Improving Virtual Team Collaboration with Internet2
More Than Just Video Conferencing

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Virtual Teams

- Traditional Teams tend to be colocated working in close proximity to each other.
- Virtual Teams are composed of individuals that are dispersed geographically and/or temporally.
- Virtual Teams form as a result of globalization, consolidation, telecommuting, and academic collaboration.
- Virtual Teams are not like traditional teams. They have different management, scheduling, communication and technical infrastructure needs.
Virtual Team Challenges

Virtual teams face many unique challenges, most stemming from reduced face to face interaction.

- Remote Management  Virtual teams require more autonomy, less hand holding, and longer development cycles.

- Team Dynamics  More difficult to achieve cohesion. Virtual teams often fail to get passed the “Storming” phase.

- Technical Hurdles  Members will eschew cumbersome tools. Unreliable or insufficient infrastructure guarantees project failure.
Virtual Team Challenges

• Project and Participant Awareness  VT members require more explicit awareness of project status, forward progress, availability and participation of other members.

• Trust  Lack of subtle communication cues and participation awareness can undermine trust between team members, and between management and the team.

• Global Virtual Teams add additional temporal, language, and cultural challenges.
Virtual Team Needs

• Common Workspace  Shared storage to maintain group artifacts: designs, documents, source code, releases, project web page, communications archive.

• Real Time Formal Meetings  Scheduled meetings with agendas. Video/teleconference, conference calls, face to face meetings, etc. Usually project related. Requires schedule coordination.

• Real Time Informal Meetings  As need arises. Video conference, telephone, IM, chat. Usually task related or social interaction. Requires participant availability awareness.

Steinfeld, Yang, Pfaff 1999
Virtual Team Needs

• Asynchronous Communications   Email, discussion lists, etc. Reduces interruptions, allows thoughtful statements and responses, eases temporal difficulties.

• Project and Participant Awareness   Improves sense of community and commitment. Project web page, blogs, regular status reporting & SCRUM, progress logs, member presence and availability.

• Reliable, Configurable Infrastructure   Different teams and projects have different requirements. Environment should be configurable and extensible. Cumbersome or unreliable components will go unused.
Theory of Media Richness

Different media will be chosen for different tasks based upon varying characteristics of the media.

Task performance will be improved when task needs are matched to a medium’s richness.
Theory of Media Richness

- **Equivocal** ambiguous, subjective, multiple or conflicting viewpoints.
- **Unequivocal** unambiguous, objective, shared viewpoints, common references.
- **Uncertain** absence of information, attempt to acquire information.
- **Certain** provide information to resolve uncertainty.
- **Socio-emotional** interpersonal, social, community and trust building.

Daft, Lengel 1996  Rice, Love 1987
Theory of Media Richness

- Socio emotional
- Unequivocal
- Certain
- Unequivocal
- Lean Media
- Rich Media
- Interpersonal
- Task Work

Group Management

Tools/Media

Graveline, Geisler, Danchak 2000
“The richness of a medium – its ability to change understanding within a time interval – is linked not only to is social factors, but also to its information processing capabilities.

For communication to be successful, the receiver must understand the message the sender intended to send, and both the sender and receiver must agree that the receiver understood the message.”

Dennis, Valacich 1999
Time, Interaction, Performance

- **Immediacy of Feedback** supports rapid bidirectional communication.
- **Symbol Variety** the number ways & channels in which information can be communicated.
- **Parallelism** ability to maintain simultaneous conversations effectively.
- **Rehearsability** allows the sender to rehearse or fine tune the message before sending.
- **Reprocessability** allows a message to be reexamined or processed again in context.

Dennis, Valacich 1999
Time, Interaction, Performance

Rehearsability

Reprocessability

Parallelism

Feedback

Symbol Variety

Asynchronous

Synchronous

Dennis, Valacich 1999
Current Web Meeting Products

- WebEX Meeting Center
- Placeware/LiveMeeting Conference Center
- Raindance Meet, Present, Train
- Centra eMeeting, Conference
- Genesys Meeting Center
- Latitude Meeting Place
- First Virtual Communications Meet Premier
- Intercall InView, MeetingCenter
- VIACK VIA3 Secure Meeting
- Cal Tech VRVS
Superset of Product Features

- Event Scheduling
- Participant Management
- Instant Messaging
- Audio and/or Video Conferencing
- Shared Desktop or Application *
- File Exchange
- Archive/Playback Meeting
- Moderated Question & Answer
- Polling/Voting
Shared Application or Desktop

4 Flavors of Shared Application Component

- Remote Window/Desktop Display  view only by others
- Shared Whiteboard  overlay scribbling by others
- Remote Window/Desktop Control  control granted to others one at a time
- Collaborative Editing  local application and window, change propagation to others
Technological Benefits of Internet2

How can these capabilities be leveraged to improve the Virtual Team Collaboration Experience?

- High Bandwidth
- Multicast Routing
- Quality of Service
- IPSec
- Large frames
- 128 bit IP addr
Improved Virtual Team Mechanisms

- Multi Participant Video Conferencing
- Remote Window/Application Display
- Rich Media Streaming to Archive/Replay meetings
- Remote Filesystem for Common Workspace
- Distributed Filesystem to hold Rich Media Archive
- Private and Secure Communications
- Standards compliant Components for improved interoperability and extensibility
Multiple Participant Video Conferencing

- Yesterday  Multiple meant 2

- Today  Participant streams are multiplexed, tiled and rebroadcast

- Tomorrow  Multicast routing directs a participant’s stream to all other participants.
Remote Window and Application Display

- Export window display to all participants via multicast
- Use Compositing for overlay effects
- All 4 window access models are useful
- Window manager support would be ideal
- Bandwidth would allow even brain dead bit scraping mechanisms
Group aware Synchronous & Asynchronous Communications

- Enhance traditional communication channels to be “Group aware” & listservs, RearViewMirror, mail aliases, chat rooms, wikis, etc.

- Group member management at the team leader or project manager level.

- Employ subtle & on intrusive presence and availability awareness. Allows participants to know if a fellow team member is available for a synchronous exchange. Participants may be “present but unavailable” & heads down or in meeting.
Concurrent Document Editing

- Applications are becoming network aware allowing concurrent real time manipulation by multiple participants.
- Multiple instances of the application coordinate changes and maintain consistency.
  - Microsoft Office 2K & XP
  - CASCADE
  - CoCoDoc
  - Groove Workspace
  - Hydra & now SubEthaEdit
  - Iris
Rich Media Streaming to Archive/Replay Meetings

- Archiver can be a “silent participant”, receiving all multi cast streams and saving them.

- Allows non participants to view meetings at a later date. Late arrivals can view from the start.

- Provides a historical record for participants.

- Would likely require a distributed file system to handle the data rate and volume.
Remote Filesystem for Common Workspace

- Globally available network filesystem will simplify access to the shared workspace.
- Reduced dependance on multiple protocols and mechanisms attempting to solve similar problems. CVS servers, DMS, ftp, http, WebDav...
- Enhanced group access rights and versioning?
Privacy and Security

• Virtual Teams should feel confident that their collaboration efforts are free from prying eyes.
• A Group private network?
• Various levels of access for participants and stakeholders.
• How much recording of communications is “right” useful but not Orwellian or wasteful?
• Security at Line Speed for VC?
• Secure data in distributed stores.
• Built on top of Authorization & Authentication, IPSec, VPNs, encryption, group access rights.
Extensible and Configurable

- Different teams and institutions have different requirements.
- A collaboration infrastructure wants to be **customizable** to suit the team’s needs.
- And **extensible** to support future grown and specialization.
- Standards based **interoperability** to allow institutions using different tools to collaborate. But this adds infrastructure reliability risk.
- This implies that monolithic or monopolistic products might not be sufficient or desirable.
Proposed Virtual Team System

- Multicast Real Time Video Conferencing with multiple participants
- Support for each of the 4 Window/Application sharing mechanisms
- Event and Project Scheduling and Participant Management
- Archive/Search/Replay meetings
- Shared Workspace as a network mounted volume with team artifact management
Proposed Virtual Team System

- Project portal to gain access to project status and important artifacts
- Workflow mechanisms
- Search over all archived content
- Instant Messaging / Chat / Discussions
- Action Items
- Group Awareness/Availability features
- Q & A
- Polling / Voting
Collaboration players (email from Cliff Ried)

1st Tier
- WebEX
- Raindance
- Placeware
- Centra

2nd Tier
- Genesys
- Latitude
- First Virtual Community
- Intercall
- VIACK

Attendees
- Moe Howard:
  - Big Company
  - Los Angeles, CA
- Larry Fine:
  - Pies 'R' Us
  - Houston, TX
- Curley Howard:
  - Grateful Dead
  - Heaven

Chat
- Moe: Listen up you guys! I got a great idea on how we can earn some dough.
- Larry: Jeez, Moe, we got creamed last time!
- Curley: Yip yip yup yip yip

Action Items [Shared]
- Get pies [Moe]
- Acquire wallpaper and paste [Larry]
- Get brushes, ladders [Curley]
- Collect underpants [Shemp]
- ???
- Profit!
References


4] RFC 2445: Internet Calendaring and Scheduling Core Object Specification (iCalendar) <http://www.ietf.org/rfc/rfc2445.txt>


References


References


Additional Links

Links

Rear View Mirror User Guide:
http://www.dcs.qmul.ac.uk/research/imc/mmc/rvmguide.html

Internet Mail Consortium Personal Data Interchange (vCard, vCalendar, iCalendar):
http://www.imc.org/pdi/

David Woolley's Virtual Team Collaboration Technology Portal:
http://www.thinkofit.com/webconf/

Web Conferencing Products we looked at:

WebEX: http://www.webex.com
PlaceWare:  http://main.placeware.com
Raindance:  http://www.raindance.com
Centra:   http://www.centra.com
Genesys:   http://www.genesys.com
First Virtual Communications: http://www.fvc.com
Intercall: http://www.intercall.com
VIACK:   http://www.viack.com
Latitude:  http://www.latitude.com/
Additional Links

Collaborative editing technologies:

CoCoDoc:  http://citeseer.nj.nec.com/terhofte97cocodoc.html

CASCADE:  http://www.sis.pitt.edu/~cascade/

Iris:

Hydra/SubEthaEdit:  http://hydra.globalse.org/features.html

Collaborative authoring with document fragments and contracts:

Collaborative editing plugins for Microsoft Office products:

Microsoft Office 2000 and XP seem to have conferencing and collaborative editing built-in

Groove Workspace:  http://www.groove.net/pdf/ms_oxp.pdf

Workshare Synergy: (MS Word only)
http://www.workshare.net/products/pr_synergy_overview.htm