Collaborative Operations

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Abstract: The use of collaborative means to conduct activities among dispersed groups of individuals is not a recent phenomenon. Telephones, faxes, video teleconferences and e-mail have been traditional for years. The military and other organizations have relied heavily upon tactical radio communications to conduct operations. The more recent development of persistent, place-based collaborative tools associated with computer-based applications has further improved the way business is conducted among geographically separated groups.

Purpose

This paper provides operational lessons learned based on real-world deployments of collaborative environments to military contingencies and at major exercises; gives some collaborative environment examples; demonstrates some simple techniques used to enhance collaborative activities; shows the effect of collaboration on these operations, and concludes with points for assuring collaborative success. It is derived from information gathered from large scale Army and Air Force exercises and the use of collaborative means during Operations Allied Force in Kosovo and Serbia in 1999.

Collaborative Operations

Collaboration tools, which comprise the environment, should enable a transparent co-location and interaction, independent of geography, time and/or organizational type. They should support the spectrum of operational activity, to include planning, support, management, and execution of operations. To date, the deployment of collaborative tools within operational settings has resulted in six recurring improvements: Process Enhancement, Production Synergy, Much Improved Situation Awareness, Time Reduction, “Smart Pull,” and Removal of Ambiguity.

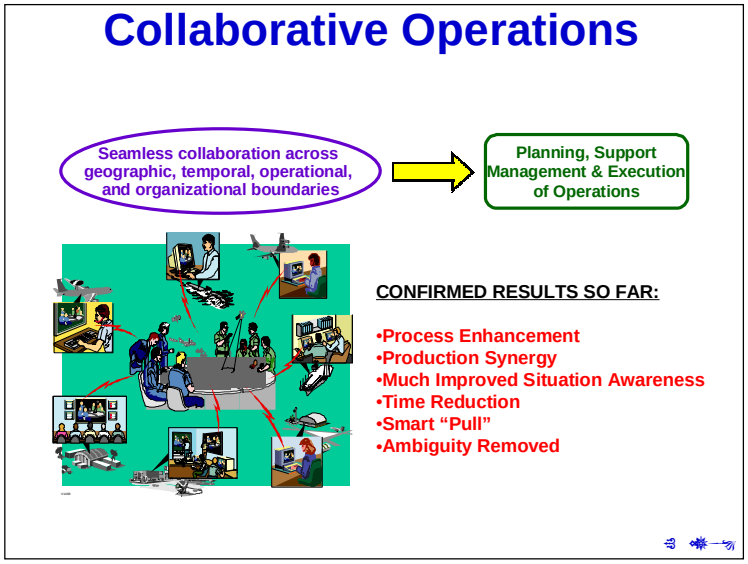

Figure 1. Collaborative Operations

Joint Vision 2010

Joint Vision 2010, a document produced by the Joint Chiefs of Staff, looks to the future and envisions a much more fluid operational environment characterized by parallel planning and real-time decision making, not the sequential, prearranged process which currently is widespread. Collaborative tools have already demonstrated how they can much better support this faster moving decision environment.

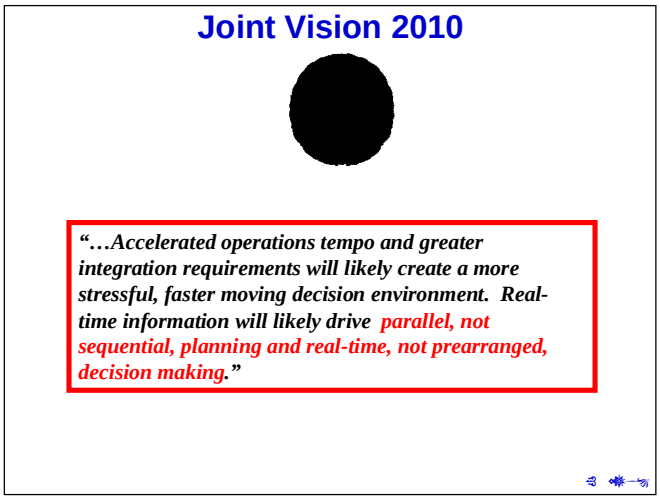

Figure 2. Joint Vision 2010

Kosovo/Operation Allied Force After-Action Report

The DOD Report to Congress on Operation Allied Force reflected most favorably on the use of Video Teleconferences (VTCs), finding these sessions spanned the strategic, operational, and tactical levels of command. In reality, these VTCs were over the system high Joint Worldwide Intelligence Communications System (JWICS) originally designed and funded only for intelligence traffic. These VTCs were also relatively limited in scope and number of personnel in attendance, non-persistent and session oriented. The report did acknowledge a need to optimize the use of VTCs and other advanced collaborative technologies, develop doctrine, and TTP (Tactics, Techniques, and Procedures), and include these technologies in large scale joint and combined exercises. Exercise integration has already been ongoing with the Air Force's Expeditionary Force Experiments (EFXs).

Figure 3. Kosovo/Operation Allied Force After-Action Report

Virtual Environments

Persistent, place-based collaborative tools provide a framework for organization, activity and communication. As depicted, some of these tools use the metaphor of physical spaces – buildings, floors, and rooms. These spaces serve as settings for collaborative activities and at a minimum should allow information display and exchange through room contents, sharable documents and whiteboards. Text chat and audio are both means of communicating that are used dynamically in operations. Experience has shown that desktop video has not provided much value added beyond presence detection and visual identification of collaborators. However, there is potential utility in broadcasting video feeds such as Unmanned Air Vehicle (UAV) or other imagery.

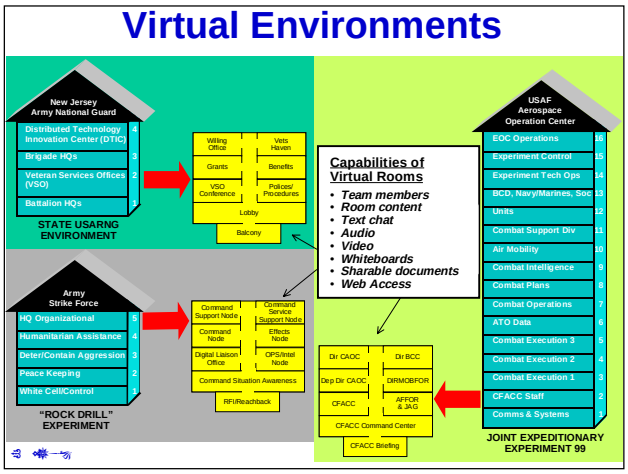

Figure 4. Virtual Environments

Mission Planning

Traditional Serialized Mission Processes

Shared production among dispersed sites has traditionally been a serialized process. A lead site begins development of the product which, in turn, is passed to various co-producing sites for refinement and/or additions, returned to the originator, submitted for decision maker review and returned to the lead site for dissemination. Methods of transmission between sites include email, fax, electrical messages, telephones or simply hand carrying. This multi-step process has inherent disadvantages including: extended timelines, potential for duplication of effort, ambiguity, and a frequent lack of consensus among distributed producers with the final product.

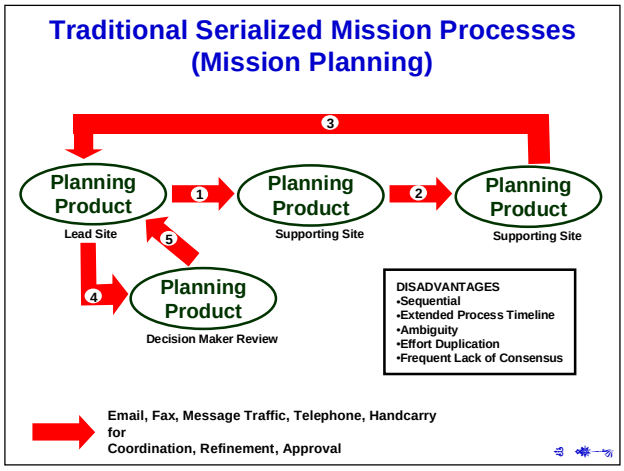

Figure 5. Traditional Serialized Mission Processes

Collaborative Mission Processes

In contrast, production in a virtual collaborative environment can make the activity a parallel process. Each site can meet in the same virtual space with access to the same reference material and instant availability to their co-producing partners. Audio, text chat, document sharing and whiteboards facilitate this interactive production. Differences include: considerable time saved, a lack of ambiguity, and immediate feedback at any point in the production process.

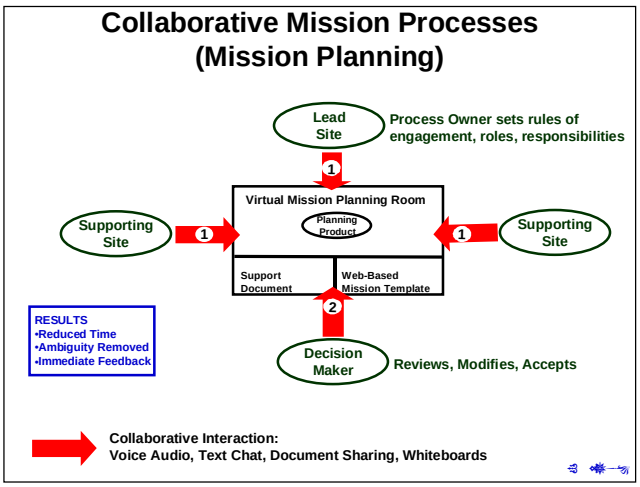

Figure 6. Collaborative Mission Processes

Army STAFFEX Collaborative Environment

Army doctrine has traditionally made use of a well-defined Military Decision-Making Process at the command, staff and execution level. During a Staff Experiment (STAFFEX) in 1999, Army planners examined and conceptualized what it would be like to conduct this process in a collaborative environment. The chart shows their intent. This integration of traditional staff coordination activities with leading edge collaborative tools is a positive indicator of melding time proven processes with evolving technologies.

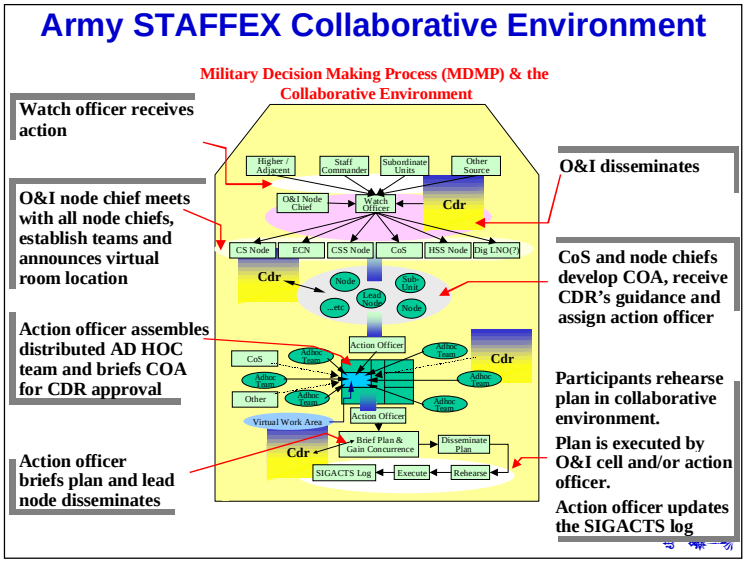

Figure 7. Army STAFFEX Collaborative Environment

Whiteboard Checklists

Users devised a technique for using collaborative checklists to support operations. They used the text entry feature embedded in whiteboards to construct preformatted checklists for use in Combat Search and Rescue (CSAR) missions. These checklists were then prepositioned in CSAR designated virtual rooms. The checklists enabled dispersed personnel to work together on critical actions and show the latest status of mission support actions.

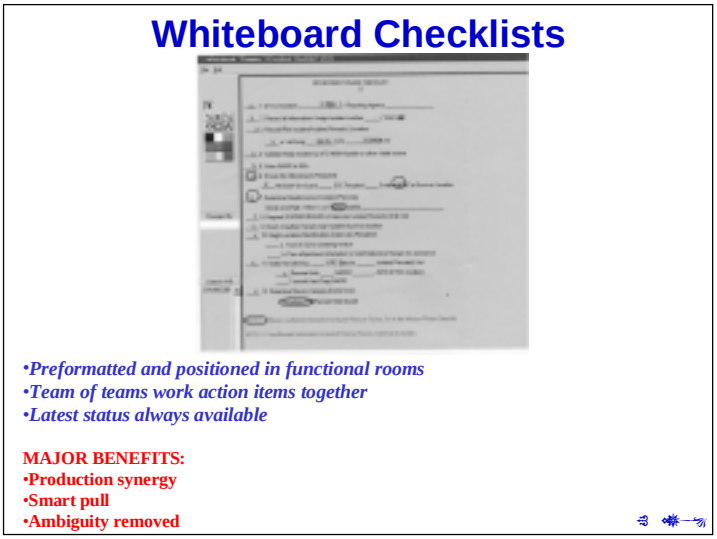

Figure 8. Whiteboard Checklists

Virtual Mission Folders

Users were also able to put the document components (images, whiteboards, checklists, text documents, video clips) associated with particular tasks into specific virtual mission folders. These folders typically included: unit status reports, overhead and/or handheld imagery, maps, threat data, and weather. In addition to being immediately available during mission planning and execution, they were also used for archival purposes.

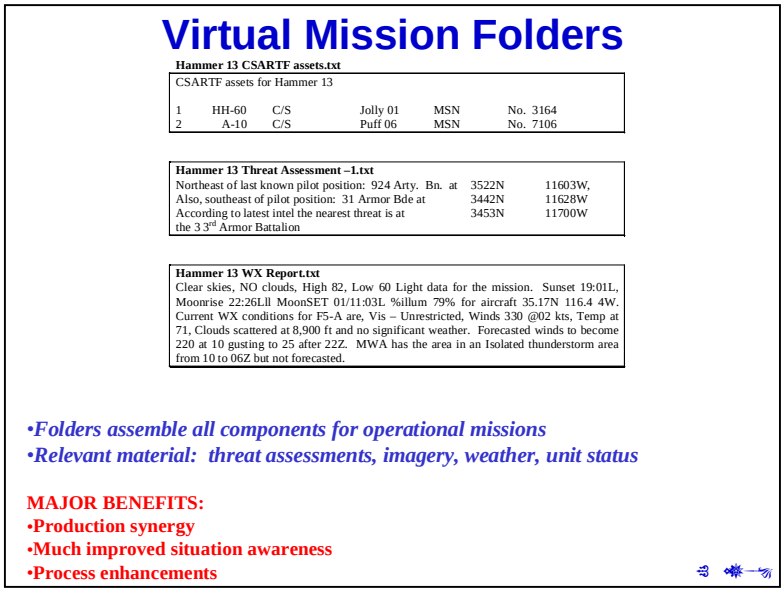

Figure 9. Virtual Mission Folders

Procedural Notes

When equipped for the first time with a set of collaborative tools in an integrated environment, many users rapidly developed new procedures for doing their jobs. The simple text note capability within one collaborative tool enabled them to write short explanatory instructions, place these notes within a functionally-oriented room, and have the process immediately accessible to personnel throughout the distributed organization. Personnel were able to ask questions, if needed, and get answers immediately from the process owners. This method also insured a standardized understanding and approach across time and geography. When changes in process were implemented, the change could be universally broadcast and the change to the text note was trivial.

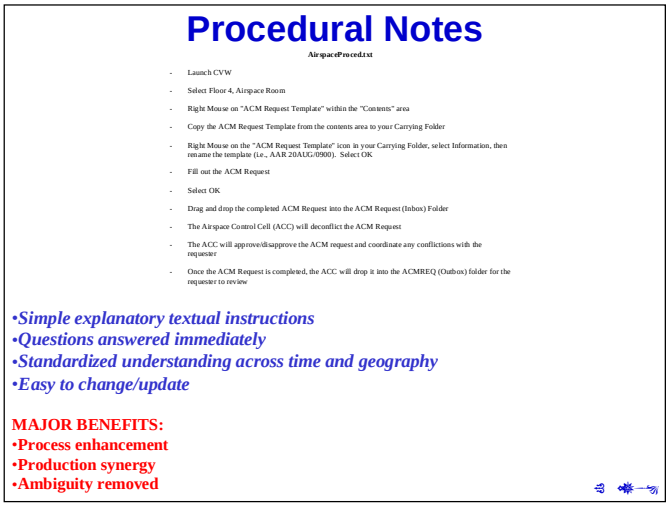

Figure 10. Procedural Notes

Templates

Users devised preformatted templates to support the development of various mission support products. These templates appeared in various formats to include: PowerPoint, Whiteboard, and Text. Many were used to build command and decision briefings among dispersed elements. The templates provided a simple and standardized process and assured coordination by their presence in the collaborative spaces and accessibility for peer review.

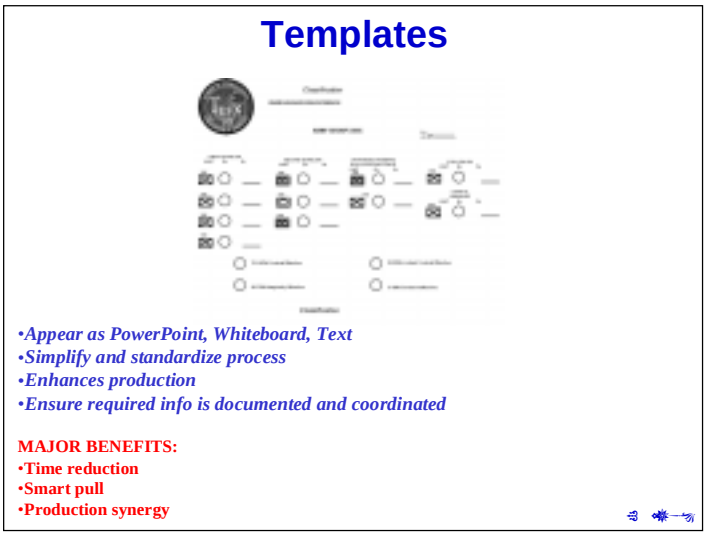

Figure 11. Templates

Screen Captures

Not all users within distributed environments have access to the same information, computer applications, and/or sensor data. The capability to capture the output from individual computer screens as backdrops for whiteboards was widely used. This provided operators, who otherwise would not have had access to application displays, a capability to view and collaborate on that information. However, currently there is not yet a capability to have full application sharing, i.e., view live real-time data in any of the collaborative tools in operational use.

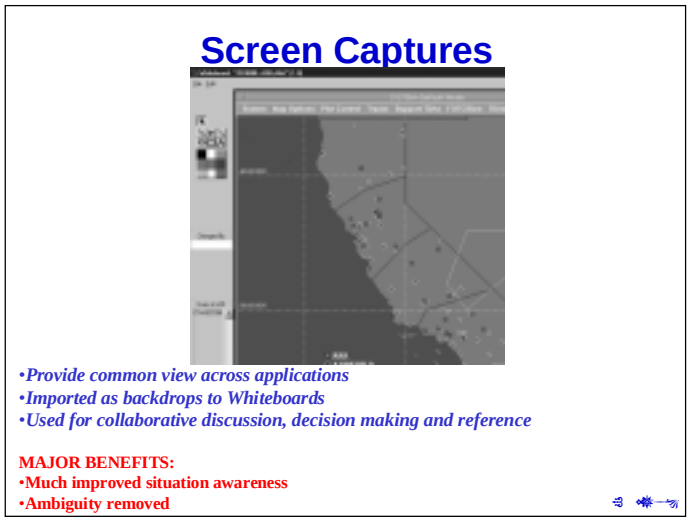

Figure 12. Screen Captures

Other Collaborative Techniques

Operators can receive hundreds, or even thousands, of electrical messages and e-mails of different types during the course of exercises or contingencies. The simple capability to copy and paste selected messages and post them to virtual rooms or even send them as pop-up text data to dispersed personnel was widely used. This minimized information saturation but still assured critical information was globally disseminated. Operators also made use of virtual room based duty logs to assure continuity.

Operators made use of the capability to establish virtual teams of selected personnel. These functional groups were placed as objects in virtual rooms and facilitated immediate alert, notification, contact, and information dissemination. Virtual "In Boxes" provided the same capabilities as physical "In Boxes." Personnel used them to submit, review, annotate, and instantly determine status of information.

Functional Observations

Command and Decision briefings, and other mass presentations, were made within the collaborative environment with more than 140 personnel following, in live audio, the PowerPoint

presentations from their individual workstations. Questions could be posed in audio, or less disruptively, in text chat. This resulted in a dramatic surge in situational awareness among the distributed organizational personnel and a genuine improvement in team building. Personnel working Information Operations (IOs) in the Secure Compartmented Information Facility (SCIF) using collateral Secret workstations were able to pass sanitized data to the bulk of operational personnel who did not work in a system high environment. This became especially useful in passing sanitized time critical alert-type information in "Pop-Up" pages.

Weather personnel stated their function has always been a distributed service. Using collaborative tools, they were able to publish tailored forecasts designed for different organizational and geographical teams within the collaborative environment. They also manned a virtual weather information room and were able to be thoroughly integrated into the various task teams throughout the organization. Request for Information (RFI) become less required in a collaborative environment where different echelons and functional teams can have immediate access to other elements supporting the mission. Some operators did develop simple procedures for submitting RFI and those responding were also accessible within the collaborative environment to provide explanatory information as required.

Impact of Collaborative Operations

In the area of Process Enhancement, Air Force operators reported significant improvement and times savings. European Command personnel reported a synchronization improvement among their current intelligence and operations personnel by using collaborative tools during Operation Allied Force. The ability to provide tailored weather products and templated request forms within the collaborative environment were just some examples of enhanced production synergy.

Dramatic improvements in situation awareness were reported by all organizations during major exercises. The ability for so many members of the team to virtually attend key command and decision briefings is a major change from the past where physical restraints enabled only a few contributing personnel to be fully aware of the situation. During Joint Expeditionary Force Experiment 1999, members of the distributed Aerospace Operations Center (AOC) reported a 40% improvement in operations times in contrast to their experiences in the real world, Coalition Aerospace Operations Center (CAOC) in Vicenza, Italy during Operation Allied Force. During Allied Force itself, EUCOM reported that by "selective" use of collaborative tools, targeteers were able to reduce target development/ nomination for approval from 2-4 days to 2-3 hours.

Special Operations Forces (SOF) Intelligence personnel reported that the ability to "pull" select data from functionally organized rooms was much easier than the traditional "forced push" of massive amounts of information. They also felt it was very quick and easy to determine the relative usefulness of data in the various virtual rooms. The use of whiteboards in planning and executing Combat Search and Rescue (CSAR) missions much improved synergy among the dispersed personnel supporting these missions. Mission planners using collaborative tools for Tomahawk Land Attack Missile (TLAM) strikes during Allied Force stated collaboration has "taken ambiguity out of tasking" and cut timelines "nearly in half."

Summary

Experience has shown for distributed operations to be increasingly successful, collaboration should be institutionalized throughout the enterprise. This means a maximum saturation of collaborative capability across the enterprise – ubiquitous penetration across workstations, platforms and functions. The capability to have seamless interaction with others must be continuously available and collaborative processes should be operationally mainstreamed.

The collaborative software should be stable and scalable across a reliable network and integrated into the enterprise's system of systems.

Training should be focused on the operational utility of collaboration, not just "buttonology." General structured procedures should be encouraged and then innovation should be promoted to further hone processes to conduct the mission. Again, experience has shown users that using collaborative tools will quickly develop new and radically better methods to accomplish their tasks.

Introducing a new collaborative environment is easiest when associated with a directed Task, Mission, or Activity focus. Users are less likely to adapt to collaboration when it is associated only with routine daily activities. Working with allies in a coalition collaborative environment is a continued challenge and efforts need to progress in this area.

Finally, a collaborative environment is not composed of any single tool. E-mail, the Web, VTCs, telephony, full application sharing, and place-based collaborative software should all be mutually supporting and integrated to exploit the demonstrably powerful results of collaborative operations.

Glossary

ACM	Aerospace Coordination Message
AOC	Aerospace Operations Center
CAOC	Coalition Aerospace Operations Center
CDR	Commander
COA	Course of Action
CoS	Chief of Staff
CS	Combat Support
CSS	Combat Service Support
CSAR	Combat Search and Rescue
CVW	Collaborative Virtual Workspace
DigLNO	Digitization Liaison Officer
ECN	Electronic Combat Node
EFX	Expeditionary Force Experiment
EUCOM	[US] European Command
JWICS	Joint Worldwide Intelligence Communications System
O&I	Operations and Intelligence
RFI	Request for Information
SIGACTS	Significant Activities
SOF	Special Operations Force
STAFFEX	Staff Experiment
TLAM	Tomahawk Land Attack Missile
TTP	Tactics, Techniques, and Procedures
UAV	Unmanned Air Vehicle
VTC	Video Teleconference