A Review of Team Collaboration Tools Used In the Military and Government

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A Review of Team Collaboration Tools Used In the Military and Government

"Communications."

The Honorable Thomas F. Hall's single word reply when he was asked for his opinion about our lessons learned from Katrina.

Summary

The military operates today both administratively and tactically using collaboration tools. The purpose of this report is to explore the recent past and current status of collaboration tools use in order to provide recommendations for the future with respect to crisis reaction. In other words, what are the "best" web-based tools to support small team interaction and work when team members cannot reside in the same physical workspace? Two methods, ad hoc research and systematic document search, were used to identify commercial and proprietary collaboration tools that deserve review and consideration for military and government crisis response. In this report we report on 64 collaboration technologies and tools, 37 in use by the U.S. Military and Government. The collaborative technologies and tools are grouped into these four categories: (a) Modern collaboration technologies for the design, development, or enhancement of collaboration tools, (b) "Authorized" collaboration tools being used by the military or government, (c) Other collaboration tools being used in the military or government, and (d) Collaboration tools recommended for consideration by the military or government for crisis response. The identified tools or technologies are described in terms of capabilities and are analyzed for potential to improve cognitive collaboration for crisis actions teams.

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency therein. Moreover, the content of this document benefited from comment and suggestions by several people. However, the views and opinions by the authors as expressed herein are personal and do not necessarily state or reflect those of the United States Government or any agency therein.

Mr. Hall is the Assistant Secretary of Defense for Reserve Affairs, and provided the kickoff address at West 2006 in San Diego, California on January 10, 2006.

Objective

The purpose of this report is to explore the previous and current use of commercial off-the-shelf (COTS) and Government off-the-shelf (GOTS) collaboration tools by government and military organizations. [1] This report seeks a current understanding and the wider perspective more than an in-depth analysis of specific tools because the tools and their usage change or evolve surprisingly quickly over time. Unlike just a few decades ago, the U.S. Government, including all branches of the military, operates today both administratively and tactically using the Internet. Not surprisingly, the public sector has greater computer and Internet user rates than the private sector (Bureau of Labor Statistics, 2005), and increasingly the Internet use involves commercial collaboration tools. Therefore, it will be beneficial to explore the recent past and current status of collaboration tool use in order to provide recommendations for the future. A reasoned objective might be to ask the question, what are the "best" web-based tools to support small team interaction and work when team members cannot reside in the same physical workspace. This quick review of a wide array of collaboration tools cannot address that question. Nor does this research address the benefits for using collaboration tools, although it is informative to note that Ford, Hogan, and Perry (2002) suggested that most complex work involves decisions, and that too often our decision space is limited by our bounded rationality (cf. Kahneman, 2003). Likewise, both the reliability and validation of collaborative tools are beyond the scope of this effort, although Powers (2004) and Noble and Letsky (2003) have addressed those fundamental topics. Finally, this report does not address prospective collaboration technology such as tele-immersion, [2] nor collaboration process tools like GroupSystems.

Here, we will report on our search for team collaboration tools used in the military and government. The tools will be reviewed in terms of capabilities, and then analyzed with respect to which collaboration applications may offer the most potential to improve cognitive collaboration within and among the stages of the collaboration model proposed by Warner, Letsky, and Cowen (2005). Moreover, Wroblewski & Warner (2005) have provided a list of collaborative capabilities on commercially available tools for team collaboration (cf. Appendix A). For this report, two methods were used to identify collaboration tools being used either by the U.S. military or the Federal Government. Those two methods, ad hoc research and systematic document search, are described below. The culmination of this report will be the identification of collaboration tools that are currently "authorized" for use, as well as the identification of a handful of current COTS tools that deserve review and consideration for military crisis response.

The Dilemma

No nation in the history of the world is more capable and trained to deal with crisis than the United States of America. Nevertheless, as the lessons from September 11, 2001 and Hurricane Katrina continue to unfold, we continue to discover our inability to evolve a comprehensive communication solution to crisis or disaster response. Katrina provides only the most recent example wherein a lack of coordination and misinformation fueled the response

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[1] For economy of space and time in this report, comments about specific collaboration technologies and tools may be in quotes. To facilitate the exploration and understanding of the various topics and tools presented in this document, the liberal use of hyperlinks and footnotes has been used.

[2] For tele-immersion see: http://www.advanced.org/tele-immersion/introduction.html

delay. Bolstad and Endsley (2005) noted the "major communication failures" during and after Katrina associated with federal, state, and local government authorities. Moreover, according to Cooper (2005), Admiral Tim Keating, at the U.S. Northern Command said, "The devastation was so complete, so comprehensive ... that we couldn't figure out how bad it was." Addressing the media the admiral said of himself, "On Tim Keating's list of things we need to work and to analyze very carefully, communications is at the top of that list" (Cooper, 2005).

It may seem as if we live in a world populated with sophisticated communications. Commercial cell phones and broadband Internet access are visible daily in developed nations, and ubiquitous wireless Internet access has become a reality (see Appendix B). Traditionally, the U.S. military served as the vanguard for the specification and development of communication tools. One need only consider wideband radios, satellite communications, and the Internet itself. In sharp contrast, today's consumer-driven market has surpassed the military, with negligible exceptions, in its ability to invest and support the latest communication technology and tools. Consequently, sophisticated COTS tools are being widely employed in all of the military services, as well as in large business organizations, and the ability to manage that use represents challenges heretofore unprecedented.

As noted by Seymour (2002), most collaboration tools that support communications technology have short life spans. Thus, many earlier collaboration tools, including those that received accolades, are no longer readily available. For example, consider these three early contenders:

(a) "**Actionize** (http://www.actionize.com) is an effective tool for raising issues and forming community around those issues. Designed as online environment for political action, Actionize invites Webizens to make themselves heard and rally around shared issues,"

(b) "**InsideTheWeb** (http://www.insidetheweb.com) Message Board is a free service provided by Looksmart, Ltd. to all members of the Internet community, including commercial websites,"

(c) "**Zaplets** (http://www.zaplets.com) are the new way to communicate that turns your email into a live, shared place. Want to set up a meeting? Share an idea? Make a group decision? Zaplets get everyone on the same page with just one email. And less inbox clutter." [3]

At that time, about 2003, three different products embodied the state-of-the-art for commercial web-based collaboration tools: IBM's Lotus Instant Messaging and Web Conferencing, Microsoft Office Live Meeting and WebEx's Meeting Center. The explosion of communication technologies and COTS collaboration tools has not waned, and organizational IT professionals must address this rapid growth with reasoned policy. The COTS collaboration tool explosion sword is double-edged. The time critical information cycle for crisis response or military operations requires that we use such tools, if only to gain or maintain an edge, yet such tools arrive faster than they can be studied, evaluated, managed and incorporated into formal systems.

[3] Source for three collaboration tools is: http://www.kmunity.net/Free_Tools_/Collaboration/collaboration.html

The Critical Context: Military Crisis Planning

The U.S. military planning system traditionally falls into one of two categories, deliberate (detailed and systematic) or crisis action (immediate and spontaneous). The foundation for joint planning guidance is contained in JOPES (Joint Planning and Execution System).[4] "JOPES is much more than a manual. It is an elaborate system run by many people who use procedures, publications, and automatic data processing to integrate NCA policy decisions with military planning and execution at national, theater, and supporting organizational levels. JOPES supports this integration by facilitating actions during deliberate planning or crisis action planning" (Soucy, Shwendo, and Haven, 1995).

According to United States military joint publications (c.f. Appendix C), crisis planning, as opposed to deliberate planning, requires rapid sharing of facts and knowledge, because there is an immediate threat against U.S. interests that may call for a military response. Commanders use options previously developed by deliberate planning if possible to solve crises quickly, but such plans sometimes have major shortcomings. JOPES points out that deliberate planning is done for hypothetical crises and relies "heavily on assumptions regarding the political and military circumstances [which] make it improbable that any contingency plan will be usable without modification." In a crisis, military staffs are faced with a serious, rapidly developing situation for which they must produce a plan that takes into account the realities of a particular problem, not a hypothetical incident. Moreover, they may not have a lot of time to consult the keystone doctrinal manuals" (Soucy, Shwendo, and Haven, 1995).

Although this system has been exceptionally functional and is well engrained across the US military services, it does not address the newer communication technologies and tools that are being used in the armed forces today. For that reason the military should explore and employ the more recent COTS tactical "unifying communications" systems (i.e., Blog, chat/IM, collaboration, e-mail, Internet, MoBlog, RSS, VPO, VoIP, wikis, etc.) because the current expectation for optimal crisis response changes the requirements (the preceding acronyms or terms will be explained in more detail later in this report).

Scientific Background: Cognitive Models of Team Collaboration

The cognitive mechanisms for effective team collaboration are not well understood and several models of team collaboration have been proposed (Orasanu & Salas, 1992; McNeese, Rentsch, Perusich, 2000; Cooke, 2005). Bolstad and Endsley (2005) provided a taxonomy of collaboration tools according to function: face to face, video, audio, telephone, net radio, chat/IM, whiteboard, file transfer, program sharing, e-mail, groupware, bulletin board, and geographic information systems. The value of that taxonomy reinforces our fundamental understanding that collaborative tasks are not generic and thus require different tools.

Another collaboration model proposed by Warner, Letsky, and Cowen (2005) focuses on macro-cognition and provides a better context to evaluate collaboration tools, because there is empirical support for their collaboration stages: "Knowledge Construction", "Collaborative Team Problem Solving," "Team Consensus" and "Outcome, Evaluation and Revision."

Teams will typically start in the Knowledge Construction stage and proceed into Collaborative Team Problem Solving, Team Consensus and finally to Outcome, Evaluation and

[4] JOPES see: http://www.fas.org/nuke/guide/usa/c3i/jopes.htm

Revision. The stages are not necessarily sequential. Because team communication is very dynamic, the flow of communication can follow virtually any path. The cognitive processes within each stage are represented at two levels: meta-cognitive, which guides the overall problem solving process, and macro-cognitive, which supports team member's activities within the respective collaboration stage. In addition, there are communication mechanisms (i.e. verbal and non-verbal) for developing the meta-cognitive and macro-cognitive processes.

Warner, Letsky, and Cowen (2005) propose 16 distinct macro-cognitive processes for successful team collaboration:

• Individual mental model construction. Individual team members use available information and knowledge to develop their mental picture of the problem situation.

• Knowledge interoperability. The act of exchanging useful, actionable knowledge among team members.

• Individual task knowledge development. Individual team members ask for clarification of data or information, or respond to clarification requested by other team members.

• Team knowledge development. All team members participate in clarifying information to build team knowledge.

• Individual knowledge object development. Pictures, icons, or standard text developed by an individual team member or the whole team to represent a standard meaning.

• Individual visualization and representation of meaning. Visualizations (e.g. graphs, pictures) are used by individual team members to transfer meaning to other team members. Representations are methods (e.g. note pads) used by individual team members to sort data and information into meaningful chunks.

• Iterative information collection and analysis. Collecting and analyzing information to come up with a solution with no specific solution mentioned.

• Team shared understanding. The synthesis of essential data, information or knowledge, held collectively by some (complementary understanding) and/or all (congruent understanding) team members working together to achieve a common task.

• Develop, rationalize and visualize solution alternatives. Using knowledge to justify a solution.

• Convergence of individual mental models to team mental model. Convincing other team members to accept specific data, information or knowledge.

• Team negotiation. Team negotiation of solution alternatives ending in a final solution option.

• Team pattern recognition. The team as a whole identifies a pattern of data, information or knowledge.

• Critical thinking. The team works together toward a common goal, whereby goal accomplishment requires an active exchange of ideas, self-regulatory judgment, and systematic consideration of evidence, counterevidence and context in an environment where judgments are made under uncertainty, limited knowledge and time constraints.

• Shared hidden knowledge. Individual team members share their knowledge through prompting by other team members.

• Compare problem solution against goals. Team members discuss solution option against the goal.

• Analyze and revise solution options. Team members analyze final solution options and revise them if necessary.

Thus the report by Warner, Letsky, and Cowen (2005) serves as a necessary foundation for the exploration and synthesis of the new digital collaboration technologies that are emerging during the past decade. Any future review of collaboration tools should consider tool capabilities that may support these macro-cognitive processes, ultimately leading to a better understanding of how to create effective collaborative environments.

APPROACH

Two methods, ad hoc research and systematic document search, were used to identify commercial and proprietary collaboration tools that deserve review and consideration for military and government crisis response. We identified 64 collaboration technologies and tools, 37 of which are being used by the U.S. Military or Federal Government agencies.

Ad Hoc Method

To assess the pulse of current military collaboration technology, a small number of domain experts were contacted during August 2005 and asked to discuss what they knew about COTS and GOTS collaboration tools being used in the U.S. military or Government today. In addition, the Internet was searched, in particular the .mil domain, for tools and comment related to collaboration tools. The following review and analysis of collaboration technologies and tools in use by the U.S. military and or the U.S. Government is exploratory. While neither comprehensive nor systematic, our search can be considered representative.

Systematic Document Search

Two electronic searches were conducted during July and August 2005 in support of this effort. The first was at the Government Accountability Office (GAO) website where an advanced search for the term “collaboration tools” was made for anywhere in the document without time or other constraints. Six documents were identified (GAO, 2005), none of which identified any specific collaboration tool, yet all of which support the notion that the Government is interested in the functional utility associated with collaboration tools. For example, in 2004 the GAO looked across the Federal network landscape and identified nine agencies, which reported “34 major networks that support homeland security functions—32 that are operational and 2 that are being developed.” A key finding in that report was that the Department of Homeland Security “is in the process of developing the new Homeland Secure Data Network, which is expected to provide classified e-mail and Web sites, messaging, data analysis tools, collaboration tools, and other applications required to support DHS” (GAO-04-375, p. 25).

The second electronic search at the Defense Technical Information Center (DTIC) looked for any of these three terms, “collaborative software,” “collaborative assistants,” or

"collaborative tools" during the most recent decade. The DTIC search tool, STINET, automatically performs a "wild card" truncation, and thus it searched for collaboration, collaborative, collaborated, and collaborates. The search was created as part of a brief newsletter report for the System Development Technical Group (Alley, 2005) of the Human Factors and Ergonomics Society. Eighteen documents were found that met the criteria, nine of which are cited elsewhere in this report.

Scanning the Environment

Prior to exploring the topic of collaboration tools, we should recognize explicitly that such tools require at least two people who are working on the same task, likely in different locations and perhaps at different times. Digital teamwork is not something we learned in school, and collaboration implies social interaction, even at a distance. Moreover, tools and their use are always embedded within a cultural environment. Therefore, it will be instructive to explore briefly a small part of the current and likely future cultural setting in order to set the stage for understanding the current and next generation of government and military workers, and where our preconceived notions about those topics may require some adjustment.

Some readers may be surprised to learn that in the Fall of 2005 millions of students entered "college for the first time. On average, these members of the Class of 2009 were 18 years old, which means they were born in 1987. Starbucks, souped-up car stereos, telephone voicemail systems, and Bill Gates have always been a part of their lives" (Beloit, 2005). [5] Likewise, practically no one today has heard the term, "Digital Information Fluency," which is rapidly becoming a prerequisite for most information- or knowledge-based work (Kennedy, 2005). Clearly, our younger (and future) military personnel are living in and exploring a technological world quite unlike what most of us knew even five years ago, a time prior to the common use of blogs, IM, and wikis (defined below).

Early Collaboration Research and Usage

A short decade ago, there were no commonly available multi-user internet-based digital collaboration tools (excluding e-mail) available anywhere. But the need for such tools was becoming visible. For example, in the early 1990s the Army selection board required a way to make distributed group decisions (e.g., brainstorming) easier. The Army also studied the implications for using collaboration tools in training (Bonk & Wisher, 2000), and in supporting the learning organization (Kingsbury, 1999). Likewise, the Navy has studied the use of web-based collaboration for peace operations (Spivey, 2002), during complex humanitarian emergencies (Ford, Hogan & Perry, 2002), in support of sea-based aircraft maintenance (Nasman, 2004), and to enhance group performance (Gallaher & O'Rourke, 2004). In the early

[5] "The list is distributed to faculty on campus during the New Students Days orientation. According to McBride, "It is an important reminder, as faculty start to show signs of 'hardening of the references,' that we think about the touchstones and benchmarks of a generation that has grown up with CNN, home computers, AIDS awareness, digital cameras and the Bush political dynasty. We should also keep in mind that these students missed out on the pleasures of being tossed in the back of a station wagon with a bunch of friends and told to keep the noise down, walking in the woods without fearing Lyme Disease, or setting out to try all of the 28 ice cream flavors at Howard Johnson's."

1990s, the LAN was used mainly to share printers. As collaboration technology started to emerge networking became digital.[6]

After the World Wide Web expansion in 1995, collaboration topics developed relatively quickly. By 2001, there were at least four popular collaboration tools designed or enhanced by technology innovators in use by various Governmental and military organizations.[7] These four collaboration tools are identified below:

• Collaborative *Virtual Workstation* (CVW): This is a software prototype developed by MITRE that supports a collaborative environment optimized for supporting persistent, geographically dispersed virtual rooms. CVW provides chat, audio/video conferencing, application sharing, electronic whiteboarding, and multi-point communications. At the time this paper was written, MITRE was looking for a vendor who would assume responsibility for managing and improving the software.

• Information *Workspace* (IWS): General Dynamics developed IWS as a Web-based, collaboration environment featuring virtual rooms, audio/video conferencing, chat, electronic whiteboarding, and application sharing with multipoint communications.

• Microsoft *NetMeeting:* A Microsoft product that supports point-to-point communications for its audio/video conferencing, chat, application sharing, and electronic whiteboarding.

• IBM *Lotus Sametime:* A Lotus product that interfaces with most Web browsers and provides audio/video conferencing, chat, application sharing, electronic whiteboarding, and awareness with multipoint communications.

Prior to that, however, Congress recognized the need for distributed coordination and in 1999 "instructed the Department of Defense (DOD) and the Intelligence Community (IC) to address the lack of interoperability between fielded collaborative tools. To respond to this Congressional direction, the Office of the Secretary for Defense (OSD) and the Joint Staff (JS) established a Collaboration Tiger Team (CTT) composed of members from the Commanders in Chief (CINC) (unified commands), Services, and Agencies (C/S/A), with a two-fold mission: (1) Develop a strategy for implementing the use of collaborative tools throughout DOD, and (2) Define and validate a prioritized list of functional requirements for DOD collaborative tools." [8] As of May 2005, applications were still being accepted for the test process, although the Defense Collaboration Tool Suite has remained their interim choice (see below).

Other organizations were pursuing parallel courses. For example, the review by Lindvall et al. (2001) exemplifies both the continuing growth of collaboration technology, and its wide usage. Likewise, by mid 2003, the National Institutes of Health had performed an internal survey and identified these collaboration tools as being used by NIH at that time: AMBIS, Conference Server, eRoom, Exchange 5.5, Groove, GroupWise, Key Flow, Place Ware,

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[6] About LANs, interestingly, iGov recently was awarded a $300 million contract that "will provide acquisition, engineering, integration, testing, fielding and training services for SOCOM's Tactical Local Area Network. SOCOM, one of the military's nine major commands, located in Tampa, Fla., coordinates Army, Navy and Air Force special forces' units that perform reconnaissance of enemy forces prior to a military conflict, trains foreign forces in warfighting tactics, and tracks terrorists."

[7] P. A. Dargan. (2001). The Ideal Collaborative Environment. The Journal of Defense Software Engineering: http://www.stsc.hill.af.mil/crosstalk/2001/04/dargan.html

[8] Source for 1999 Congressional initiative: http://jitc.fhu.disa.mil/washops/jtcd/dcts/index.html

Plumtree, Project Server, Share Point, Shared Folders (Exchange 5.5), WebDAV, and WebX. Of these fourteen resources, eleven were identified as recommended for use in the next two years: Conference Server, eRoom, Exchange 2000, Groove, Key Flow, Place Ware, Plumtree, Project Server, Share Point, WebDAV, and WebX. [9]

Eventually, the Department of Defense became proactive about the critical importance of standards for collaboration, and in particular for records management (RM). The HIPPA [10] and Sarbanes-Oxley [11] acts support the use of similar standards, but apply more to commercial organizations than to the military, and thus, are not discussed here. Standards for RM are described in DoD 5015.2-STD:

> DoD 5015.2-STD, "Design Criteria Standard for Electronic Records Management Software Applications," 06/19/2002…This Standard is issued under the authority of DoD Directive 5015.2, Department of Defense Records Management Program, March 6, 2000, which provides implementing and procedural guidance on the management of records in the Department of Defense. This Standard sets forth mandatory baseline functional requirements for Records Management Application (RMA) software used by DoD Components in the implementation of their records management programs; defines required system interfaces and search criteria to be supported by the RMAs; and describes the minimum records management requirements that must be met, based on current National Archives and Records Administration (NARA) regulations." [12]

Yet, the progress of COTS collaboration tools, driven by commercial interests, has continued unfettered by the lack of any comprehensive and systematic military analysis. At the Department of Defense Human Factors Engineering Technical Advisory Group (TAG-47) annual meeting, Seymour (2002) provided the most inclusive unofficial view of COTS collaboration tools to that date, and discussed some of the more than 700 COTS or GOTS collaboration tools that were available at that time. That call for a coordinated and joint military direction and oversight continues to remain officially unacknowledged, yet was independently revisited by Gallaher and O'Rourke (2004). They recommended a "Navy-wide scale to evaluate the 181 collaborative technology tools currently in use."

It is important to note that collaboration progress is no better for the classified side of the military. Alexander (2005) reports that, "the intelligence community has not kept up with the Army. The 15 agencies of the community – ranging from the armed services to the National Geospatial Intelligence Agency – maintain separate portals, separate data, and separate people. The bad guys exploit the gaps, and your safety is on the line."

With practiced caution, the military is recognizing that gap. In December 2003, the Navy held its first Naval Information Technology (IT) Summit "designed to strengthen and align its Information Management/Information Technology" (Pierce, 2004). The DON IM/IT leadership team has recently published the DON IM/IT Strategic Plan for 2004-2005. [13] It specifies six goals, a few of which identify collaboration tools that are applicable here and are identified

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[9] NIH Survey: http://enterprisearchitecture.nih.gov/brick_collaboration_tools.htm N.B. the new webpage is http://enterprisearchitecture.nih.gov/ArchLib/AT/TA/CollaborationToolsBrick.htm

[10] An explanation of HIPPA can be found here: http://aspe.hhs.gov/admnsimp/pl104191.htm

[11] Discussion about Sarbanes-Oxley can be found here: http://www.oalj.dol.gov/Public/WBLOWER/REFRNC/sox.htm

[12] The source for DoD 5015.2-STD is: http://www.dtic.mil/whs/directives/corres/html/50152std.htm

[13] Which can be found here: http://www.doncio.navy.mil/fy05stratplan

below. Finally, the 2005 International Symposium on Collaborative Technologies and Systems was held in St. Louis during May 15-19 with the support of the Air Force Research Laboratory. The principal technologies discussed included, "Human Collaboration, Jabber, Instant Messaging, Presence Awareness, Web-Services, Virtual Meetings (VMA), Video-Teleconferencing, Domain Tasking, KnowledgeKinetics™, Plug-in Architectures, and Java." [14]

Given the Defense Information Systems Agency's long association with the digital collaboration concept, it may be constructive to discover what DISA considers useful for collaboration technology. "DISA says, it is using the COTS Tandberg systems, along with other COTS collaboration products (including IBM Lotus Instant Messaging, Bantu IM, and Wired Red conferencing products), to add new collaboration features to its expanding JWICS, the federal government's top-secret communications and collaboration system" (Mahowald, 2005). Moreover, "Air Force Lt. Gen. Charles Croom, the agency's new director, said in August that Net-Centric Enterprise Services (NCES) "is the only transformational program DISA has." General Croom also said that "the nine technologies in NCES need better explanations and the program may require more than nine" (Tiboni, 2005a). There is little doubt that DoD is moving toward the NCES and the start date was October 2005, however, the collaboration aspects are not widely known at this time. [15]

Collaboration Tools in Use Today

The identification and compilation in this report of thirty-seven collaboration technologies and tools in use by the U.S. military or the U.S. Government, while neither comprehensive nor systematic, serves as the base for exploring capabilities and functions considered necessary for military collaborative communication. These technologies and tools likely also serve as foundational for identifying the existing military collaboration state-of-the-art. With those caveats, the following collaboration tools and technologies have been grouped into four categories, and then listed alphabetically within each category. The four category groupings are: (a) modern collaboration technologies, in other words capabilities that permit the design, development, or enhancement of collaboration tools, (b) six conventional or "authorized" collaboration tools being used by the military, (c**)** thirty-one other collaboration tools being used in the military or the U.S. Government, and (d) collaboration tools recommended for consideration by the military specifically for crisis response. To facilitate the objective of this report, identifying likely tools that can be used for military crisis intervention, only groups (a) and (d) are included in the report below, whereas groups (b) and (c) can be found in Appendices D and E respectively. In addition, one author (Seymour) is compiling a larger list that will address these topics which currently contains more than 100 collaboration technologies and tools.

RESULTS AND DISCUSSION

At one time four years ago, we marveled at the explosion of information (Seymour, 2002). Today, the information explosion is as passé as ice cream, and we need to tune in to the explosion of digital technology. Collaboration technology itself is exploding, not just the

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[14] 2005 International Symposium on Collaboration: http://www.engr.udayton.edu/faculty/wsmari/cts05/DM3.htm

[15] Rumor from the "deck plates" holds that, "DISA will provide NIPR and SIPR commercial collaboration services in early 2006 (RFP on the streets a/o December 9, 2005; expectation of an award will be made around mid February and two will be chosen) through the Network Centric Enterprise Services [program]."

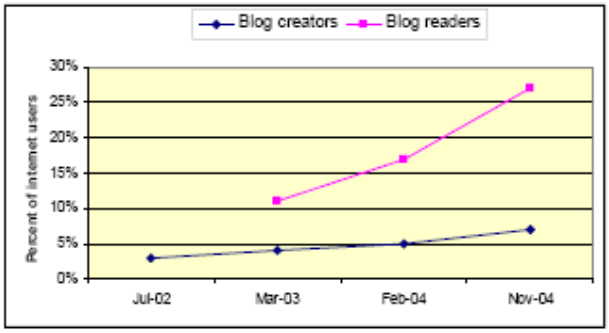
collaboration tools. Unlike the previous growth in collaboration tools wherein commentators wrote about incremental advancements within whiteboards, audio conferencing, or groupware etc., today we see the emergence of new capabilities that support the design and development of new collaboration tools. For these reasons, our first emphasis is on the most recent collaboration technologies.

Modern Collaboration Technologies/Capabilities

The 13 most noteworthy technologies that deserve to be explored and exploited by every major U.S. military command for crisis collaboration are blogs, Bluetooth, chat, IM, pocket casting, podcasting, RFID, RSS, video conferencing, [16] voiceXML, VoIP, webcasts, and wikis. Again, these are generally generic capabilities, not tools per se. They are technologies that support or can support collaboration, upon which tools are being created or enhanced at increasingly faster rates. Each of these collaboration technologies is described briefly below.

• **Blogs**: The explosion of blogs represents but one capability that in its own right is exploding into variants each of which provides additional methods to collaborate. A brief background will be useful. "The term "weblog" may have been coined…in December 1997. The shorter version, "blog", was coined by Peter Merholz, who, in April or May of 1999, broke the word *weblog* into the phrase "we blog" in the sidebar of his weblog." [17] Originally blogging was a way to provide text to selected readers who would offer comment on the periodic postings. Today, however, we have audioblogs, moblogs (mobile blogs), photoblogs, etc. Thus this new blog technology continues to grow at extraordinary rates. Although in December of 2004 62% of Internet users reported that they did not know what a blog is, "8 million American adults say they have created blogs; blog readership jumped 58% in 2004 and now stands at 27% of internet users." Figure 1 below supports those data (Pew / Internet, 2005).

1 - The growth of the blogosphere



"A weblog (usually shortened to blog, but occasionally spelled web log) is a web-based publication consisting primarily of periodic articles (normally in reverse chronological order)" (Weblog, 2005). The Army Management Staff College uses blogs to support distributed

[16] Although video conferencing has been available for about 30 years, until recently the technology precluded practically all but those willing to endure the small screens, large expense, jerky images, and other bandwidth issues. All of that is poised for change; see below.

[17] Source and introduction to weblogs: http://en.wikipedia.org/wiki/Weblog

learning. [18] Likewise, Federal government contracting uses a commercial blog host called BlogSpot.[19] Interestingly, the "Iraq war was the first "blog war:" Bloggers in Baghdad gained wider readership and one (Salam Pax) published a book of his blog. Soldiers serving in the Iraq war created "milblogs" [20] and provided readers a new perspective on the realities of war. Reading the thoughts of people who were "on the spot" provided a supplement to official news sources" (Weblog, 2005). The Mudville Gazette claims to serve as a resource for one of the largest collection of milblogs.[21] The power of blogs is exemplified by Kevin Sites who was honored by Wired Magazine in 2005 for "for rewriting the rules of war reporting." [22]

In another military domain, Alexander (2005) [23] is optimistic about using blogs on the classified side. He states that,

> "When I Google 'Afghanistan blog' on the public internet, I find 1.1 million entries and tons of useful information. But on Intelink there are no blogs….It's not far-fetched to picture a top-secret CIA blog about Al Qaeda, with postings from Navy Intelligence and the FBI, among others."

On the other hand, in August 2005, the Army reported performing a "closer look at blogs and Web sites maintained by soldiers. Many such blogs and Web sites include photographs or other information that inadvertently exposes classified or sensitive information to anyone with access to the internet. General Peter Schoomaker, the Army's chief of staff, noted that soldiers routinely post pictures online that include "tactics, techniques, and procedures" for weapons systems." According to Richard Cody, Army vice chief of staff, "The enemy is actively searching the unclassified networks for information, especially sensitive photos." (Federal Computer Week, August 30, 2005) [24]

• **Bluetooth**: "Bluetooth has become the most widely known short-range wireless communications standard. Defined by the Bluetooth Special Interest Group (SIG), the technology is quickly replacing various wired applications such as data cables for mobile phones and printer cables in office environments. Bluetooth has also found its way into several other applications in the automotive, industrial, medical and scientific sectors. Examples of such

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[18] For the Army's educational use of blogs see page 10 of the January 2005 TRADOC Perspective: http://www.tradoc.army.mil/pao/TRADOC_Perspective/TP4.pdf

[19] Located at this site: http://profrex.blogspot.com/

[20] Milblogs were given focused attention by Hugh Hewitt in March 2004 at: http://www.weeklystandard.com/Content/Public/Articles/000/000/003/840fvgmo.asp Currently 284 participants contribute to the Milblog Ring, although many of them are not tactical. See: http://www.ringsurf.com/netring?ring=MiliBlogs;id=18;action=list

[21] http://www.mudvillegazette.com/ whereas the most famous military blog is called the Blogs of War: http://www.blogsofwar.com/ Interestingly, blogs quickly evolved into both photo blogs and video blogs: http://www.videoblogs.com/.

[22] That event last November when he was embedded with the 3rd Battalion, 1st Marine Regiment, can be read here: http://www.wired.com/wired/archive/13.03/rave.html?pg=8.

[23] Kris Alexander is a captain and military intelligence officer in the US Army Reserve.

[24] The following five popular military blogs support the notion that technology will be used and that consequently it is better used when managed: A soldier's thoughts (misoldierthoughts.blogspot.com), Boots in Baghdad (bootsinbaghdad.blogspot.com), Life in this girl's Army (sgtlizzie.blogspot.com), 365 and a wake up (thunder6.typepad.com), and Ma Deuce Gunner (madeucegunners.blogspot.com). Source: Federal Computer Week: Chris Dorobek on September 21, 2005 http://www.fcw.com/blogs/archives/editor/2005/09/soldier_blogs.html

applications include remote metering and data collection, and wireless heart or blood pressure monitors….The Bluetooth SIG launched the Bluetooth 2.0 specification late last year. This was shortly followed by Bluetooth 2.0+EDR (Enhanced Data Rate). Bluetooth 2.0 is a refined version of previous standards and is fine-tuned to specific Bluetooth profiles. The EDR technology delivers 3Mbps transmission speed at minimal power." [25] The Air Force in particular has recognized the critical value of enabling digital technologies such as Bluetooth. [26]

> **Messaging Systems Overview**: The most common Internet and associated messaging systems include: e-mail, IM, chat, short message services (SMS) and multimedia message services (MMS). Discounting e-mail, the two most common, chat and IM, are discussed below.

• **Chat**: Chat is widely used tactically on Navy ships, and is a key communications tool for all the military services. Seymour (2001) discussed the use of chat rooms as they become recognized as useful for tactical missions. Recently, one Army organization professed this policy, "The use of chat software including American Online (AOL) Instant Messenger (IM) is prohibited on all Army systems. The only chat use authorized is that which is provided by Army Knowledge On-Line (AKO). ARL has attempted to remove AOL IM from ARL systems." Nevertheless, chat rooms can be found on every major ship in the Navy, as well as at many Air Force, Army, and Marine Corps commands. Chat, unlike IM (below) is typically accomplished at a workstation in a home or office.

• **Instant Messaging (IM)**: IM has been available for decades, but was used earlier mainly by computer professionals. In 1996 AOL pushed IM into the public eye with their buddy list, now copied widely by competitors. Buddy lists are like an interactive address book -- names essentially light up on your computer screen when someone online is ready to chat. There is no mystery as to when they will get your message (Seymour, 2001). The IM popularity has grown almost exponentially. Recently, the Air Force initiated the "Friends and Family Instant Messenger" program, available through the Air Force Portal. Not only can Airmen communicate on work-related projects, but also they can chat online with non-Air Force friends or family members. "Air Force Instant Messaging is the hi-tech end of Combat Care," said Gretchen Shannon, 48th MSS FSC Flight chief. "It allows families to reach across the miles in real time and have that connectivity." [27] The prime issue with IM is that there are dozens of tools that provide IM capabilities, but few interact with each other. A notable exception is Trillian, which can connect to several other different instant messengers such as: Yahoo Messenger, MSN Messenger, ICQ, mIRC, AIM, and IRC. Another exception is BuddySpace (see below). In August of 2005 Google raised the bar by offering free phone and IM services to subscribers of their free Gmail accounts. [28] Moreover, using SMS, IM can be accomplished while walking down the street. [29]

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[25] Bluetooth: http://www.telecom.globalsources.com/gsol/I/Bluetooth-headset/a/9000000063869.htm

[26] Air Force enabling technologies: http://www.stsc.hill.af.mil/crosstalk/2002/08/alford.html

[27] Source Air Force Instant Messaging: http://www.lakenheath.af.mil/jet48/2005Folders/020405/news_messaging.htm

[28] "Google has announced a free service called Google Talk that lets e-mail account holders talk to each other using a PC, microphone, and speakers and provides instant messaging capability. Google reportedly plans to make the service compatible with other companies' services, basing it on an open standard, which would allow users to

• **Pocket casting**: "ComVu has created the world's first live video broadcast solution from a mobile device to a global audience. With the push of a button on a camera phone bloggers, citizen reporters, family members, friends and corporate professionals can broadcast live events to their communities - simply and inexpensively." "This is a world where everyone will be able to carry around a mobile outside broadcast studio in their pocket. Just strikes muffin here that this could lead to all sorts of stuff. Imagine never knowing who's filming who, for what purpose or when? DIY reality TV en masse. The beta is free, and there will be free and Pro versions eventually." [30]

• **Podcasting**: Podcasting is a way of publishing audio broadcasts using the Internet. It allows users to subscribe to a feed of new files, and became popular in late 2004.[31] Interestingly, during the day, "Aviation Technician Chief (SW/NAC) Todd Cochrane can be found at Commander, Patrol and Reconnaissance Wing-Two, but by night he is a talk show host broadcast worldwide. Cochrane hosts a technical 'podcast' show where he talks about different technologies on the market from video games to the latest software, and technical news." [32] There is a military podcast site: http://www.militaryspot.com/military-podcast.htm and both the Air Force http://www.podcast.net/show/17153 and the Army http://www.army.mil/srtv/SoldiersRadio/SRN.html support podcasts. Moreover, on August 5, 2005 IBM began using podcasting to share its strategic vision with investors and businesses. "Companies have streamed audio at Web sites for years. The advantage of a podcast is that audio information (and in the future, perhaps other media) can be downloaded to a PC, iPod, or other MP3 player, and then played at the recipient's convenience." [33] A podcasting kit costs $20. In October 2005 Yahoo became the first major search service to support the search for podcasts. Yahoo estimates that five million people listen to podcasts. Podcasting has obvious educational benefits [34] but also tactical and crisis response applications too. Podcast Alley has a useful directory, and an introduction can be found here (CNET.com).

• **RFID:** Radio Frequency Identification is being used in DOD for logistics, and likely will expand its use in the near future. "On July 30, 2004, the Acting Under Secretary of Defense for Acquisition, Technology, and Logistics signed a memorandum outlining policy for the use of RFID within the Department of Defense (DoD). The strategy calls for taking maximum advantage of the inherent life-cycle asset management efficiencies that can be realized with integration of RFID throughout DoD." http://www.acq.osd.mil/log/rfid/index.htm

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talk to people on competing systems. Users will not be able to make calls to landlines or mobile phones, however. The new service does not carry advertising." Source: Edupage, August 24, 2005.

[29] Interestingly, IM and SMS have evolved an abbreviated "language." See: http://www.transl8it.com/cgi-win/index.pl

[30] Source: http://www.redferret.net/?p=5846 or to visit ComVu use this link: http://www.comvu.com/

[31] Podcasting defined: http://en.wikipedia.org/wiki/Podcast

[32] Hawaii Navy News, July 27, 2005: http://www.hawaii.navy.mil/NewsPAO/HNN_Archive/050527/052705NAVYNEWSB.pdf

[33] IBM podcasts. InformationWeek, August, 2005: http://informationweek.com/story/showArticle.jhtml?articleID=168600396

[34] "Purdue University has begun providing podcasts of lectures for certain courses. Purdue offers recordings for students who miss a class or who want to review specific lectures. Previously, recordings were available for about 100 courses but only on audio cassettes. Starting this fall, recordings for lectures from some courses are available as MP3 files, allowing students to download the recordings." Chronicle of Higher Education, 31 August 2005.

• **RSS**: RSS stands for Really Simple Syndication. "RSS is a family of XML file formats for web syndication used by (amongst other things) news websites and weblogs." [35] The U.S. Army War College provides an explanation of RSS here: http://www.carlisle.army.mil/usacsl/whats_rss.asp as does the U.S. Joint Forces Command: http://www.jfcom.mil/rss_fact.htm. The reason RSS is a critical technology for the military is that in the future commands will use it to customize their hourly information input. "Millions of people today are using RSS to get their news, customized to fit their tastes. Most don't know it--but anybody who uses My Yahoo's news feature is consuming data via RSS." [36] Within five years every major command center in the U.S. military will be using RSS, or some advanced version, to segment and process its intelligence and unclassified data and information input. The USJFCOM RSS site can be found here: http://www.jfcom.mil/rss_fact.htm. Another introduction to, and recommendations for using, RSS can be found here: http://www.askbobrankin.com/what_is_rss.html, which makes recommendations for aggregators that support Windows, Mac, and Linux platforms. Not only will the military have to use RSS aggregators to acquire information, but they also will be required to create reports that support the RSS format to support rapid collaboration among the many distributed crisis teams that evolve during any major National catastrophe. The DoD Newsreader Feed resource can be found here: http://www.defenselink.mil/news/rss/ .

• **Videoconferencing**: As mentioned above, although video conferencing has been available for about 30 years, the technology precluded practically all but those willing to endure the small screens, large expense, jerky images, or other bandwidth issues. All of that previous frustration is poised for change (Regenold, 2005). The current shift from ISDN- to IP-focused videoconferencing reflects the newest technology advances. Moreover, Regenold (2005) offers seven cogent reasons why the promise of desktop webconferencing "at long last, may have arrived." Currently the Army is using video conferencing to connect families with warriors in Iraq. [37]

• **VoiceXML**: "VoiceXML, or VXML, is a markup language like HTML. The difference: HTML is rendered by your Web browser to format content and user-input forms; VoiceXML is rendered by a voice browser. Your application can speak to the user via synthesized speech or by prerecorded audio files. Your software can receive input from the user via speech or by the tones from their telephone keypad. If you've ever built a Web application, you're ready to get started with your phone application….As in the old days, you can still rent a telephone line and run commercial voice recognition software and text-to-speech (TTS) conversion software. However, the most interesting aspect of the VoiceXML revolution is that you need not actually do so. There are free VoiceXML gateways, such as Tellme, BeVocal, and VoiceGenie. These take VoiceXML pages from your Web server and read them to your user. If your application needs input from the user, the gateway will interpret the incoming response and pass that response to your server in a way that your software can understand….You use a Web form to configure the gateway with the URL of your application, and it will associate a telephone number with it. In

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[35] RSS is explained here: http://en.wikipedia.org/wiki/RSS_%28file_format%29

[36] Needleman, R. (2005). Small Business Technology. CNET. http://reviews.cnet.com/4520-3000_7-6299586-1.html?tag=txt&tag=nl.e501

[37] See the report titled, "From Iraq, a smile for folks at home High-Tech Hello: Videoconferencing changes the way soldiers keep in touch" in the San Francisco Chronicle, July 24, 2004: http://sfgate.com/cgi-bin/article.cgi?file=/c/a/2004/07/24/MNGQC7SL491.DTL

the case of Tellme, your users call 1-800-555-TELL, dial your 5-digit extension, and now they're talking to your application." [38]

• **VoIP:** Voice Over Internet Protocol has been evaluated by military commands for several years. "As part of its project management service offering, DTS-W [39] offers ongoing project management support and connectivity for Voice over Internet Protocol (VoIP) technology. Although DTS-W does not provide VoIP equipment, it assists its customers in: Obtaining connectivity (DSN and dial-tone), Selecting and procuring the necessary switches and equipment, and Managing the installation and support of VoIP implementations." Moreover, VoIP is being used over military networks under battle conditions, and the U.S. Marine Corps has been proactive in implementing this technology in the field, especially at its innovative Unit Operating Centers (UOC). [40]

• **Webcasts**: Webcasts are a type of digital information pull system wherein personnel can obtain information (typically used for education and training) over the Internet. The Navy "Summex Health Management has sponsored a monthly Webcast since 2003 on a variety of health management topics. The Webcasts are designed for wellness program managers, human resource staff, medical directors, chief financial officers, health plan managers and administrators." [41]

• **Wikis**: The general consensus is that, "Wikis Make Collaboration Easier" but they are not foolproof (Goodnoe, 2005). "Blogs and wikis are increasingly being used in collaborative educational settings…. Wiki is Hawaiian for "quick," and is a method for MANY users to create and edit web page content quickly and easily. A Wiki is . . . the simplest online database that could possibly work." [42] A recent study by, Wei, Maust, Barrick, Cuddihy, and Spyridakis (2005) reported that, "Wikis allow distributed teams to collaboratively write and edit documents through the Internet in a shared online workspace, without the need for special HTML knowledge or tools. The flexibility of wiki technology is a boon for increased cooperative work on large team projects." The authors know of no official military wikis in use, but noted that all branches of the military refer to, and provide links to, the Wikipedia, if not others. For example, Chips, [43] the Navy's premier information technology periodical provided a link to Wikipedia that described the 802.11i wireless Ethernet security standard. [44] The Space and Naval Warfare Systems Center in San Diego recently installed a wiki for internal use by young professionals to support new technology.

As mentioned above, Appendix D identifies the six conventional or "authorized" collaboration tools being used by the military or U.S. Government, and Appendix E identifies other collaboration tools being used in various agencies or organizations of the U.S. military or government. Before exploring today's collaboration technology and tools, it will be instructive

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[38] VoiceXML is defined here: http://philip.greenspun.com/seia/voice/

[39] The Defense Telecommunications Service—Washington organization (DTS-W) "acquires cost-effective, responsive and flexible telecommunications products and services for the DoD within the National Capital Region (NCR) in accordance with DoD Directive 4640-7, DoD Instruction 5335.1 and AR25-1, Army Information Management, Sections 2.7 and 6.3." https://secureapp2.hqda.pentagon.mil/dtsw_cms/index.cfm

[40] cf. Miller, 2005.

[41] Here is a list of webcasts available to Navy commands: http://www-nehc.med.navy.mil/hp/Summex.htm .

[42] Navy Human Performance Center: https://www.spider.hpc.navy.mil/index.cfm?RID=WEB_OT_1001257.

[43] http://www.chips.navy.mil/archives/04_fall/Web_pages/grid_computing.htm .

[44] http://en.wikipedia.org/wiki/IEEE_802.11b .

to take a quick glimpse about the technology environment and what the next generation of military and Government technologists are exploring.

Future Web Collaboration

"A whole new Web is emerging from the wilds of cyberspace. It's no longer all about idly surfing and passively reading, listening, or watching. It's about doing: sharing, socializing, collaborating, and, most of all, creating. Says Eckart Walther, Yahoo! Inc.'s vice-president for product management: "It's the second coming of the Web'" (Hof, 2005). Think back to the days in 1985 when Gopher was considered state-of-the-art on the Internet. Never before then could anyone sit at their desk and travel the world seeking information and finding it with several clicks of the keyboard. It was like the best information in the best collective libraries opened up and invited you to browse. Back when Gopher (and Archie and Veronica) represented high technology all the information was plain text. On the Internet, there were no pictures, no hypertext, and no audio or video files, only folders and more folders filled with text documents. And we worked alone. An example can be found by using either your web browser or anonymous FTP to visit the boombox.micro.umn.edu directory at the University of Minnesota. Then look in the directory called /pub/gopher. Adding pictures, audio, video, and hypertext only enhanced the exploration. Using Google only made the search easier. If you didn't know that Rice University contained an excellent repository about the Civil War, then eventually you would find it. Google simply made the search much quicker. Yet, with the exception of special teams who use relatively primitive collaboration tools, for the most part, we still work alone in 2005.

Walther implies that the next generation web needs to be collaborative. The future is Web 2.0 and this environment must be able to separate the data and the presentation, something unusual until now. "One key takeaway from the Web 2.0 panel was that data, interface and metadata no longer need to go hand in hand. When working on an application/website, one thinks of the overall picture including the data, the metadata, and the interface. With Web 2.0 apps, the data might be from one place, the metadata from another and the interface from a third party or a remix." [45] As noted below, the technology and tools are available today to build this new collaborative web.

Specific Collaboration Tools

More than fifty collaboration tools, from Arel Anyware and Articulate [46] to World Crossing and Zeosoft having unknown usage patterns associated with official U.S. military organizations were identified as potentially useful for crisis collaboration. Given that at least a few U.S military organizations are (or have been) using these tools, the expectation is that military commanders or teams in a distributed collaborative environment would benefit from the use of these tools. Such tools not only indicate the explosion within the digital collaborative sphere and the need to find and share information at speeds unparalleled in history, but they also signal the non-linear digital future. Although all of these collaboration tools deserve some consideration, that would not be possible in this report. Consequently, fourteen collaboration tools are

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[45] Details about Web 2.0 are: http://www.rashmisinha.com/archives/05_08/web2-data-metadata-interface.html

[46] Articulate can be considered a collaboration tool only in the sense that practically all of the typical collaboration tools use the Internet and the five Articulate tools significantly enhances the presentation of information that "rides" the Internet. See: http://www.articulate.com/

identified below as likely collaboration resource options for most military organizations, especially those with crisis response missions. The decision process was not easy, but consideration was given to tools that were relatively mature, tools that exploited the newer technologies, tools that received good reviews, and open source tools. Not all of the following met all four criteria equally well, but this is the list that stands out in that regard. Also, open source is considered critical for the DoD which should create its own "tiger-teams" that would compare and contrast the various open source tools, choose the optimal tool(s), and then would modify the application's open source code with security features and task specific enhancements. All of the tools are discussed briefly below. Five of these tools however (indicated by a ☑) were selected for more detailed attention. Their analysis and review is emphasized because they are particularly representative of the newer collaboration technologies with potential for use during crisis collaboration. Thus, the following collaboration tools should be given serious consideration and analysis in terms of the collaboration models discussed herein, as well as their capability to support military crisis response.

• **Citadel**: "Citadel is a different kind of messaging and collaboration platform. While others focus on automating business processes, Citadel focuses on connecting communities of people together. Users love Citadel because its software that helps them work, play, stay in touch... without calling attention to itself. A Citadel system is made up of containers called "rooms." A room may be used as an email folder, a discussion forum, a real-time chat, a mailing list, a calendar, an address book, an RSS sink ... sometimes a combination of any of the above, and certainly any other uses which could be added in the future. Furthermore, you can replicate rooms between multiple Citadel nodes, allowing you to set up a federated, distributed messaging environment." [47]

• ☑ **FlashMeeting**: Remember NetMeeting? This is the high tech version. "FlashMeeting is a project of The Centre for New Media, which is a part of The Knowledge Media Institute, based at The Open University, Milton Keynes, UK. It is a simple but sophisticated web based 'meeting' tool, allowing a group of people to setup and have a meeting with each other using the internet. As long as you have an internet connection you can join a FlashMeeting anywhere in the world." Given that FlashMeeting was written in Macromedia Flash and is low-bandwidth friendly, it should be considered for Navy ships and other "field" uses in the military. [48] Given the military requirement for documentation, especially during any crisis, FlashMeeting has a complementary product called FlashMeeting Memo, which supports the direct reference of any part of a live session recording contributed by any one of the participants. According to Good (2005), [49] "This feature has much more important implications than, for example, the ability to reference any individual paragraph or section in a rich text-based document. While a text document can be "scanned" easily, a rich media file, like an audio or a video recording, cannot be easily browsed yet. However, by allowing granular referencing down to the level of each individual voice intervention, while adding the ability to create a unique URL for each one, a vast number of opportunities for the effective use of live event recordings are opened up." Providing a hyperlink in a message to a document or a webpage is easy. Imagine being able to provide a hyperlink to one audio or video sentence by the Commander during a crisis.

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[47] See: http://www.citadel.org/ .
[48] http://www.flashmeeting.com/
[49] The entire Good comment can be read here:
http://www.kolabora.com/news/2005/01/19/accessing_individual_bits_in_a.htm

• **Glance 2**: Glance is a real time desktop sharing tool that allows up to fifteen distributed participants to see exactly what you show them on your desktop. They do not need to download anything; they have no costs, and need only use any common browser. Although designed for sales, it can be used for sharing any information or data that needs to be shared within a small distributed group. [50]

• ☑ **Holocene Conversation Mode:** "Holocene Chat is a distinctively new (patent pending) approach to real-time online communications. Initial versions will quickly replace the 30-year old "chat" standard of interrupted, upward-scrolling lines with a graphical interface incorporating more than two dozen skills that people use in the real world, during spoken conversation." [51] [52] This new approach lets "people self-organize by distance, orientation, time, reputation - as in real life, and provide services that make conversation useful. It can be used in any browser in real time, and provides much better situation awareness than any chat heretofore designed. Interestingly, slide 18 states, "cheap, easy, low bandwidth way for neighbors to self-organize in a crisis. More effective than any chat room. Faster than email."

• **GoToMeeting**: "Citrix GoToMeeting is the most robust Web conferencing and collaboration offering available. Not only does Citrix GoToMeeting have all the necessary features to hold effective and successful online meetings, training sessions and collaboration gatherings, but it is the easiest and most cost-effective solution on the market. Citrix GoToMeeting is truly the most robust web conferencing and collaboration product available." [53]

• **Hexagon**: Hexagon is another "project of The Centre for New Media, which is a part of The Knowledge Media Institute, based at The Open University, Milton Keynes, UK. It is a simple but sophisticated web based 'presence' tool allowing a group of people to stay in touch with each other within a private, persistent, virtual 'room'. As long as you have an internet connection you can join 'your' Hexagon community anywhere in the world." [54]

• ☑ **JotSpot**: JotSpot identifies itself as an application wiki. In fact, Joe Kraus, co-founder and CEO, calls it "the first application-wiki company." It is likely one of the easiest to use collaboration enabled web page building tools available. One can create dynamic tables, and attach any type of file. The Application Gallery allows the installation of specific tools. [55] This tool deserves serious consideration. One reviewer wrote, "In a few minutes, I created a form using simple scripting. In about the same time, I built dynamic tables with drop-down menus for displaying and updating data. And, with JotSpot, you're not limited to using your own information. I had no trouble displaying a map from MapQuest, a Yahoo News search result, and even a view of Salesforce.com (Profile, Products, Articles) data in my pages. JotSpot's

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[50] See: http://beta.glance.net/site/home.asp

[51] "The invention, called Holocene Conversation Mode ("HCM"), takes advantage of the observation that human beings utilize a number of real world characteristics to participate in, perceive, control, and glean subtleties from conversations. These characteristics include proximity and orientation of a listener to other speakers, memory ageing, emphasis by a speaker, relative importance or reputation of a speaker, and the unique human ability to "filter" words of special interest to a listener from overheard conversations of many other speakers." See: http://www.holocenechat.com/

[52] A useful 1.2 MB PowerPoint presentation is available here: http://www.holocenechat.com/hcs.ppt. The subtitle of that presentation is "Meeting-ware, Real-time Conversation Spaces, Useful Virtual Worlds."

[53] See: http://www.citrix.com/English/PS2/products/product.asp?contentID=13976

[54] The URL is: http://hexagon.open.ac.uk/index.html .

[55] See: http://www.jot.com/index.php.

application gallery takes this process to the next level. Need a help-desk or CRM solution? Just browse the library, click the Install button, and it's loaded into your wiki — to be used as is or modified. Except for a few editing features that weren't yet operational, JotSpot looks to be a tough service to beat if you're creating applications around wikis." [56]

• **MERBoard**: Also known as the Blueboard, NASA uses it to share information.[57] "The MERBoard places information and images literally at the fingertips of the Mars Exploration Rover (MER) scientists and engineers. They can quickly and easily share, view, annotate, and store data and images with the touch of a finger, using drag and drop functionality." [58]

• **Ourmedia**: Ourmedia is an example of the democratizing of information that will require careful analysis and study to avoid its pitfalls and exploit its strengths. The concept behind Ourmedia is that it "is a project allowing any person with net access to publish their text, image, audio and/or video files for public consumption, for free, with the promise of permanent web presence as long as the host, the Internet Archive, exists." [59]

• ☑ **phpGroupWare** "formerly known as webdistro - is a multi-user groupware suite written in PHP. It provides about 50 web-based applications, as there are the Calendar, Address Book, an Advanced Projects Manager, Todo List, Notes, Email, Newsgroup- and Headlines Reader, a File Manager and many more Applications. The calendar supports repeating events and includes alarm functions. The email system supports inline graphics and file attachments. The system as a whole supports user preferences, themes, user permissions, multi-language support and user groups. It includes modules to setup and administrate the working environment. The groupware suite is based on an advanced Application Programming Interface (API)." [60]

• **R-CAST**: R-CAST is unique in that it supports collaborative activities among teammates comprised of both humans and software systems. R-CAST was designed at Penn State University, and recent experimental research has been described in a paper, "Extending the Recognition-Primed Decision Model to Support Human-Agent Collaboration," presented in July 2005 by John Yen at the Fourth International Joint Conference on Autonomous Agents and Multi-Agent Systems in Amsterdam. The U.S. Army Research Laboratory supported the research. [61] Given the recent interest in Augmented Cognition by DARPA, the R-CAST technology could be explored for tactical and operational utility.

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[56] See: http://www.infoworld.com/article/05/03/28/13FEblogwiki-rev1_1.html .

[57] IBM created the MERBoard. "BlueBoard is an architecture for making information easily available to people no matter where they are. It is a 50-inch touch-sensitive plasma display that integrates easy-to-grasp interface functions to make it significantly easier for groups of users to access, share and annotate content from their desktop. It is intended for use as a collaboration tool within a corporate environment to support fast encounters and spontaneous meetings, but has also been the inspiration for NASA's customized version of this technology (referred to as MERboards)." See: http://www.almaden.ibm.com/software/user/BlueBoard/index.shtml

[58] See: http://www.cict.nasa.gov/assets/pdf/033_CICT_IS_MERBoard_A_web.pdf

[59] Ourmedia report: http://www.worldchanging.com/archives/003299.html

[60] See: http://www.phpgroupware.org/. Note: the PHP scripting language was cited as one of the five best open-source products favored by commercial companies and winning support in government IT shops (Joch, 2005).

[61] For R-CAST contact Margaret Hopkins mhopkins@ist.psu.edu or 814-865-7888.

• **smartMeeting**: "smartMeeting is designed to be feature rich but not over engineered. Users benefit from intuitive and easy to use functionality that addresses their every day key communication and collaboration needs." [62] It was highly rated by Kolabora.[63]

• **Socialtext**: "The Web isn't so much a place anymore, explains Ross Mayfield, CEO of Palo Alto (Calif.)-based startup Socialtext Inc., which offers services to create collaborative Web sites called wikis. It's more of a doorway into services, from the user-written reference site Wikipedia to the community organizing service Meet up to the folksy classifieds site Craigslist" (Hof, 2005). One reviewer wrote, "It is as simple as working inside a normal text editor**.** Text can be formatted very easily, and making a change to an online document requires only a few seconds. Weblogs and RSS are integrated from day one. You can also create as many "workspaces" as you want and utilize each one of them to manage a different project or workgroup. Each workspace is in fact associated with the people you select and it is extremely easy to remove or invite new team members. SocialText wiki workspaces generate email notifications, RSS feeds and Update pages that allow any team member to easily monitor and track any progress and changes to the workspace without needing to access it directly. Everything that is composed, edited and written in the wiki maintains a full track record of the changes made, and the administrator(s) can easily revert any document /web page to any previous state it was in. Workspaces in the SocialText wiki can also receive emails from any of the team members, which are immediately organized and made available to all the other workspace members. For my own experience, this is indeed a great collaboration technology that can be extremely useful to virtual teams of non-technically oriented people. It bridges ease of use and access with all the advantages of being web-based and open to any operating system." One of the few downsides was cost at $30 per month per user.

• ☑ **WiredRed Web**: "Two features distinguish the WiredRed collaboration server from its competition: First, it has extremely small server software requirements. Second, it almost exclusively focuses on deployment inside an organization's firewall…. The product's video and VOIP support is strong, and the solution provides a good collaborative workspace. We were also impressed with WiredRed's security options." (Garza, 2005). According to their webpage (http://www.wiredred.com/), their e /pop web conferencing software is being used by 3,500 organizations including the U.S. Army and Air Force. According to Garza (2005), "WiredRed supports three types of conference attendees. First, the host is responsible for all aspects of the conference, including content and user privileges. Second, presenters can share documents and their desktops with other conference attendees. Third, participants can view only the presentation. As in Macromedia Breeze, a host can easily promote a participant to become a presenter. But all three attendee types can have video and VOIP inside a conference, a trick that Breeze did not achieve. This environment creates a user-friendly videoconference with collaborative document facilities. WiredRed users can record conferences in a variety of formats. Unlike Breeze, WiredRed allows users to share Word and Excel files without needing to convert to a Flash format. They also can view PowerPoint documents. WiredRed includes five default layouts, optimized for different presentation types and styles. Although WiredRed layouts are

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[62] See: http://www.smartmeeting.com/

[63] Kolabora said, "This is the way you will meet in the future. A virtual immersive 3D office space in which you can gather, talk, present and discuss with your customers and peers. A secure, virtual office, which offers better than collaboration facilities than any videoconferencing solution while requiring only a 28.8 modem." Their evaluations are located here: http://www.kolabora.com/tools.htm

harder to manipulate than Breeze's pods, they work well. Hosts can also control the screen layout of participants by using the Apply My Layout function, which pushes the host's layout to all attendees. WiredRed also has a plethora of security offerings, including SSL3 and options for RC2, RC4, IDEA, Data Encryption Standard (DES), 3DES, Advanced Encryption Standard, RSA encryption algorithms and certificate support. Overall, we found WiredRed's e/pop straightforward, elegant and easy to use. WiredRed is more effective as a collaborative tool with multipoint video and VOIP than other products that are focused on one-to-many presentations."

Preliminary Analysis of Current Military Collaboration Tool Use:

The United States military clearly maintains World superiority in platforms, sensors, weapons, transportation, and traditional communications. Yet we stand equal, if not behind, in some of the newer digital capabilities where the investment required would permit practically any nation to compete, including the Kyrgyz Air Forces.[64] Clearly, the best interests of the U.S. Government are served when various departments and branches are able to work among themselves. Given the phenomenal growth of collaboration tools in use by the U.S. Government, and in particular by the U.S. military, these various collaboration tools, both official and unofficial, serve a need. However, as stated previously, there are no known coordinated and clearly articulated collaboration drivers either within the Department of the Navy or the Department of Defense. Stated differently, there is no comprehensive collaboration requirements analysis for the U.S. Military. In this regard, the U. S. Department of Justice has created a functional Information Technology Strategic Plan that may be useful in other organizations.[65]

For example, it has been difficult to find analysis, discourse, discussion, or oversight on official military webpages about Blogs, Chat, Instant Messaging, Podcasting, RSS, etc. An advanced search of the DON CIO website for the terms "blog" or "instant message" in August 2005 resulted in zero returns. [66] Likewise, a concurrent review of the 111-page 2004 "Report of the Defense Science Board Task Force on Strategic Communication" [67] found no mention of a blog. Collaboration tools such as blogs clearly serve current military missions and perhaps operations; yet remain official technological "black holes." Apparently the newer technologies such as PHP, Podcasting, RSS, and VoiceXML are not even on the military radar screen.

Implications: Crisis Planning and Collaboration 2010

Leveraging the Seymour (2002) appraisal, and subsequent to this 2005 review of the military collaboration technology landscape, one can reasonably conclude that military leadership has its collective collaboration technology vision fixed firmly in the past, whereas the junior officers and senior enlisted tend to be reaching forward although without coordinated oversight. Examples include blogs, chat, podcasting, RSS, and wikis. Moreover, the various services are using a wide set of collaboration tools, few if any of which interoperate, much less support each other. The primary implications for the current status of U.S. military collaboration technology usage are that: (a) inter-service coordination and collaboration are more limited than necessary, (b) security issues become too diffuse thereby increasing the risk at all levels of

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[64] Kyrgyz Air Force: http://www.muslimuzbekistan.com/eng/ennews/2005/08/ennews11082005_7.html
[65] DOJ Information Technology Strategic Plan: http://www.usdoj.gov/jmd/irm/imss/2002itplan/appendix_b.htm
[66] The DON CIO search webpage is: http://www.doncio.navy.mil/(g03wv0zx42oxibud3fxp2iqp)/Search.aspx
[67] The Defense Science Board Report: http://www.acq.osd.mil/dsb/reports/2004-09-Strategic_Communication.pdf

military operations, (c) training costs become unnecessarily large (cf. Softskills, 2004), (d) the current military collaboration technology capability inevitably ranges from poor to exceptional, and (e) the likeliness of any effective coordinated response during a national catastrophe using the current set of collaboration tools is extremely low.

However, the U.S. military and Government collectively have moved forward in their use of digital collaboration tools, and yet the lack of coordination and interoperability has never been wider. [68] Nevertheless, we should be optimistic. USJFCOM has already funded a task team to survey the administrative, tactical, and operational U.S. military collaboration requirements and has created a roadmap (Schneider, 2005; See Appendix F). Military crisis and tactical response teams of tomorrow will incorporate collaboration and media technology unlike anything being used today or even under consideration. Imagine a distributed team whose job it is to keep track of certain topics or regions, and which use the functionality of Breeze, Crayon, Columbia Newsblaster, JetEye and Shadows collectively. [69] The collective use of sets of modern collaborative tools represents the optimal empowerment of both standing crisis action teams, as well as any future ad hoc crisis collaborative teams.

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[68] For example, does the Army or the Navy leadership know about the Air Force Integrator? The Integrator is a weekly publication consisting of a "collection of news and information specifically for the C4ISR community." http://esc.hanscom.af.mil/ESC-PA/The%20Integrator/Archive.htm The April 21, 2005 issue carried a report titled, "10 Emerging Technologies."

[69] These tools should be explored collectively in a crisis context. For example, "Crayon is a tool for managing news sources on the Internet and the World Wide Web. Crayon uses a simple analogy that everyone can understand - a newspaper to organize periodical information. The result is a news page customized for you with the daily information that you are most interested in." Likewise, "JetEye is a meta-search tool, much like Dogpile, ixquick, MetaCrawler and others that aggregate search engines like Google, Yahoo, answers.com, etc. But more than a meta-search tool JetEye allows you to aggregate your search objects; links, pictures, tags, text/notes, etc. into a container called a JetPak. You can even put your own comments and analysis in the JetPak. Later this fall JetEye will allow you to add RSS feeds to the JetPaks. JetPaks can be saved and shared or even published. The collaboration part comes in when someone you share a JetPak with comments on your JetPak (much like a wiki). JetEye also has some other community features such as rating and ranking of JetPaks." Further, "Shadows is a free, social bookmarking community created by you and other shadows users. With Shadows, you can create your own collection of web pages, complete with tags (for easy finding), comments (to remember why you saved it and to share with others) and ratings (to really show others how you feel about page)." The power of collective webpage evaluation is critical to any team task analysis, as well as leveraging the work done by others in the past.

COLLABORATION REFERENCES AND RESOURCES

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Appendix A

Collaborative Capabilities by Wroblewski & Warner (2005)

Asynchronous:

- E-mail: A network service that allows the transmission of electronic mail to other users. Users can create, send, receive, forward and store these messages on a disk or computer.
- People Locator: A feature that allows users to locate another user's user id.
- Group Calendar: The ability to share calendar information between users.
- Threaded Discussions: Virtual postings to which other users can link responses.
- Virtual Persistent Workspace: Virtual rooms where users collaborate through virtual teaming activities in an effort to problem solve.
- File Transfer: Moving a file from one computer to another through a network
- Surveying: Online surveys written by a facilitator and geared to the specific goals of the team
- Voting: Electronic ballots used to cast votes, poll or prioritize information specific to the goals of the team

Synchronous:

- Audio Conferencing: Real-time teleconferencing between two or more participants connected by network, telephone or satellite link.
- Video Conferencing: Real-time visual display between two or more participants at different sites using computer networks to transmit audio and visual data. (Point-to-Point conferencing involves only two users; Multipoint conferencing allows for three or more users.)
- Awareness: A feature that allows users to know who is online.
- Chat/Instant Messaging: Real-time text-based communication.
- Shared Applications/Screen Sharing: A data conferencing tool allowing a user to view and control an application on another user's desktop.
- Whiteboard: A shared drawing board on the display that allows one or more participants to write, draw and review in real-time.

Appendix B:

Wireless Internet Accessibility in the U.S. late 2005

Like cell phones in the early 1980s, [71] wireless Internet access in the United States feeds the incessant demand for mobile work and entertainment. Many workers need to be mobile to accomplish their work.

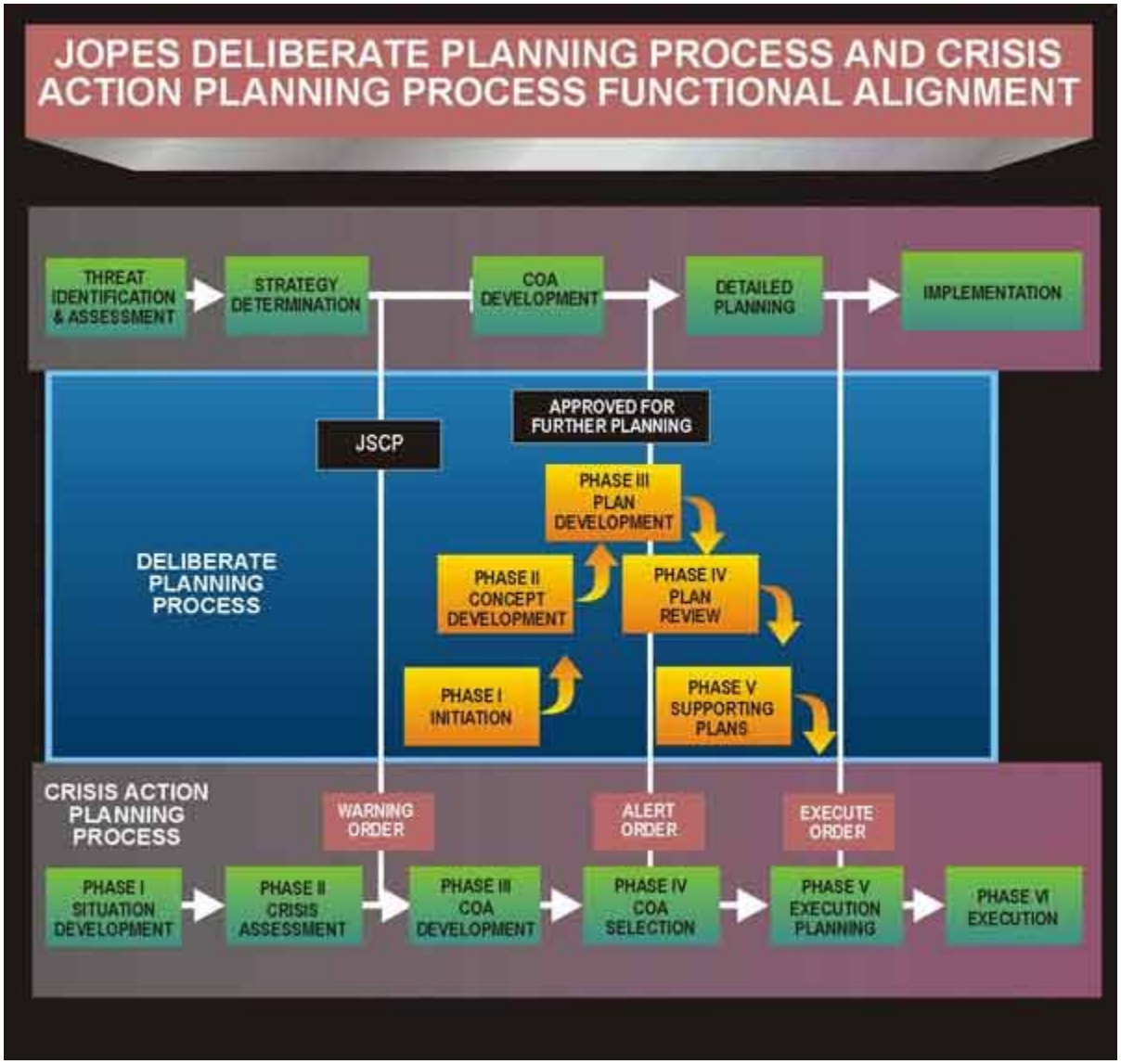
Most of us are familiar with WI-FI, the wireless computer technology that allows us to communicate with our computers within a room or small building. WI-FI radiates a signal with a radius of approximately 300 or 350 feet indoors. Although that freedom from wires is helpful, it is not as functional as the newer EV-DO (EVolution, Data-Only) wireless that is being offered throughout cities. This newer wireless computer access is available anywhere a cell phone is available within the provider's EV-DO service area. Subscribers not only can use their cell phones and other handheld devices, but also they can surf the Internet using their laptop computer without concern for wires.

As of September 2005, there were four major Internet wireless providers in the U.S. Verizon Wireless, the acknowledge leader, provides service to approximately 60 markets, and their recent price reduction makes them one of the most affordable. They charge $60 per month. Sprint-Nextel first offered service this past July, and they offer service in approximately 70 markets. They followed the recent Verizon price reduction to $60. Alltel Corporation offers service in six markets and charges approximately $70 per month. All three use the EV-DO technology. On the other hand, Cingular uses the UMTS technology, provides service in six markets, and charges approximately $80 per month (Searcey, 2005).

[71] "Dr Martin Cooper, a former general manager for the systems division at Motorola, is considered the inventor of the first modern portable handset. Cooper made the first call on a portable cell phone in April 1973. He made the call to his rival, Joel Engel, Bell Labs head of research. Bell Laboratories introduced the idea of cellular communications in 1947 with the police car technology…..By 1982, the slow-moving FCC finally authorized commercial cellular service for the USA. A year later, the first American commercial analog cellular service or AMPS (Advanced Mobile Phone Service) was made available in Chicago by Ameritech." Source: http://inventors.about.com/library/weekly/aa070899.htm

Appendix C:

Contrasting Deliberate and Crisis Action Planning



Source:

http://jdeis.cornerstoneindustry.com/jdeis/paragraphsPop.jsp?cId=516&parId=3896&SearchString="

Appendix D:

Six Conventional Collaboration Tools Being Used by the U.S. Military

The six most noteworthy (official and or widely used) collaboration tools known to be functional in the U.S. military as of 2005 are identified below.

• **Collaboration at Sea** (CAS): Collaboration at Sea is based on the IBM / Lotus Sametime / Domino collaboration toolset, and is used currently by the planning (J5 and N5) community of interest (COI) because of their need to support multilevel secure operations with coalition partners. [72] Early uses of CAS included the "USS John C. Stennis and USS George Washington Battlegroup's use during 1999-2000, and following that, the USS Carl Vinson's success with Knowledge Web (K-Web) in 2001-2002" (Natter, 2002). The Commander, Joint Task Force (CJTF) 950 and the Second Fleet/NATO Striking Fleet Atlantic have used CAS. Since then the Navy has shared CAS with a large number of its coalition partners.[73] CAS is the first collaboration system being used by the Navy that is moving into a program of record (i.e., acquisition funded as opposed to using O&M funds) via the CENTRIX (Combined Enterprise Regional Information Exchange) program of record. Thus, it is coalition specific.

• **Collaborative Information Environment** (CIE): The USJFCOM J9 supports CIE. Beginning "in November 2003, CIE developers and engineers provided actual working prototypes of the CIE to U.S. Southern Command (SOUTHCOM) and U.S. Pacific Command (USPACOM)."[74] Recently, CIE "garnered the U.S. Joint Forces Command (USJFCOM) a prestigious award. The award from the E-Gov Institute was for 'best practice in a public sector organization for innovative knowledge management (KM).'" [75] CIE is funded by the Standing Deployed Joint Task Force (SDJTF) project.

• **Defense Collaboration Tool Suite** (DCTS): Supported by DISA, DCTS is a "flexible, integrated set of applications providing interoperable, synchronous and asynchronous collaboration capability to the Department of Defense's agencies, Combatant Commands and military services…. Initial fielding of DCTS V1.1.12 began in April 2002. By June 2003, DCTS V2.0 Phase I was installed at 101 sites worldwide, with another 56 sites to be installed in 2003 at all combatant commands, their major components and all the services. Fielding of DCTS V2.0 Phase II, with several user enhancements, is scheduled to begin in 4th Qtr FY 03." [76] According to Powers (2004), as of "January 2004, DCTS V2 P1 is installed at 138 sites worldwide, at all combatant commands, major components and services, with another 218

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[72] The JFCOM CAS website is located here: http://www.jfcom.mil/newslink/storyarchive/2004/no061604a.htm .

[73] Moreover, Admiral Natter says, "Their pioneering efforts have paid off during Operation Enduring Freedom, as the Enterprise, Theodore Roosevelt, and John F. Kennedy battlegroups have adopted and expanded collaborative planning to support strike missions into Afghanistan, MIO and amphibious operations, logistics, and command and control. Mission briefings and operational data posted to replicated Web sites, the use of various collaborative tools such as MS Chat, Sametime Chat, and Instant Messaging, and application sharing have dramatically increased information flow and situational awareness, facilitating better decisions by commanders at every level. Most importantly, it has helped the Navy rapidly and effectively carry the fight to the enemy, at and from the sea, for a sustained period of combat operations. We could not have done it as well without the benefit of globally networked collaborative planning tools." The overlap between CAS and the IBM Lotus Sametime <http://www.lotus.com/products/product3.nsf/wdocs/homepage> remains unclear.

[74] USJFCOM CIE: http://www.jfcom.mil/newslink/storyarchive/2003/pa121103.htm

[75] Source: Space and Naval Warfare Systems Center San Diego Outlook, August 26, 2005.

[76] DCTS Resource: http://www.disa.mil/main/prodsol/dcts.html

planned for 2004. DCTS will remain in place until the Next Generation Collaboration Service (NGCS) is on-line in 2005 or 2006." This suite was "recommended as the interim standard DoD tool set by the OSD/Joint Staff Collaboration Tiger Team" (mentioned above). DCTS is the collaborative tool suite used for interoperability collaboration on the STRATCOM Command and Control LAN. It provides real-time and asynchronous collaboration using voice, video conferencing, document and application sharing, combined with instant messaging to assist in the planning and management of crisis situations. It is used by many military commands to support the mission planning process. DISA reports that, "As of February 2005, DCTS Version 2 is installed at 184 sites worldwide, including all combatant commands, major components, and services, with additional installations planned. DCTS will remain in place until an enterprise collaboration service takes over the operational load (in 2006 or later) under the Net-Centric Enterprise Services Program" (NCES). [77]

• **InfoWorkSpace** (IWS): InfoWorkSpace[78] is the official collaboration tool via the JIVA [79] for Joint intelligence commands, including J2 and N2. It is used in the JBMC2 [80] project at JFCOM, and also at PACOM, EUCOM, TRANSCOM, and CENTCOM. According to Powers (2004), "IWS is comprised of several third-party products including Placeware/Microsoft, Oracle, IPlanet/Sun One Directory Server and Web Server, and the Tomcat Servlet Engine/Apache. IWS provides a secure virtual office organized into buildings, floors and rooms where users can build online meeting places to interact on projects in realtime. Accessed via a Web browser or Java client, it includes a number of features, including an instant-messaging client (LaunchPad), text chat (public and private), audio, Web video, application casting, desktop conferencing, Virtual File Cabinet, a bulletin board, Collaborative Whiteboard and shared Text Tool, threaded discussions (news groups), mail, and a calendar." [81]

• **Intelink: "**It's an open secret that the US intelligence community has its own classified, highly secure Internet. Called Intelink, it's got portals, chat rooms, message boards, search engines, webmail, and tons of servers. It's pretty damn cool … for four years ago….The scary truth is that most of the time analysts are flying half blind….There's no reason our nation's spy organizations can't leapfrog what the Army is already doing with Web technology [cf. AKO in Appendix E] and, at the same time what the public is doing with the blogosphere (Alexander, 2005)."

• **WebEx**: Previously, DISA planned to "add 7,500 Tandberg desktop videoconferencing systems, in a broad shift away from its room-based video collaboration strategy. DISA says it is using the COTS Tandberg systems, along with other COTS collaboration products (including IBM Lotus Instant Messaging, Bantu IM, and Wired Red conferencing products), to add new collaboration features to its expanding JWICS, the federal government's top-secret communications and collaboration system. ….The terms of the deal are vague, but essentially WebEx has won a bake-off to provide on-demand conferencing services to improve

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[77] Rumor "from the deck plates" has it that, "JITC [Joint Interoperability Test Command] collaboration [DCTS] certification stood down in 2005 (and DCTS will be sunsetted in 2006). You can continue to use JITC certified collaboration tools, even if they do not meet DoD IT Standards Registry guidelines until 2007, wherein they **must** meet DISR. By the way, there are few (if any) truly *interoperable* collaborative tools in the commercial market today."

[78] http://www.infoworkspace.com/

[79] Joint Intelligence Virtual Architecture.

[80] Joint Battle Management Command and Control. See: http://www.jfcom.mil/about/fact_jbmc2.htm .

[81] IWS is owned by Ezenia: https://www.ezenia.com/default.asp and they cite quotes by military leaders here: https://www.ezenia.com/cases.asp

communications and coordination between DoD's military, business, and intelligence organizations worldwide (Mahwold, 2005)." More recently, rumor has it that WebEx has been removed from DoD networks. There are no plans for it to show up on DoD networks again.

- **Others:** Based on "insider" information,
    1. We know that DISA is interested in Jabber as an IM tool. They may make it available to commands for free for evaluation. The Jabber website is: http://www.jabber.com/
    2. The Army Knowledge Online website uses Bantu for its IM requirements. Bantu can be found here: http://www.bantu.com/
    3. Hyperwave Government Solutions claims to offer a, "Single, unified platform that delivers the most comprehensive enterprise knowledge and content management solution available." See: http://www.federal.hyperwave.com/solutions/

Appendix E:

Other Military or Government Collaboration Tools:

The following 31 collaboration tools and services were identified as being used at large or smaller commands somewhere in the U.S. military or the Federal Government. Likely, this list is not comprehensive, yet it signals a presumably unrecognized generic requirement for collaboration capability, and each tool does serve some utility somewhere in the Federal Government. Moreover, one author, Seymour, is in the process of compiling a large list of current collaboration technologies and tools, which numbers more than one hundred.

• **Advanced Reality**: "Presence-AR is the first, real-time collaborative platform to deliver digital collaborative experiences spanning participants, applications, devices, and platforms. Far beyond screen or file sharing, Presence-AR enables existing and new applications to support multiple people working on one or more files or applications synchronously." [82] [83]

• **Army Knowledge Online (AKO):** "Launched in 2001, Army Knowledge Online is Yahoo! for grunts. All the things that make life on the Net interesting and useful are on AKO. Every soldier has an account, and each unit has its own virtual workspace. Soldiers in my reserve unit are scattered throughout Texas, and we're physically together only once a month. AKO lets us stay linked around the clock" (Alexander, 2005).[84]

• **Bantu**. Bantu Instant Messaging (IM) and Presence Platform provides organizations with an IM technology that -- from an information security perspective -- offers significant advantages over many IM alternatives, including: (a) The ability to integrate with enterprise authentication systems, (b) Encryption of message traffic between users, and (c) Lack of support for file transfers (which means the product cannot be used to introduce malicious mobile code into the Department of Defense (DoD) computing infrastructure, a threat intrinsic to many other IM solutions). GCCS personnel use it to communicate system upgrades and fleet problems.[85]

• **Basecamp**: "From small and big businesses managing their client and internal projects, to professors managing their classrooms, to individuals managing their home improvement projects (and weddings), everyone is using Basecamp to keep whatever it is they're working on organized and on track."[86]

• **Breeze 5:** Breeze, owned by Macromedia, "is a rich web communication system that lets you reach your audience anytime with engaging multimedia content. And, because Breeze is deployed using Macromedia Flash Player, already installed on more than 98% of browsers worldwide, your audience can join your Breeze online meetings, training courses and on-demand presentations instantly."[87] The "U.S. Naval Air Systems Command (NAVAIR) uses Breeze to provide on-demand, standardized computer-based training to 30,000 employees worldwide."

• **CD/DVD**: Although this is considered more of a capability as opposed to a tool, it serves as another compelling example of what can be called the "Insider Democratization" of information.

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[82] The Advanced Reality website is located here: http://www.advancedreality.com/ar/index.html
[83] The Army CIO/G6 lists this tool: http://www.army.mil/ciog6/links/links_home.html .
[84] The AKO can be found here: https://www.us.army.mil/suite/login/welcome.html .
[85] The 2002 DISA white paper on Bantu can be found here: http://iase.disa.mil/stigs/whitepaper/bantuwhitepaper12-13-02.doc .
[86] http://www.basecamphq.com/index.php .
[87] http://www.macromedia.com/software/breeze/ .

For example, Army soldiers in Iraq created a music CD called "Live From Iraq." Much of the content of this CD is a sharp contrast to what is being published by official civilian and military news sources. An example is a 12-minute audio interview with Sergeant Neal Saunders, "who constructed his own studio and produced a brutally honest hip hop album while stationed in Sadr City, Baghdad."[88]

• **CollabWorx**: "CollabWorx has taken a unique approach to providing collaborative solutions with its CollabWorx Platform. Building collaboration and communication solutions on this platform offers benefits over either of the two traditional approaches: implementing a packaged, "out of the box" solution, or implementing a custom-built solution." This tool is used by the Army Training Support Center in Fort Eustis, VA. In September 2005, the US Army DITSCAP ATO provided CollabWorx with certification for web-based audio/videoconferencing[89].

• **Composable FORCEnet** (CFn): According to a Navy message dated September 1, 2005, the Seventh Fleet Maritime Operations Center watch standers took CFn and turned it into a tool for expeditionary operations including amphibious assault planning and sustainment ashore of the follow-on and follow-up echelons. CFn is a product of the Space and Naval Warfare Systems Center, San Diego[90].

• **Digital Dashboard**: The Microsoft Digital Dashboard version 3.0, as part of the Collaboration Management Office (CMO), was approved by the Joint Interoperability Test Command (JITC) in 2002, at which time it was being used by the U.S. Marine Corps (McKenna, 2001). Owned by Macromedia, the Digital Dashboard was originally part of the DCTS (see above), and is being used by a unit of the California National Guard[91].

• **eKM** (Enterprise Knowledge Management): "eKM creates a shared environment for disparate organizations that have geographically dispersed locations. It is a web-based collaborative suite of knowledge management tools used to capture and manage documents, link command members through Communities of Practice (CoP), manage business processes, and provide ready access to command and enterprise information via search engines." It was used during JWID 2004, and currently is supported by the Air Force Research Laboratory, by PACFLT, and the submarine community. [92]

• **eRooms**: The Office of Foreign Disaster Assistance uses eRooms and Abacus[93]. In 2002, eRooms was offered as part of the NMCI COTS Catalogue Contract at the Space and Naval Warfare Systems Command. The monthly service cost was $32 per seat. [94]

• **Groove**: Groove, a subsidiary of Microsoft, is a collaboration tool allowing "users the ability to work collectively on a project. Multiple users can log on together or work individually within a shared space that contains the information (e.g., documents, etc.) that they are working on. Users will not have access to a shared space or associated information unless they have been invited to, and accept, the invitation to participate. If a user is uninvited, new keys are

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[88] http://www.onthemedia.org/stream/ram.py?file=otm/otm081905g.mp3 .
[89] See: http://www.collabworx.com/Products/whycollabworx.html .
[90] http://enterprise.spawar.navy.mil/getfile.cfm?contentId=912&type=R .
[91] http://appserv.gcn.com/23_34/dodcomputing/28059-1.html .
[92] Submarine Group 10 comment can be found here: http://www.chips.navy.mil/archives/04_spring/web_pages/KM_training.htm
[93] See: http://tinyurl.com/9sn6g .
[94] NMCI COTS Catalogue: http://www.nmci.navy.mil/Primary_Areas/Contract/Content/Files/Contract_Artifacts/PMods-_1_thru_100/N00024-00-D-6000_P00042.pdf

distributed by Groove to all remaining participants." The Department of Homeland Security uses Groove, primarily because of its encryption capability, and because the audio is also encrypted. The U.S. Department of State "used Groove to coordinate the establishment of the U.S. Embassy in Baghdad. Gallaher and O'Rourke (2004) reported that 27 percent of their Naval Postgraduate School survey respondents reported using Groove. Additionally, the U.S. Army Corps of Engineers uses Groove as part of its common operating environment that promotes the sharing of knowledge and expertise among the organization's divisions and with partners." [95] [96]

• **Human Performance Center Spider**: HPC-Spider: is "the Navy's premier online resource for human performance and training technology for lifelong learning." Although primarily a resource tool, it does support 37 discussion links that include chat rooms, and 23 listservs links[97].

• **Hummingbird**: "Hummingbird Enterprise 2004 - Collaboration is a highly secure, Web-based collaborative workspace for dispersed teams across and beyond the enterprise. It enables businesses across the entire industry spectrum to streamline collaborative processes, enhance team productivity, and speed the delivery of targeted results in any collaborative activity." Apparently (based on their website), Hummingbird is either in use by or has been tried by the Air Force Personnel Center, Air National Guard, DoD Joint Strike Fighter Program Office, Headquarters Air Force, etc. [98] In terms of records management, Hummingbird is a strong contender because it goes "beyond the basic DoD 5015.2 standard in RM…. We support the more secure Chapter 4 level, which is used by highly sensitive agencies like the CIA (Smallwood, 2005)."

• **Hyperwave**: Each August the DTIC "Horizontal Fusion Portfolio conducts a demonstration of Net-Centricity, Interoperability, and Transformation capabilities that have been developed…. The Collaboration Service in the Horizontal Fusion environment is provided by a collaboration server based on the Commercial-Off-The-Shelf (COTS) product Hyperwave eConferencing Suite." [99]

• **iUpload**: According to the company, "In most organizations, there is a huge gap between people empowered to use content management and others that need to communicate with smaller work groups. The latest release of iUpload's Application Suite brings tight integration between blogs and content management, allowing you to take full advantage of the blog phenomenon at a corporate level to connect and stay connected with employees, customers, partners or other key constituencies." Sandia National Laboratories, US Army Prescom, and Tinker Air Force Base are using this product[100].

• **meebo**: meebo is an example of the newer dotcom entrepreneurial technology tools being run out of an apartment and spread mainly by word of mouth. This tool provides IM capability across various IM services and, being web-based unlike most IM clients, can be accessed from any computer, not just one's office or home computer. Thus, soldiers in Iraq are using meebo.

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[95] Source for Groove use at the State Department and the Army Corp of Engineers: http://government.ihs.com/news-05Q3/general-dynamics-business-workflow.jsp

[96] The 2002 DISA white paper can be found here: http://iase.disa.mil/stigs/whitepaper/Groove-Networks-WhitePaper-120402.doc .

[97] https://www.spider.hpc.navy.mil/ .

[98] Hummingbird website can be found here: http://www.hummingbird.com/

[99] The 2004 Horizontal Fusion Collaboration Service Specification report can be found here: http://horizontalfusion.dtic.mil/docs/specs/HF_20040916_Collaboration%20Specification.pdf

[100] http://www.iupload.com/ .

Web-access tools would seem to be critical to crisis response workers who may not be able to get to their work location early in any crisis. [101]

• **MERIT** "is a powerful, web-enabled tool that graphically depicts the current Marine Corps readiness posture and detailed supply and maintenance information using emerging data visualization techniques. MERIT transforms data into information that provides a dynamic and adaptable view of equipment readiness by commodity, functional area, and organization." [102]

• **mIRC**: mIRC is generally considered to be a friendly IRC chat client that is equipped with useful options and tools. Some Army tactical units in Iraq used it heavily, in particular to coordinate with the Air Force for air support. [103] Version 6.16 was released in July of 2004. [104]

• **Navy Knowledge Online (NKO):** "The NKO collaborative tools provide users different ways to communicate with each other and offer the ability to connect with others using: Chat sessions in real-time with other users having similar interests, Instant messenger to talk with other users one-on-one in real-time, Message Boards to read and participate in," etc. Phase II is called the Sea Warrior Portal[105]. NKO had achieved 72 percent active duty and 91 percent reserve force registration by the end of FY 2004.

• **Navy Marine Corps Intranet (NMCI)** "is a major transformational initiative for the DON. It consolidates hundreds of networks into a single integrated network. NMCI has helped the DON implement consistent and reliable security, better manage its applications and data, and provide more consistent and higher level of service to DON users." Although it could be argued that NMCI provides limited collaboration tools (it does provide e-mail and a collective calendar), they report a plan to introduce an EDS-based collaboration capability in the future. [106]

• **Raindance**: "How do you give one single sweeping presentation to multiple audiences dotted across the map? Start with Raindance Web Conferencing Pro[107]." The Navy Civil Engineer Corps Officer School for web conferencing is using it. [108]

• **Sametime** (IBM / Lotus): The "Sametime Instant Messaging and Web Conferencing System Version 3.0 (formerly Sametime V3.0)" has been certified for use on DoD SIPRNet Networks by the Joint Interoperability Test Command. [109] Refer to CAS in Appendix D.

• **SKIWEB (Strategic Knowledge Integration Web):** This tool is used by USSTRATCOM to provide real-time command status, scrolling news, significant events and announcements, as well as, uniquely, a blog function. In other words, anyone in STRATCOM can get on SKI WEB and see what's going on and have a threaded discussion. The Commander will ask a question and anyone, regardless of rank, is encouraged to get on and add his or her input in a rolling discussion. Very high usage and the commander "loves it." He operates in a very short time frame, so doesn't like the old staffing of issues through formal taskers - generate discussions on

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[101] meebo can be found here: http://www16.meebo.com/. Soldiers' use in Iraq: http://blog.meebo.com/
[102] For MERIT see the Department of the Navy IM/IT Strategic Plan for 2004-2005.
[103] mIRC also has been used by the Space and Naval Warfare System Center METOC Systems Knowledge Center: http://www.spawar.navy.mil/sti/publications/pubs/sd/530/sd530cond.pdf
[104] Their homepage is: http://www.mirc.com/ .
[105] https://wwwa.nko.navy.mil/portal/splash/index.jsp .
[106] http://www.nmci.navy.mil/ .
[107] See: http://www.raindance.com/rndc/wcp/wcpOverview.jsp.
[108] http://cecos.navy.mil.raindance.com/iccdocs/index.shtml .
[109] http://www-03.ibm.com/servers/eserver/iseries/sametime/ .

line in a chat room, for lack of a better term, and get thoughts and ideas from the E-1 through O-10, civil servants, and contractors. [110]

• **Skype**: "Skype is a little program for making free calls over the internet to anyone else who also has Skype. It's free and easy to download and use, and works with most computers." Skype works with several platforms including Windows, "Mac OS X, Linux and PDAs" For a slight fee, you can call any number anywhere[111]. Note, however, their worthy new competition is called Wavigo.[112] "Since its launch in August 2003, its software has been downloaded more than 174 million times in 225 countries and territories. Around 56 million people are registered to use Skype's free services, with more than 3 million people using Skype simultaneously at any one time, according to the company." [113]

• **Sitescape:** Enterprise Forum, Version 7 has been given a "Statement of Non-Applicability for JITC Collaboration Interoperability Certification Testing. The Statement of Non-Applicability authorizes the use of the products listed on DoD Networks." [114] The Dockside Security group uses Sitescape extensively.

• **Stellent:** Stellent just released Version 7.5 of Stellent Site Studio, which they call the "Industry Leading Multi-Site Web Content Management Application." Apparently it is being used by the Air Force Medical Services.[115] The Air Force brochure states that, "U.S. military department gains efficiencies and ease-of-use by consolidating approximately 350 Web sites with Stellent multi-site Web content management." Given the growing recognition for the importance of records management (RM), Stellent "helps organizations control the creation, declaration, classification, retention, and destruction of business records. The Stellent solution manages records, along with documents (even non-records), digital assets, collaboration, and Web content, within one server via a common user interface, which simplifies use and minimizes total cost of ownership (Smallwood, 2005)."

• **Virtual Program Office (VPO):** A Virtual Program Office application is based on the IBM/Lotus Domino technology, and was designed to enable geographically dispersed teams to work collaboratively via the Internet in a secure environment. Both the Space and Naval Warfare System Center and Command have been leaders in providing this exceptionally useful resource to their work teams. The primary advantages of VPOs are that they are: exceptionally secure, accessible to anyone who has prior permission including contractors, supports membership access levels, organized to support distributed work, and can support very large documents.

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[110] Additionally, the Commander basically told senior leadership that nobody in the command should ever be restricted from blogging on SKI WEB and he better not hear you're the one behind discouraging a low ranking person from getting on there. He believes the system is self-correcting. If someone says something dumb, the community will let him know about it. On the flip side, leadership gets some very interesting insights from the trenches, as well as the head shed. SKIWEB resides on SIPRNet, so info is limited. Everyone in STRATCOM is on SIPRNet and generally uses that as primary web/e-mail interface, so it works for reaching the broadest community.

[111] Their URL is: http://www.skype.com/. See also: http://sscc.spawar.navy.mil/aboutus/pubs/chronicle.pdf.

[112] For Wavigo see: http://www.kolabora.com/news/2005/08/09/beyond_skype_wavigo_integrates_multiprotocol.htm

[113] Source: Educational CyberPlayGround, September 29, 2005. See also: http://business.timesonline.co.uk/article/0,,9076-1803303,00.html

[114] The complete Defense Collaboration Tool Suite CMO Product Exemption List can be found here: http://jitc.fhu.disa.mil/washops/jtcd/dcts/cmo.html

[115] Air Force Medical Services: http://www.stellent.com/stellent3/groups/mkt/documents/nativepage/airforce.pdf

Moreover, they are user-friendly. The lead author manages three VPO sites for various interests or projects.

• **Webbe:** The Special Forces warriors have preferred Webbe, and a related earlier tool called SWAMPS, because they were modified to support their unique focus, and can be used on portable computers. Moreover Webbe has great FTP and Falcon View support, and a very quick chat system. The military leaders who have seen it report asking for copies. Part of the development took place at China Lake, CA the rest at Amphibious Base in Coronado, CA. The Joint Interoperability Test Command has certified Webbe. According to Powers (2004), "The architecture is a peer-to-peer design that is distributed and modular with no single point of failure (see Figure 2). It provides presence awareness, intelligent routing, and guaranteed message delivery to member servers within a federation. A single federation can support up to 256 member servers. It uses the XML Distributed Architecture, which distributes realtime messages on the IP network…. A GSA contract was awarded in May 2004 to upgrade the Webbe Instant Messaging Tool Software Server/Client to support the Special Operations Mission Planning Environment (SOMPE) mission. Other commercially available instant messaging tools do not provide the voice instant messaging and highly compressed audio needed for this application."

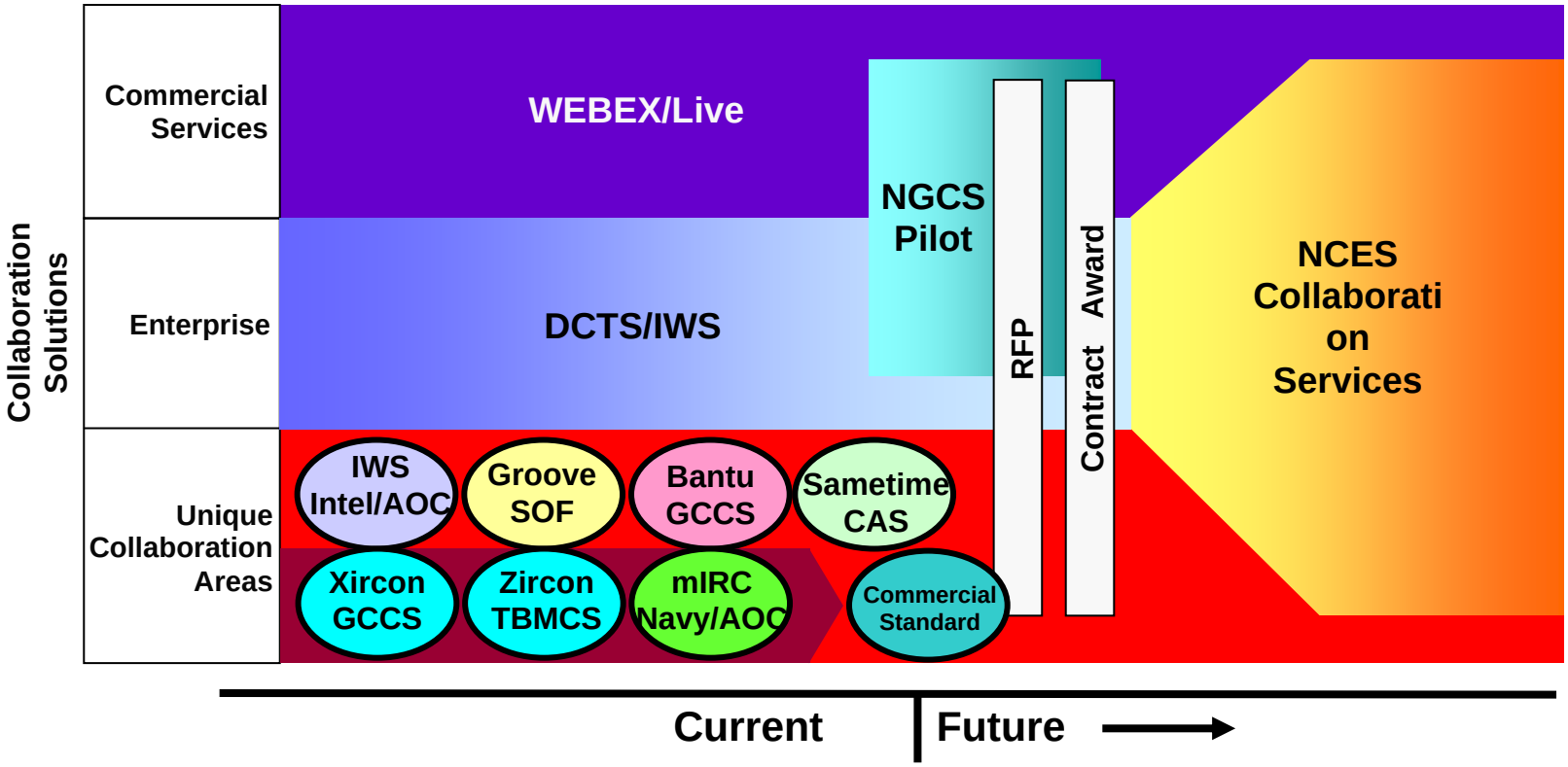
• **WEBSKED** (Web-Enabled Scheduling System; formerly known as VIPER). WEBSKED is an Internet-based "employment scheduling application designed to support current and long-range scheduling, force planning, fuel planning and budgeting, [and] was designated as the Fleet's primary scheduling tool."[116] This tool is required for all components of the Maritime Forces Protection Command. Likely WEBSKED will become part of the JESS (Joint Event Scheduling System).

• **WiredRed Web**: "Two features distinguish the WiredRed collaboration server from its competition: First, it has extremely small server software requirements. Second, it almost exclusively focuses on deployment inside an organization's firewall…. The product's video and VOIP support is strong, and the solution provides a good collaborative workspace. We were also impressed with WiredRed's security options (Garza, 2005)." According to their webpage, [117] their e /pop web conferencing software is being used by 3,500 organizations including the U.S. Army and Air Force.

[116] http://www.dodccrp.org/events/2004/CCRTS_San_Diego/CD/papers/115.pdf
[117] http://www.wiredred.com/ .

Appendix F: DoD Roadmap

From Schneider, 2005



DCTS - Defense Collaboration Tool Suite
IWS - InfoWorkSpace

NCES – Net Centric Enterprise Services
NGCS – Next Generation Collaboration Service Pilot