Collaboration Technology in Military Team Operations: Lessons from the Corporate Domain

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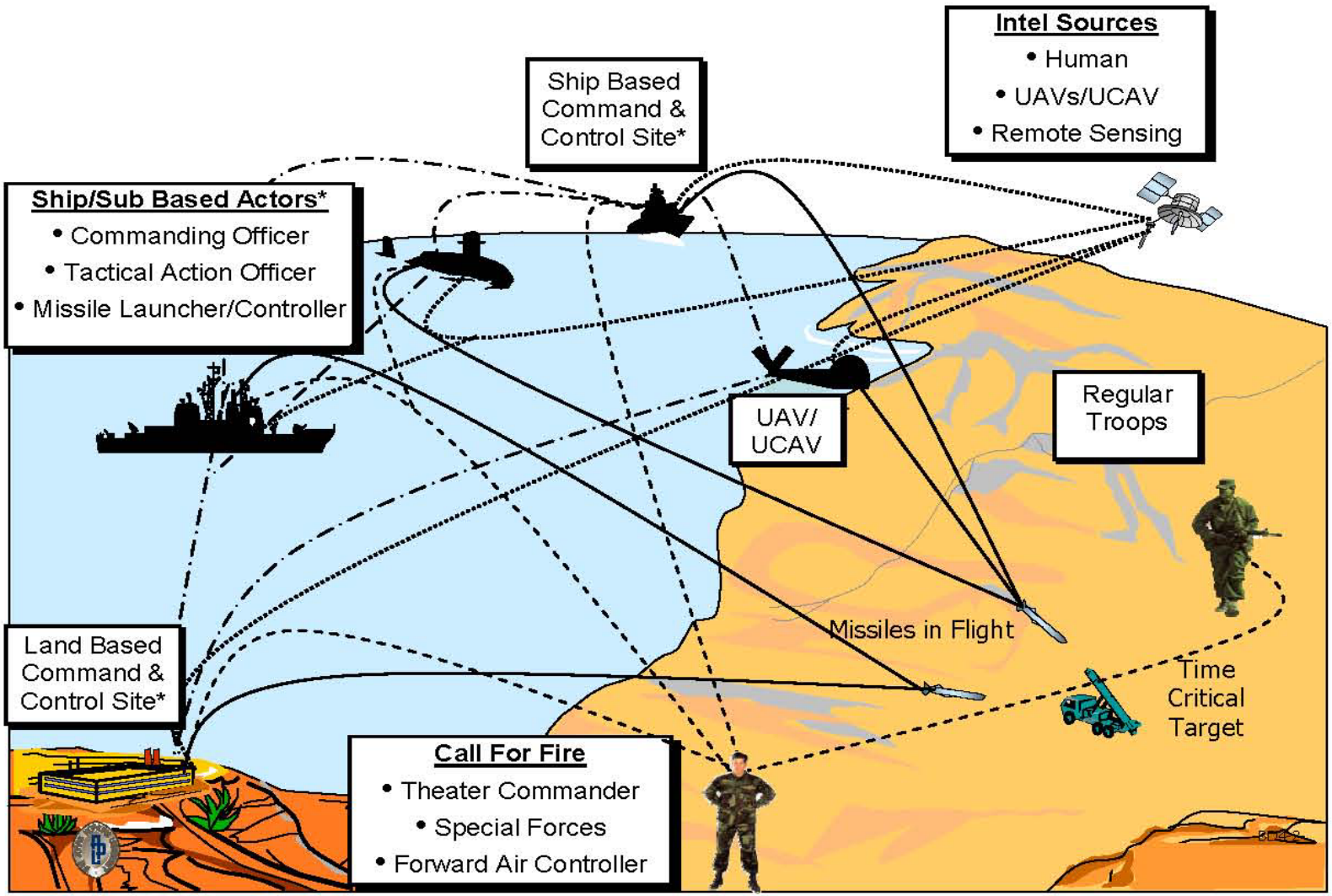
Teamwork Critical to Successful Military Operations



Teamwork in Network-Centric Operations

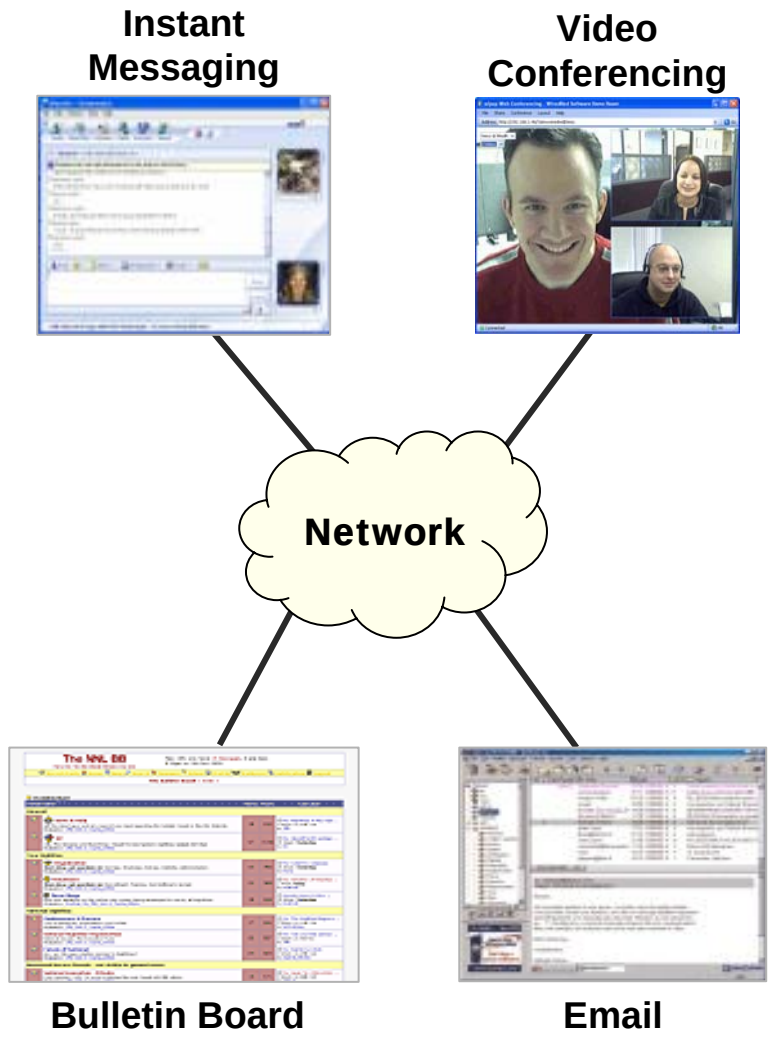
- Highly connected operators, often working remotely

- Heavy reliance on commercially available **Collaboration Technologies (CTs)**
  - email
  - instant messaging (‘chat’)
  - video & desktop conferencing

(Proposed command and control center for future naval destroyers)

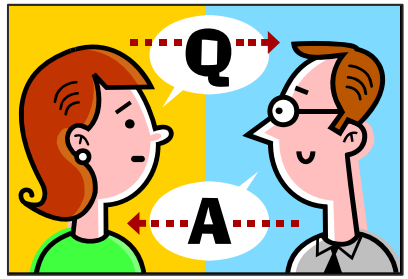
Benefits of Collaboration Technologies

- Facilitate **communication** and **coordination** with remote colleagues
- Facilitate **sharing** and **accessing digital media** during teamwork
- Provide opportunity and support for **casual interactions**, helping to:
  - Promote ad hoc collaboration & communication
  - Improve team cohesiveness



CTs Primarily Support **Explicit** Interaction

- Collaboration technologies have been mainly designed to support **explicit**:
  - **Communication**
    - e.g., email and chat applications
  - **Sharing of electronic resources**
    - e.g., desktop conferencing, file transfer



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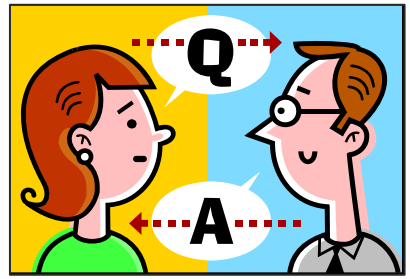


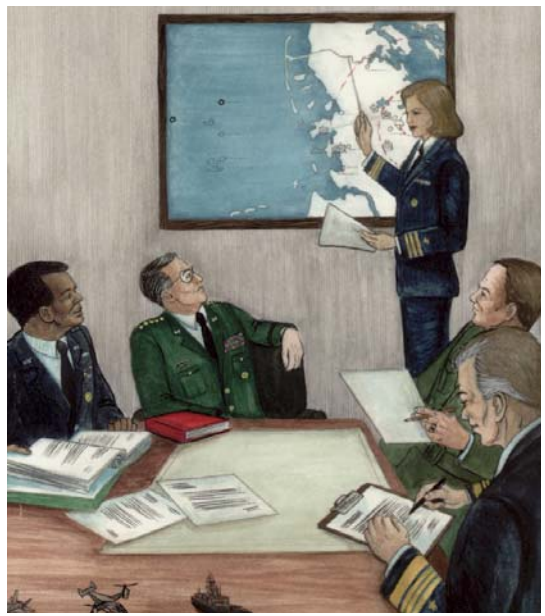
- Lack of support for **implicit** or more subtle interactions introduces challenges for:
  - Communication
  - Engaging in shared activities

Limitations of CTs for Supporting **Communication**

- Lack **richness** of face-to-face communication
  - No non-verbal or 'backchannel' communication
  - No contextual information

(Source: NC Times (nctimes.com))

- Difficult to use learned **social practices** to negotiate smooth interaction, e.g.:
  - using pauses and eye contact for effective turn-taking
  - using nods to infer conversational understanding



(Source: Military Operations Research Society (www.mors.org))

- When social practices are unavailable human interaction becomes challenging

Limitations of CTs for Supporting **Shared Activities**

- Difficult to gather activity-related information from remote teammates because their **activities are not visible**
  - What part of the shared activity are they working on?
  - What is their current progress?
  - Do they require assistance?

- Difficult to **coordinate** team interactions
  - Use of shared resources
  - Integrating related activities
  - Determining when someone is available to provide information or resources related to the shared activity

How Can We Address these Limitations?

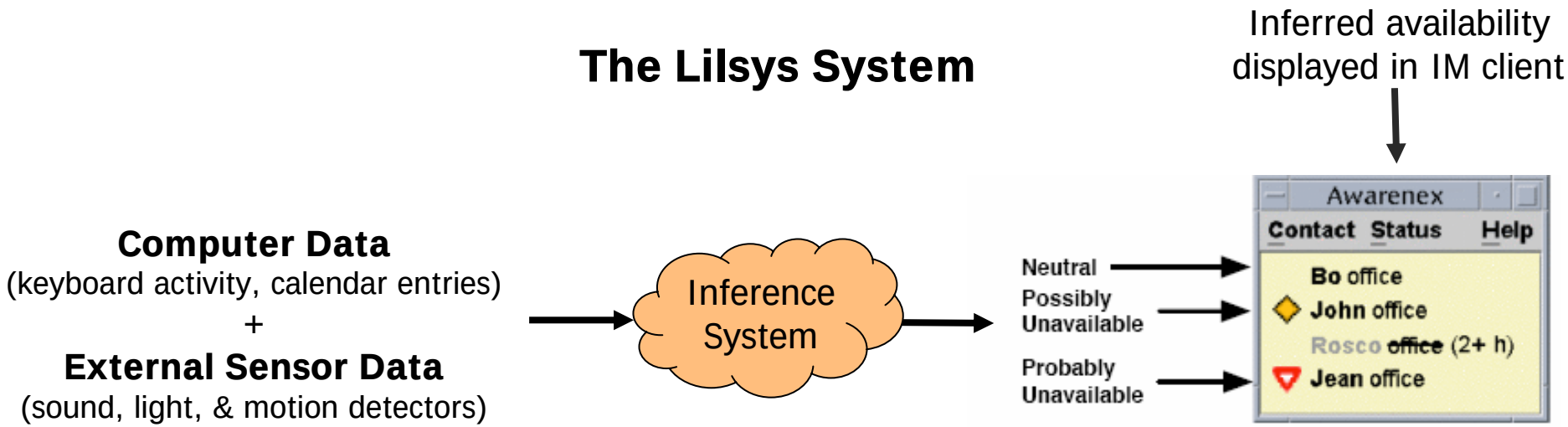
- Limitations of CTs **affect teamwork across domains**

- Goal of this project was to **identify design approaches in other domains** that could help improve CTs in military operations
  - Primarily drew from corporate technologies, since computer-support collaboration research is focused on corporate domain

- Approaches that best address the CT limitations share two underlying design concepts:
  1. Designed to **minimize time/effort** of sharing information
  2. Rely on **increased use of automation** to provide this information

(1) Provide Automatic **Contextual** Information

- Using **computer** & **sensor information** to automatically provide contextual cues to remote team members
- Helps team members determine **how** and **when to contact** and interact with remote colleagues

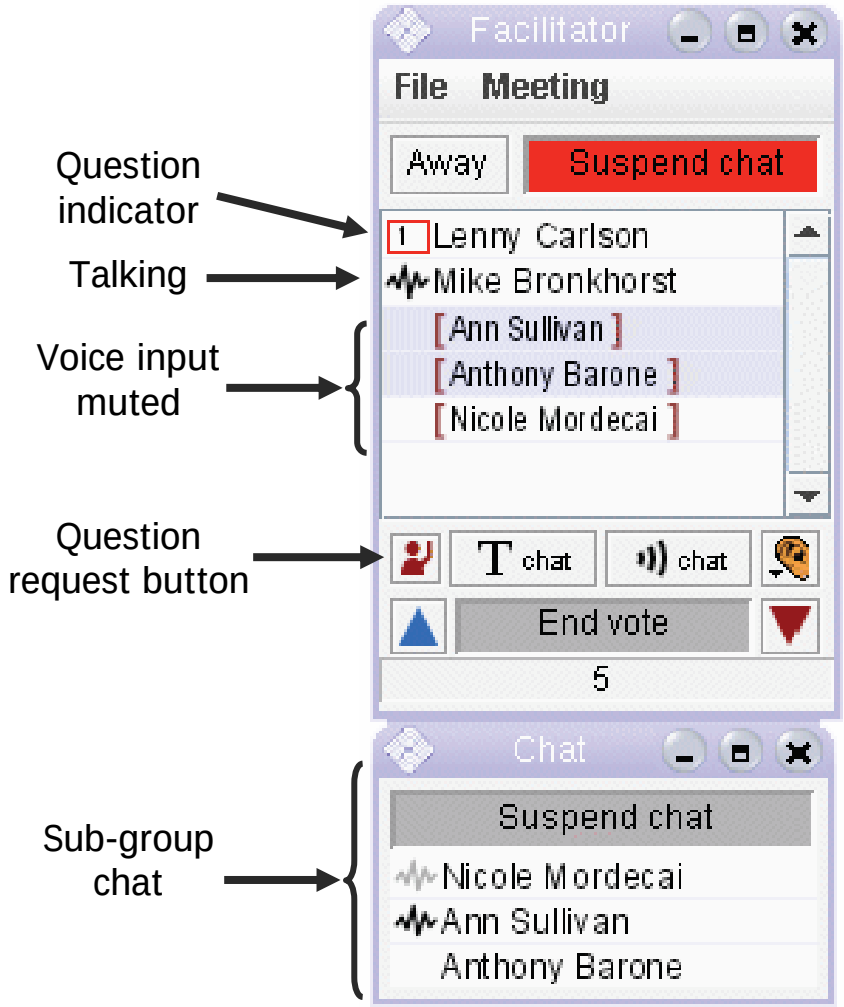


Begole, James "Bo", Nicholas E. Matsakis and John C. Tang (2004) Lilsys: Sensing Unavailability. In *Proceedings of CSCW'04: ACM Conference on Computer-Supported Cooperative Work,* pp. 511-514.

(2) Enable **Non-Intrusive Communication**

- Provide **subtle communication mechanisms** during remote collaboration
- Enable **feedback** and **backchannel communication**
- Helps **prevent** and **resolve miscommunications**, improving effectiveness of remote interactions

Meeting Central Application: Facilitator Window

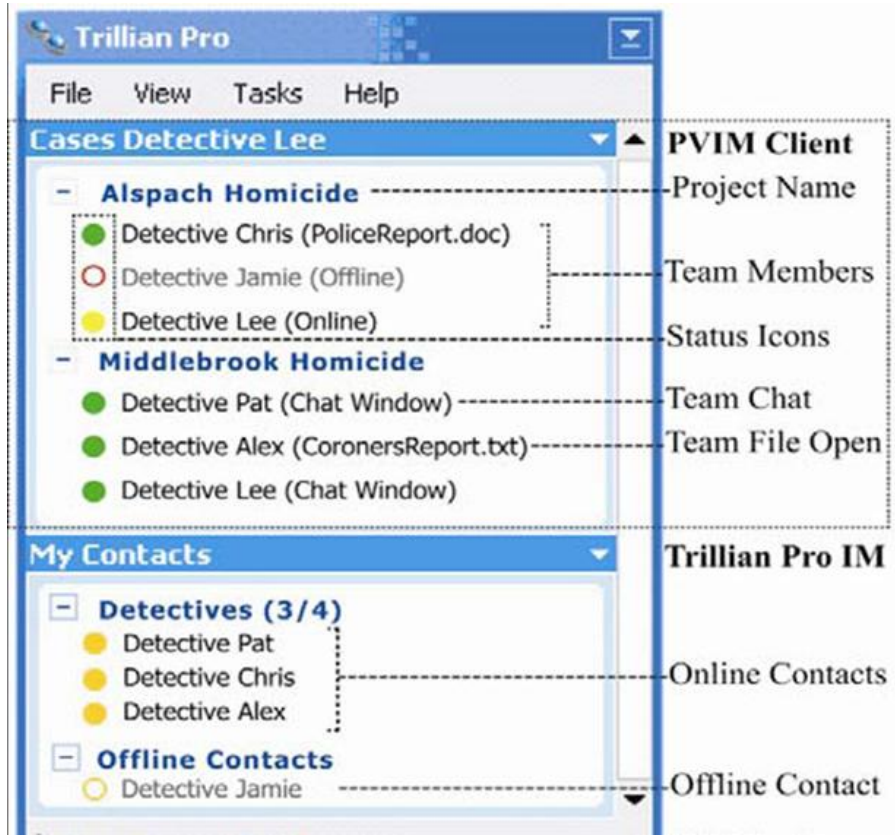


Yankelovich, N., McGinn, J., Wessler, M., Kaplan, J., Provino, J. & Fox, H. (2005). Private Communications in Public Meetings. In *Extended Abstracts of CHI 2005: ACM Conference on Human Factors in Computing Systems*, pp. 1873-1876.

(3) Support the **Shared Activity Process**

- Keep people informed of **ongoing activities** of remote team members
- Use **feedthrough** and **visibility of action** to share information
- Facilitates **planning** and **coordination** aspects of teamwork

Project View IM Application

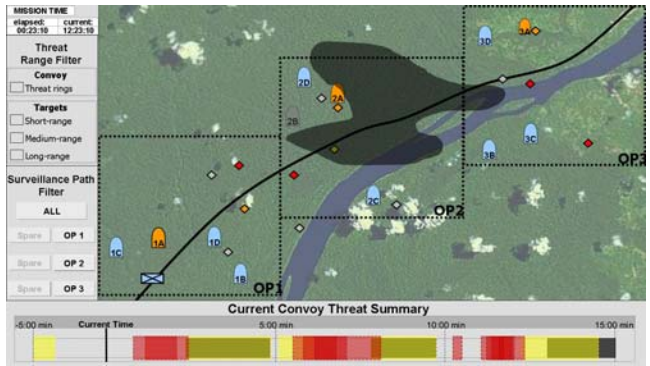


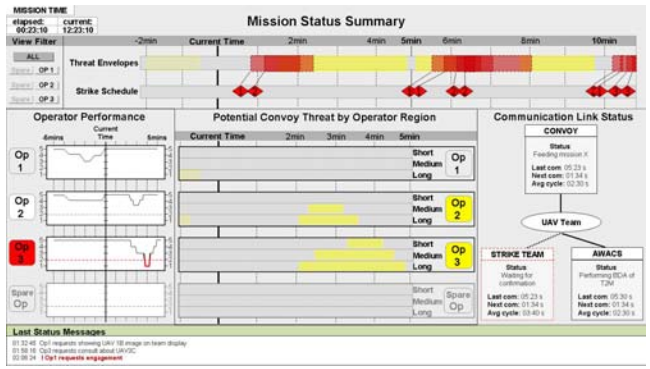
Scupelli, P., Kiesler, S., Fussell, S.R., & Chen, C. (2005). Project View IM: A Tool for Juggling Multiple Projects and Teams. In *Extended Abstracts of CHI 2005: ACM Conference on Human Factors in Computing Systems*, pp. 1773-1776.

Challenges for Applying these Approaches to Military Team Settings

- **Mission criticality** impacts design priorities
  - fidelity of information provided to remote teammates
- Maintaining **continuous operations**
  - dynamic team membership
  - network instability
- **Complex team settings**
  - large-scale teams, teams of teams
  - time pressures

TST Team Supervisor Displays





Conclusions and Future Research

- Collaboration technologies provide **many benefits** for network-centric operations but currently provide **poor support for complex remote teamwork**

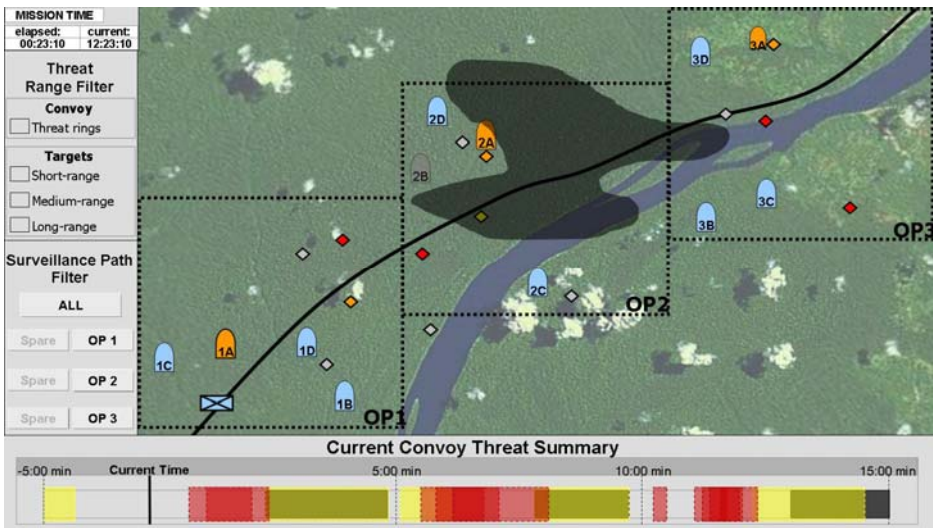
- Advancements in the corporate research domain offer potential to address the current limitations of CTs

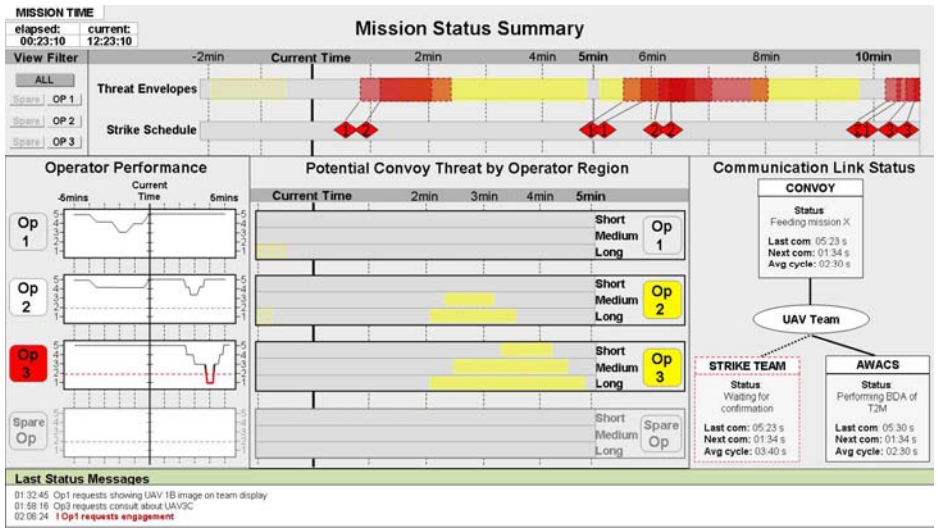
- Ongoing and future research focused on applying these design approaches to technologies for **collaborative time-sensitive targeting** operations

Thanks! Questions?

Ongoing Research:

Large Display Interfaces for Supporting
Team Supervision in Time-Sensitive Targeting





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