



# Current Research Directions in Collaboration Tools

Deb Agarwal

Lawrence Berkeley National Laboratory

# Motivation



- Collaboration size ranges from two to hundreds - a collaboration likely begins with just two or three members who decide to work together
- Interaction capabilities needed vary over time and are determined by the activity being pursued
  - Meeting/presentation
  - Document editing
  - Computations and data
  - Remote experiment
  - Shared coding
- Interactions are often asynchronous
- Collaborators prefer to use secure systems for their interactions
- Denial of service for legitimate users has serious consequences and will lead to use of insecure systems if available or lack of adoption

# Example Existing Tools



- Collaborative environments
  - Groove – [www.groove.net](http://www.groove.net)
  - Sakai/Chef - [collab.sakaiproject.org](http://collab.sakaiproject.org)
- Videoconferencing
  - H.323 - [www.ecs.es.net](http://www.ecs.es.net)
  - Access Grid – [www.accessgrid.org](http://www.accessgrid.org)
  - VRVS – [www.vrvs.org](http://www.vrvs.org)
  - Conference XP – [www.conferencexp.net](http://www.conferencexp.net)
- Components
  - Wiki – [www.twiki.org](http://www.twiki.org)
  - XMPP/Jabber – [www.jabber.org](http://www.jabber.org)
  - E-beam shared white board - [www.e-beam.com](http://www.e-beam.com)
  - SciShare file sharing system - [www.dsd.lbl.gov/P2P/file-share/](http://www.dsd.lbl.gov/P2P/file-share/)
  - Plone content management system – [www.plone.org](http://www.plone.org)

# Typical Decision Variables



- Capabilities provided
- Ease of use
- Available to collaborators
- Interoperability with other tools
- Required hardware, software, and operating system
- Availability of support and servers
- Security
- Availability of 'killer' content or capability
- Robustness and reliability
- Flexibility to add features or customizations

# Primary Research Directions



- User interfaces
  - Asynchrony
  - Persistence
  - Immersion
- Security
  - Protect content
  - Limit access
- Sociology of collaboration
  - Motivations of collaborators
  - What tools will be successful and why
  - Determine 'killer' content
  - Learn lessons from the existing collaborations

# User Interface Issues



- Support for time zone and work time differences (asynchrony)
  - Archiving of content for later viewing
  - Persistence across login sessions
- Information provided about the remote environment and people
  - Presence
  - Busy
- Integration of the environment
  - Single combined interface
  - Interoperable tools
  - Completely separate components
- Amount of engagement required
  - Full attention
  - Occasional glance
  - Notification of changes

# Asynchrony Research



- Archiving of content
  - Where should the content be archived?
  - How to index the archive?
  - How to correlate the streams?
  - How to maintain authorization?
- Presence information
  - How to gather accurate information?
  - How much information is enough?
  - How do we maintain privacy?
- Asynchronous interaction
  - How do you support a multi-day conversation?
  - What is the best way to notify people of content?

# Partial Answer - Personal Archives



- Each person or group can run and control their own archive
- Archiver is visible in the collaboration space so people know it is recording
- Archiver can be invited to record a session
- Access to the archive is controlled by the owner of the archive
- Metadata stored to define context
- Search capabilities to locate particular content



# Partial Answer – Jabber Instant Messaging

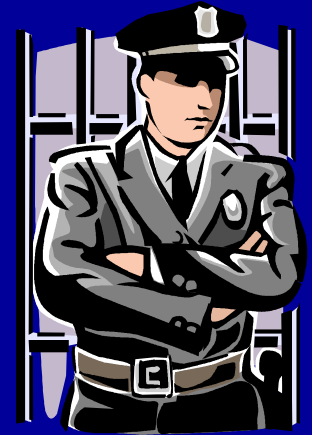


- Provides presence and idle indication
- Allows users to control who can see their presence information
- Chat rooms and instant message sessions survive individual login sessions and provide scroll back buffer for context
- Clients available that can notify users of content appearing

# Security Issues



- Restrict access
  - Authenticate users
  - Limit access to authorized users only
  - Protect sensitive content using encryption
- Provide ease of use
  - Add new users without requiring system administrator
  - User authorization managed by users
- Robust and reliable security
  - Minimize denial of service for legitimate users
  - Debugging information provided when access fails



# Security questions



- How much security do we need and how secure is the resulting system?
- Can users access the collaboration from an Internet café?
- Can we minimize the threshold for new user entry into the system?
- Do all the components in the system require the same level of authentication for access?
- Can we eliminate the dependence on servers? (particularly while the collaboration is small in number)
- Can we build security that makes sense to users?

# Partial Answer - Authentication Model



- A user has multiple means of authentication
- Registration methods
  - Self
  - Trusted user
  - Administrator
- Authentication for a particular session based on
  - Location
  - Methods available
  - Security of local machine
  - Availability of connection to servers
  - Software available on local machine
- Authentication method for a session a property of a user's session
- Authentication method parameter to authorization

# Partial Answer - Crossing the borders



- Escort
  - Accompany a user in an area they are not normally authorized to access
  - Only provides privileges of the host or less
  - Host able to control the guest's access
- Vouching
  - A user vouches for a less privileged user
  - Temporarily elevates privileges of the vouchee
  - Vouchee able to act without escort
- Elevation of credentials
  - Registration of a user's credentials to allow higher privileges – can be done by anyone with the higher credential level

# Authorization Issues to be Solved



- Authorization decision points/coordination
  - Joining a private conversation
  - Entering a shared venue
  - Looking at files/shared data
  - Accessing archives
- Authorization decision needs to take into account
  - Method of registration
  - Method of authentication
  - Vouching information
- Escort affect on authorization
  - Filter escorted user's access to real-time information
- Limitation of access granted by vouching

# Prototype Development Environment



- Needed an application to implement the research ideas
  - Gain experience
  - Test assumptions
  - Gather user feedback
- Collaborations desperately need this model
- Early experiments in our IRC-based presence and messaging application indicate that these ideas have great promise

# Jabber - Presence and Messaging



- “Jabber” is a set of standard protocols for streaming XML elements between any two points on a network
- Provides near-real-time messaging
- Provides presence, messaging, and multi-user chats
- Open and extensible protocols
- Stable and widely used (perhaps millions of users)
- Large and active developer community, organized by the “Jabber Software Foundation”



# Jabber Protocol Architecture



- “Streaming” XML messages over a (duplex) TCP connection
- Messages are addressed to a “Jabber ID” (JID), which is *user@server/resource*
- *Network of servers* handle messages, and route messages not intended for them
- *Clients* live at the “edges” and talk to servers

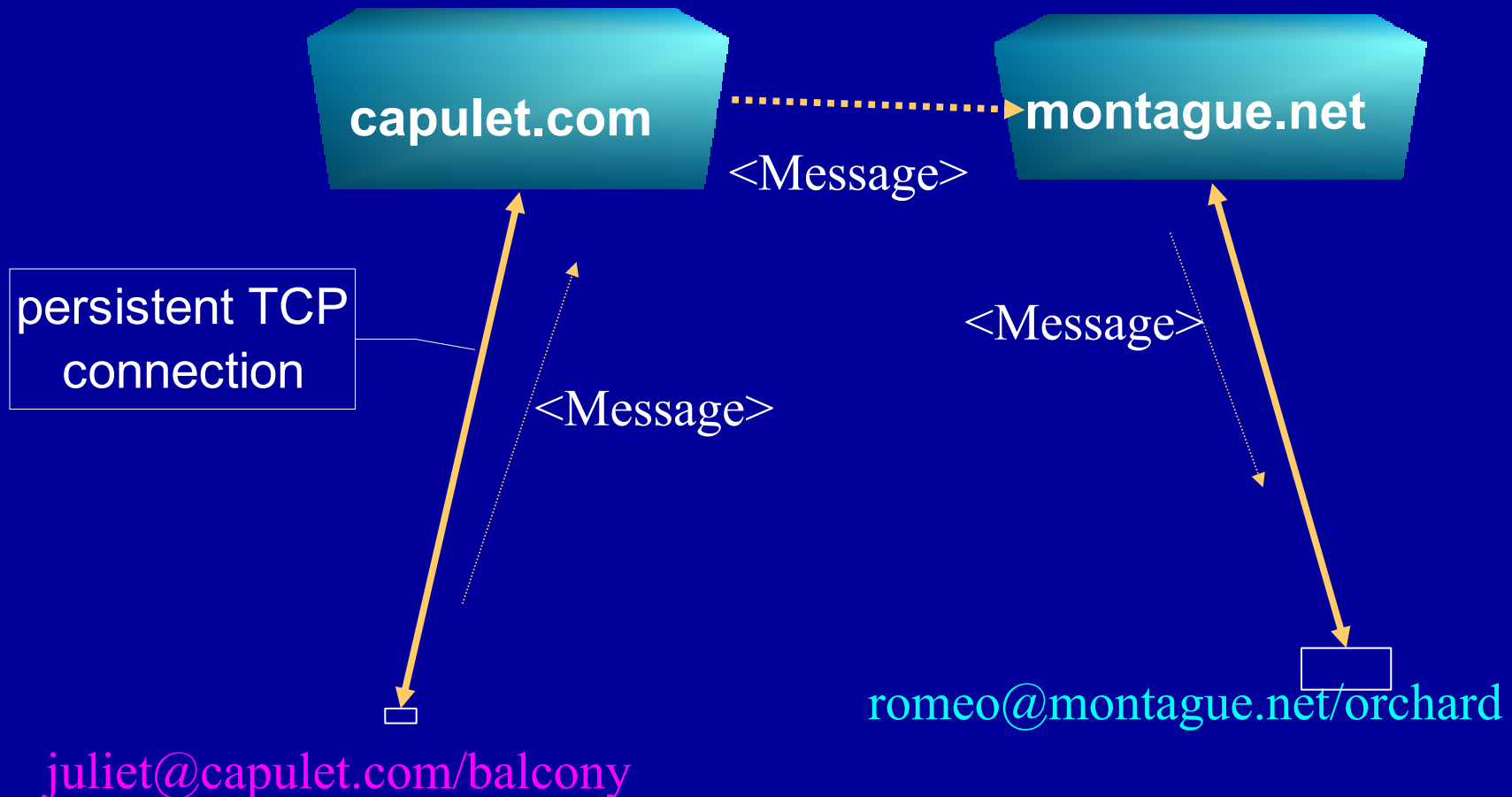
# Jabber Messaging



A screenshot of the Jabber Buddy List window. It shows a list of buddies organized into groups: "buddies-anl (0/2)" with two offline buddies (turam@jabber.mcs.anl.gov and ivan@jabber.mcs.anl.gov), "mucs (4/4)" with four buddies (meadow, nc-wk-org, dsd-admin, lobby), "Co-Workers (0/1)", "archivers (0/3)", "collab-lbl (0/22)", "GAN (0/3)", and "Buddies (2/6)". The window has a menu bar with "Buddies", "Tools", and "Help".

A screenshot of a Jabber chat window titled "meadow@conference.mcs.anl.gov". The window shows a list of tabs for other chat sessions: "meadow@conference.mcs.anl.gov", "nc-wk-org@conference.dsd.lbl.gov", "dsd-admin@conference.dsd.lbl.gov", and "lobby@conference.dsd.lbl.gov". The main chat area displays a log of messages from 10-26 09:21:03 to 10-26 13:05:17, including messages from Ivan, Jrs, Cindy\_office, and Amado. A topic has been set to "Windows Beacon: http://www.mcs.anl.gov/~judson/common-1.1.win32-py2.3.exe". On the right, a list of 6 people in the room is shown: cindy\_ag, cindy\_office, eric, jrs, lbldeba, and wes. The bottom of the window has an "Invite" button, a "Remove" button, and a "Send" button.

# Jabber Message Delivery



# XMPP Standards



- 2002 - present: XMPP-WG in IETF, drafts:
  - “core” Jabber protocol
  - “IM”, Instant Messaging with Jabber protocol
  - “e2e”, End-to-End security
  - “CPIM”, mapping Jabber to CPIM
- You can store your contact list (“roster”) and other data (like a vCard) on the server
- Standard IM 'presence' features
- The server queues up messages for you when you're away and delivers them as “delayed” messages when you come back
- Logging available at servers and clients

# Jabber Existing Software



- Servers
  - “jabberd” from jabber.com
    - GPL
    - Stable version is 1.4; beta 2.0 supports IETF protocol extensions (security)
  - Other open-source: ejabberd, WPJabber
  - Commercial: Rhombus, Accept
- Clients
  - Gaim (popular universal IM client, works on Windows and Linux using Qt library, Mac?)
  - PSI (Jabber-only client, Win/Lin/Mac)
  - Many more: Exodus, RhymBox, Yabber, ...
  - Still evaluating web interfaces

# Jabber Clients & Devices



Palm



SMS



RIM



Pocket PC



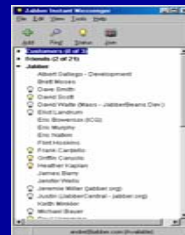
J2ME



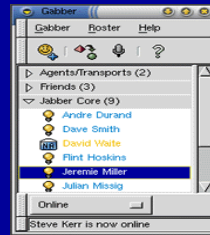
Symbian



WAP



Windows



Linux



Web

Source: <http://downloads.weblogger.com/gems/andredurand/JabberNetworkInterop.ppt>

# LBNL Jabber Enhancements



- Personal Archiver
  - Built a Python agent that archives chats and web page to search archives
  - Runs with its own credentials
  - Visible entity in the space
  - Invite archiver to chatroom to archive a conversation
  - Archive controlled by individual running archive
  - Archives to searchable database or web page
- Security
  - Implementing multiple authentication methods capabilities
  - Plan to provide a lobby that all can enter but still restrict entry to other spaces
  - Plan to implement escort and vouching
- Persistence – working with ANL to integrate into the Access Grid venue client and for use as the back channel