- Information Management
  - Situation Analysis

- Collaboration
  - Shared Workspaces

- Communicator
  - Dialogue
Software that organizes teams in rapidly changing environments

Team-based Software
• Link Visual Workspaces
• Enable Multi-modal Collaboration
• Enable Asynchronous Collaboration

Connect Collaborators/Information
• Discover Relevant Collaborators
• Discover Relevant Information
• Connect the Dots
Emphasize Technology Transfer

MILITARY TARGETS

SPAWAR Demonstration May 13-15, 1998

MILITARY TARGETS

GENOA & INTELINK

JFACC & Advanced Logistic Program & Command Post of the Future

U.S.S Coronado

DARPA/DISA Joint Program Office

COMMERCIAL TARGETS (working through International Data Corporation)

Major Players

- Microsoft
- Netscape
- IBM Lotus
- Novell
- Oracle

Startup Companies

- Placeware
- Open Text
- Instinctive
- Radnet
- Precept
Capstone Demonstration
Pacific Command Disaster Relief Scenario

CINC and components, Allies

TEMPO BRAVE

PACOM YEARLY COMMAND & CONTROL EXERCISE
SEPTEMBER 1999
(UNDER NEGOTIATION)

U.S. Embassy

U.S. Civil/Military Operations Center

U.N. agencies

non-government & volunteer organizations

Damage Assessment Response Teams

Field Relief Coordination Centers

Refuge Camps

Field Relief Teams
Team-based Software
- Link Visual Workspaces
- Enable Multi-modal Collaboration
- Enable Asynchronous Collaboration

Connect Collaborators/Information
- Discover Relevant Collaborators
- Discover Relevant Information
- Connect the Dots
VISAGE

Provide collaborators the best representation to visually explore, analyze, and explain data

- knowledge-based rules for generating 2-D/3-D graphics
- methods to automatically generate text explanations coordinated with graphics
- distributed, linked visual workspaces

Evaluation Plans
Exercise in ALP, JFACC, Genoa, and DMIF

Carnegie Mellon University, University of Pittsburgh, and MAYA Design
Innovative user interfaces specifically designed for collaboration in multimedia environments

- graphic object extraction techniques
- unencumbered speech-recognition
- language understanding
- gaze and gesture tracking
- speech synthesis

Evaluation Plans

Working with CECOM and BA&H, apply the Rutgers’ multi-modal interface to a distributed command and control application.
Asynchronous Collaboration

Bridge gaps in time and medium between collaborators

- natural language understanding
- physical schemas for knowledge representation
- unsupervised learning of physical schemas
- visual animation of physical schemas

Evaluation Plans

Working with JFACC program to apply techniques to air campaign planning, monitoring, and re-planning
Intelligent Collaboration and Visualization

Team-based Software
- Link Visual Workspaces
- Enable Multi-modal Collaboration
- Enable Asynchronous Collaboration

Connect Collaborators/Information
- Discover Relevant Collaborators
- Discover Relevant Information
- Connect the Dots
Discover Relevant Collaborators

Enable potential collaborators to discover one another in real-time during a task

- graph-matching/virtual scents
- task modeling and representation
- probabilistic pattern-matching algorithms
- relevance feedback

Evaluation Plans

Experimental deployment at SPAWAR Systems Center and in Genoa and JFACC

SRI International and HRL Laboratories
Discover Relevant Information

Extract content tags from multi-media data and distribute them to collaborators -- in real-time

- event bus sniffing
- video scene change detection
- audio transcription
- topic spotting and entity identification
- adaptive fuzzy filters

Evaluation Plans
Experimental deployment on the Internet and with Direct Satellite Service set-top boxes
Possible application in the BADD and GBS programs
Connect the Dots

Multicast Node

Data Streams

Audio Video Media Board Active Objs

RTP RTP SRM SRM

IP-Multicast

Control Protocols

Proxy GUI Archive Floor Cntl ...

SRM TCP Coordination Bus

IP-Multicast IP-Unicast IPC

Robust, decentralized, multimedia communication among 100’s to 1000’s of Internet nodes

- scaleable, reliable multicast
- distributed coordination bus
- distributed multimedia archiving

Evaluation Plans

Public beta release of MASH software - May 98

Experimental use in DARPA VINT project and for courses at UCB - FY 98

Experimental deployment for Internet Engineering Task Force meetings - FY 99

Formal evaluation by NIMA - FY 98

University of California, Berkeley
Overcome impedance mismatch in bandwidths and displays among multicast users

- transcoding gateways (video, HTML, mediaboard)
- consensus-based bandwidth adaptation protocol
- programmable network proxy system

Evaluation Plans

Campus-wide use of transcoding video gateway (MEGA) and proxy architecture at UCB from Summer 1997

Consensus-based bandwidth adaptation (SCUBA) deployed at UCB in Fall 1997

Transcoder and proxy software adopted by Proxinet for commercial ProxiWeb product

Handheld Top Gun Mediaboard under evaluation for commercial applicability
Road Map

**DARPA Road Map**

**Manages Resources based on Collaboration Context**

**FY97 FY98 FY99**

- **Team-based Software**
  - Link Visual Workspaces
  - Enable Multi-modal Collaborators
  - Enable Asynchronous Collaboration

- **Prototype & Evaluation**
  - Mash Collaboration Toolkit
  - Evaluation Methods, Metrics and Tools
  - Technology Demonstrations

- **Connect Collaborators/Information**
  - Discover Relevant Collaborators
  - Discover Relevant Information
  - Connect the Dots

**First 18 months**

- **Prototype & Evaluation**
  - Mash Collaboration Toolkit
  - Evaluation Methods, Metrics and Tools
  - Technology Demonstrations

- **Connect Collaborators/Information**
  - Discover Relevant Collaborators
  - Discover Relevant Information
  - Connect the Dots

**Next Generation Internet Multimedia Conferencing Tools**

- Scales Across Bandwidth, Access Devices, and Group Size
- Reliable Under Network Failures
- Manages Resources based on Collaboration Context

**Prototype & Evaluation**

- SRM V 1.0
- SRM V 2.0
- SRM V 3.0

**Prototype & Evaluation**

- Trails & Scents
- Bayesian Nets
- Microphone Array
- Gaze Tracking
- Multi-mode Interface
- Schema Learning
- Vissage Link

- Bayseian Nets
- Multimodal Interface
- Schema Learning
- Vissage Link
**Evaluation Approach**

**Develop method, metrics, and tools to evaluate collaboration technology**

- four-level, bi-directional evaluation model
- multi-media logging tools
- distributed collaboration scenario controllers
- standard logging formats

**Evaluation Plans**

Evaluated existing collaboration software -- Placeware and Collaborative Virtual Workspace -- during FY 97

Evaluate MASH and Habanero during FY 98

*Mitre, NIST, and NIMA*
Early military adopters derive near-term benefits from specific IC&V technologies, while industry delivers future collaboration technology based on DARPA research and development. Such technology will:

- Link visual workspaces across distributed, heterogeneous systems,
- Enable collaboration among and across interaction modes,
- Discover relevant collaborators and information in real-time, and
- Connect collaborators/information robustly across variations in bandwidth and display technology.
IC&V Accomplishments Since January 1998

- UCB released beta version of MASH with SRM v2.0
- HRL deployed collaborator discovery software and filed for patent
- UIUC released Virtue software v1.0 for immersive data visualization and exploration
- Virtue deployed to visualize large-scale battlefield simulation data from SFExpress
- Mitre released multi-modal logging environment
- IC&V evaluation methodology deployed at NIMA and SPAWAR to evaluate collaboration systems
- Distributed 35,000 copies of Alice 3-D animation authoring software
- Habanero 3-D collaborative visualization tools chosen by Sun/JavaSoft to demonstrate Java 3-D API at the March JavaOne conference
- Held research coalition meeting between IC&V researchers and relevant companies (Microsoft, Novell, Lotus, Radnet, and OpenText)