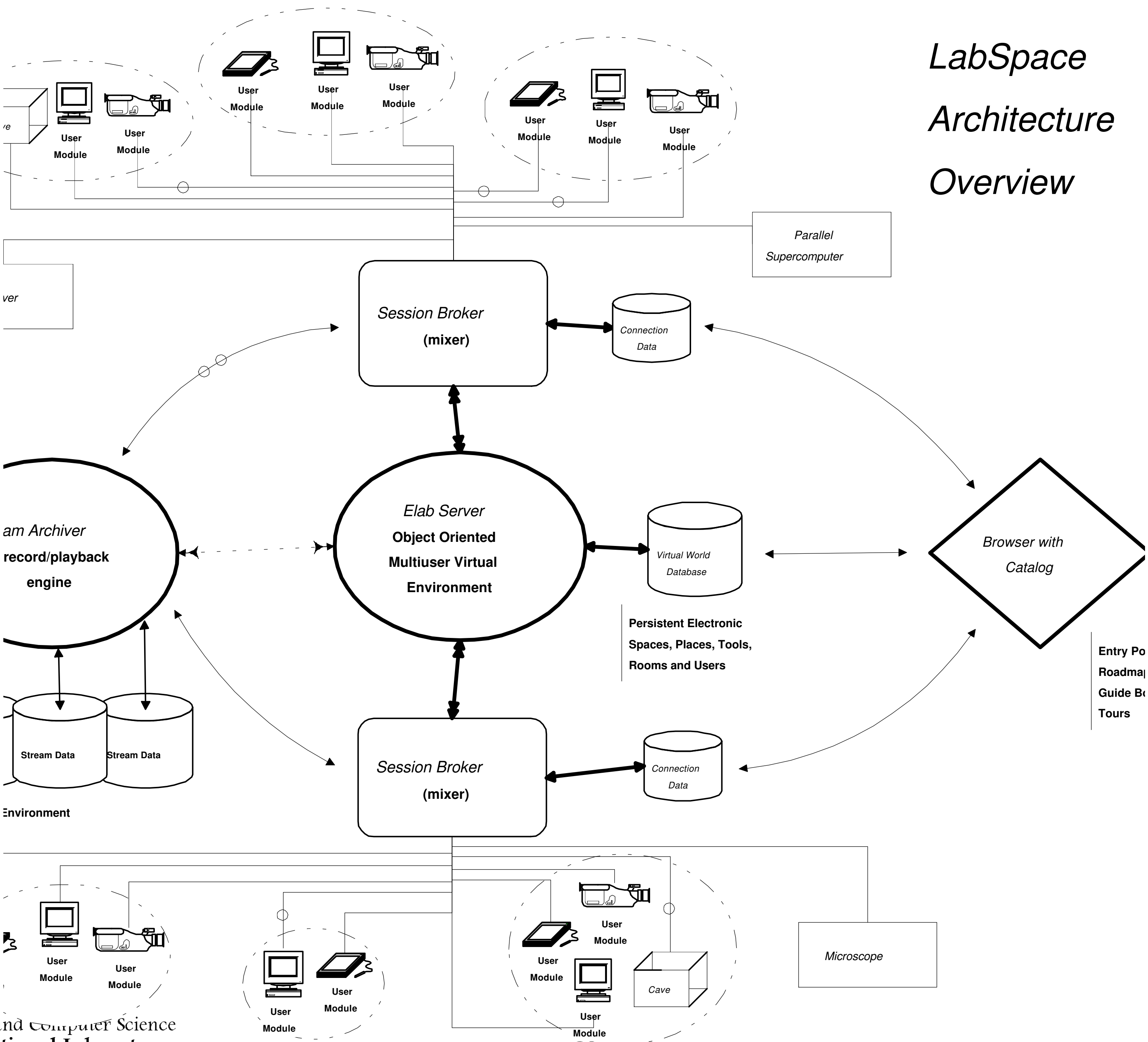
User Modules

- Audio - Video (e.g. nv, vat, nevot, Ultimedia)
- Instrumentation interfaces (e.g. LabView)
- Whiteboard, sketch pad, proof board, easel
- Shared X servers
- Immersive displays (e.g. CAVE)
- **Leverage, Leverage, Leverage**

Filters

- Unicast - Multicast
- Encode/Decode
- Format Conversion (e.g. PCM - DVI)
- Bandwidth reduction (e.g. ATM-ISDN)
- Modality conversion (e.g. text-audio)
- Language conversion (e.g. English-French)
- Debugging and quality monitoring

LabSpace Architecture Overview



Applications Trials

Four types of trials are planned, each trial involves a different type of user community, scale and set of user expectations and will stress the design and implementation in unique ways.

- Electron microscopy center ANL
- High energy physics - CERN
- Structural biology center (SBC)
- LabSpace development team

Electron Microscopy Center

- **Small scale (2-10 users/session)**
- Instrument control is important
- Image processing and analysis dominate
- University, industry and lab users
- Users not internet and Unix savvy
- Challenge: **instrumentation interfaces**

High Energy Physics

- **Large scale (10-200 users/session)**
- Widely distributed users (many sites)
- International networking is important
- Laboratory and university
- Focus on detector design and data analysis
- Users internet and Unix savvy
- Challenge: **scale and bandwidth flexibility**

Structural Biology Center

- **Medium scale (10-40 users/session)**
- Users not computer enthusiasts
- Data protection is important
- Laboratory, university and industry
- Focus on data collection, analysis, and team coordination
- Challenge: **security and ease of use**

LabSpace Development Team

- Small scale (2-10 users/session)
- Extant TB-MuVE users
- Coordination of software development
- Laboratory, university (students)
- Flexibility is important
- Challenge: **incremental usability**

Status of Project

- Architecture definition and component design underway since December 1993
- Development testbed and laboratory infrastructure under construction
- Early project team already using TB-MuVE
- Prototype **end user modules** under development (leveraged with existing codes)
- IBM and Xerox collaborations established
- Release 1.0 scheduled for December 1995

Collaboration is Invited

- We are interested in developing systems that will be used and are capable of large-scale deployment.
- We do not want to reinvent anything.
- We are interesting in partnering with all groups interested in the same goals (interoperability, scalability, portability, necessity of persistence, security and ease of use).
- We believe that DOE is the ideal environment for prototyping and testing the next generation of computer tools for supporting collaborative work.