

Collaboration Across the Multinational Battlespace in Support of High-stakes Decision Making - Instant Messaging with Automated Language Translation

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Introduction

From very simple beginnings, the use of Instant Messaging (IM) tools has increased dramatically over the past 10 years. Their use has even propagated into the business environment, where studies claim that at least 70% of enterprises now use IM, with total business-to-business communications projected to reach 50% by 2005 [1]. Several reasons abound as to why instant messaging has become so popular, but the fact remains that it has become a significant tool for business communications.

So what does Instant Messaging offer an enterprise? IM has been shown to provide several capabilities, including an easy way to communicate informally, a means of holding ad hoc meetings, broadcasting important information, and a coordination mechanism for initiating other forms of communication [2]. All these communications can take place either 1-on-1 or among a group of participants. The ease with which an individual can initiate and carry on long discussions without interrupting other activities makes IM an attractive tool. But most importantly, very little is required from the network or the system hosting the client. IM uses a very little bandwidth and works well even when network loading is high. Additionally, most IM clients provide an unobtrusive way for users to communicate without interrupting other applications on their computer desktops [3].

This has certainly been true in many DoD organizations for many years. The use of Internet Relay Chat (IRC), installed on many Command and Control (C2) systems for over 10 years, continues to grow in importance. The past 4 to 5 years have seen the advent of collaborative tool suites, or "groupware", such as the Defense Collaborative Tool Suite (DCTS), InfoWorkSpace (IWS) and Groove. All these groupware products have the ability to provide a wide variety of collaboration capabilities, such as audio/video conferencing, whiteboarding, document sharing, and text chat. However, military communications networks with their bandwidth limitations, susceptibility to failures, and firewall implementations have often rendered these tools ineffective. Additionally, organizations are required to provide extensive individual training in order for users to become fully conversant with these tools.

These limiting factors remain true even today. During Operation Iraqi Freedom (OIF), the C2 centers had full groupware suites installed with the belief that modern communication systems would be able to provide the stability and bandwidth required for the groupware tools to operate effectively. However, what they discovered is that operators needed a more immediate, simple, and stable tool for communicating with tactical users. To solve this, system administrators and users themselves downloaded and installed IRC clients for use in critical day-to-day activities. IRC fulfilled this important role very well. However, with two different collaboration tools being used, work was often duplicated, requiring some users to run both tools simultaneously to accomplish their tasks.

Although a text-chat system, IRC has some short-comings as compared to IM. Lack of buddylists, security and authentication concerns, and limited commercial offerings make IRC generally less desirable for fielding in an enterprise. However, the factors that make IRC an attractive tool for US operations apply also to IM when considering coalition operations. Network limitations, training users to use collaborative tools, and providing a channel for users of different nations to communicate informally all combine to provide a persuasive reason to use IM. Naturally, IM can't properly address all collaboration needs, and systems providing Email and Web Portal services will still be necessary. This paper will focus on the use of IM within multinational operations, including its limitations and shortcomings. Current research and lessons learned from operational experiences will be presented, outlining how Instant Messaging can be used successfully.

Why Instant Messaging?

Once regarded as a toy and for providing amusement to teenagers, Instant Messaging has moved into mainstream business computing requirements. The proliferation of "virtual teams", where members of a group participate from various physical sites, has increased the need for instantaneous, informal communication mechanisms. Telephones continue to provide an important service, however most virtual team members would rather have something less intrusive. Likewise, Email communications do not provide the quick responses desired for real discussions. Instant Messaging has found an interesting middle ground between these two well established collaboration systems.

Instant Messaging does continue to carry the stigma of being a frivolous toy. Some independent reports have stated that IM is used mostly for non-work related chatting, and that worker productivity suffers because of constant interruptions that IM produces [10]. Since a large number of users have been introduced to IM through their teenage sons and daughters, they assume it's mostly useful for exchanging gossip and talking about personal matters [12]. While these impressions do have credibility, especially with newer or younger users, more experienced users tend to view Instant Messaging not as a novelty, but rather as an extremely useful means for coordinating with others. In fact, studies have shown that seasoned users are capable of carrying on several intense, complex work conversations simultaneously [10].

In the same way that many individuals using the Internet today have no use for IM, the same holds true for its use in work environments. Within some groups, Instant Messaging

may not provide much utility. A major strength of IM is to enhance informal communications; if those types of interactions don't take place, the tool loses much of its capability. Additionally, the collective adoption of IM within a community of interest will significantly drive its usefulness within a group. Learning new skills and increasing the willingness to communicate will need to occur in order for IM to spread throughout a workplace [12]. Gaining a "critical mass" of interested users is paramount to the success of IM within any organization.

Interestingly, within business workgroups IM use tends more towards group chat rather than 1-to-1 communication [2]. Several reasons offered to explain this use include: making the chat session less intrusive, reducing individual user's obligation to continually participate in a discussion, and users can be involved in one or more work-related discussions. And should private discussions become necessary, users always have the option to initiate 1-to-1 discussions. This usage model has been noted both at OIF and the Joint Expeditionary Forces Experiment (JEFX) '04. Users often monitor several group chats simultaneously, contributing only when they feel their input is required.

The proliferation of Instant Messaging solutions available for use in enterprises seems to validate the value of IM. Companies can field IM services that use an external service provider on the Internet or communicate with an internally fielded server. While a discussion of the benefits and shortcomings of these differing architectures is beyond the scope of this paper, it is important to examine all possibilities when fielding IM services within an organization.

Establishing Multinational Collaboration

Naturally, before any collaboration tool can be used to support a multinational coalition, many factors need to be addressed. Interoperability, cultural distinctions, time zone differences, and language barriers all impede the formation of effective coalition teams. While some of these factors can be mitigated using appropriate technologies, much of the success for a coalition team will depend on the awareness of these issues and appropriate training of users to take advantage of a tool's strengths and make provisions for its shortcomings.

Alberts and Hayes [4] address some of the interoperability issues that can arise when forming coalition teams. They iterate 4 levels of interoperability which include:

- ◆ Physical Domain: Where data can travel across different environments
- ◆ Information Domain: Where information is shared in a common manner
- ◆ Cognitive Domain: Where perceptions, awareness, and values exists and, through the use of sensemaking, decisions can be made
- ◆ Social Domain: How different nationalities interact

The Physical Domain is relatively straightforward and normally can be addressed using modern communications systems. The Limited Objective Experiment (LOE) run by USJFCOM in 2001 demonstrated a good example of using a collaborative infrastructure to

bring together participants from 4 nations [5]. Even when modern telephony infrastructures are not in place, good communications can often be established. This is especially important as more Operations Other Than War (OOTW) continue to take place. RESCUER '03 provided a good example of how the Physical Domain could be addressed when working within developing nations [6].

Both the LOE '01 and RESCUER '03 approached the Information Domain in a similar manner. In each case a common tool was fielded to ensure complete compatibility across the information domain. In the case of Instant Messaging, this can become more difficult. Most commonly, users with access to the Internet will install identical commercial IM clients (e.g. AOL Instant Messenger, MSN Messenger) and communicate using that tool. However, localization capabilities of clients, connectivity to the Internet, security concerns, and perceptions of controlling the communications by using a service from within one's own country could potentially inhibit the use of a publicly available IM system.

Private standalone IM systems can be fielded to resolve some of the issues inherent in using a public service. Instant Messaging has an advantage over many other collaboration tools in this regard because as standards evolve the obligation to install and use identical IM clients will be eliminated. Two proposed standards have been submitted to the Internet Engineering Task Force (IETF): the eXtensible Messaging and Presence Protocol (XMPP) [7] and the SIP for Instant Messaging and Presence Leveraging Extensions (SIMPLE) [8]. While neither proposal has been accepted yet as the true standard for IM, both have several client and server implementations. These can be localized for particular regions and languages and can be used to establish local domains. For these systems, however, training of system administrators becomes more of an issue. Using naming conventions for users and their roles, enabling services such as group chat across all domains, and ensuring appropriate authentication mechanisms are in place must all be managed at this level.

Addressing the Cognitive Domain is less of a technical issue and instead relies more on training. Although IM systems are generally quite easy to use, in the same manner they can also cause misunderstandings and confusion in a multi-lingual coalition. Colloquial and slang expressions, dominating conversations, not using away messages appropriately, and engaging in culturally inappropriate conversations can easily cause problems. In addition to the "buttonology" training, novice users need guidance on how the tool should be used in a coalition environment.

While Instant Messaging can allow for the discussion of relatively complex issues, it alone can't fully provide for cognitive awareness and perception. Normally, tools such as Email or Web Portals will provide the exchange of artifacts required to gain the sense of a situation and guide participants towards a common decision. As the team moves towards this shared decision, IM can provide a key role in allowing important discussions to take place. To allow for meaningful discussions with all individuals, some key points in the use of IM systems should be emphasized:

- ◆ Ensure key personnel are truly involved in the decision process. Even if an IM system says a person is online, they may not necessarily be actively monitoring the discussion. Conversely, emphasize to users the importance of setting “Away” notifications in their IM tool, and of including in this notification some indication of when they expect to be active again. An away message such as "Attending General's brief, will return at 1400" quickly notifies all users when a key participant may be available or a particular topic may become active again.
- ◆ Have users keep statements short and simple, expressing complete thoughts and using correct grammar and spelling. This is especially important when operating in a coalition environment. In addition to machine translation requirements discussed later, most users who speak English as a second language will be much more familiar with proper English rather than acronyms and slang expressions.
- ◆ Give all users the opportunity to participate in a discussion. It is very easy for computer-savvy individuals to unknowingly dominate conversations simply because they can type faster than others. For those not as familiar with computers, or requiring translation before they respond, this can become a source of great frustration. Most IM systems will provide cues as to when someone is typing a response. By allowing time for the user to respond, important input can be included at a relevant point in a conversation. Having a moderator within a group discussion can help to ensure that all voices and viewpoints are heard.
- ◆ Keep conversation threads within a discussion area to a minimum. It is extremely easy for several users within a group to carry on several conversations simultaneously within a single group chat session. When this happens, other users may have difficulty following a particular conversation thread and may miss important information. If necessary, users can initiate private conversations or create new group sessions where other discussions can take place independently. This keeps the main discussion area clean and allows coalition partners who may read more slowly or must rely on translations to more easily follow a conversation.

The Social Domain aspect for multinational collaboration may actually be enhanced through the use of Instant Messaging tools. In the same way that IM has reached a global audience, its use as a means to make friends and build mutual trust will be repeated in the coalition setting. In this manner IM provides a source of “social capital” that benefits virtual teams [9]. Although most IM systems will be fielded to support military operations, its use as a way for users to initiate personal conversations need not be discouraged. Normal curiosity about another user’s life and culture can open communications channels through which work is subsequently accomplished. By allowing users to find out more about their foreign counterparts, a bonding and sense of trust is established throughout the team. Studies have shown that even though IM may be used for personal communications, the majority of discussions will remain work related [2].

Multilingual Instant Messaging

In as much as having numerous multinational participants collaborating within an Instant Messaging session can be challenging, adding their various languages to this situation increases the difficulty of this task significantly. Literal and implied meanings, cultural

differences, and even social structures can not only inhibit constructive interactions using IM, but may go so far as to strain relationships. But the benefits of closer cooperation among countries focused on common goals make this technology worth the risk. Being able to communicate easily to users of other nations may not only accomplish a common task, but also to establish relationships that benefits all participating countries.

Traditionally, language translation has been provided by human translators. While providing a valuable service, translators can be limited by experience and availability, especially to lower ranking individuals. As computing resources have increased over the past few years, the ability to provide near-real time translation has become a reality. Simple words and phrases can be translated quickly through *machine language translation* resources. By integrating machine translation with Instant Messaging, a new capability exists to allow groups made up of users, each of whom may speak a different language, to communicate rapidly and informally.

Machine translation, although one of the earliest problems addressed by the computer age, still remains greatly inferior to human translators in their ability to provide accurate translations. Morphology (how words are built up from smaller units), syntax, and semantics all combine to make language translation anything but straightforward [13]. With enough data incorporated, rule-based and statistical-based translation systems have been built that give approximate meanings to what was written or said. Although not perfect, these tools do certainly bring the technology to a point where it provides some utility.

Several companies have created products for providing language translation in IM. These include Xencoders [14], IBM/Lotus [15], and Worldlingo [16]. Our experiences using translated IM and fielding it for use in coalitions comes through the use of a prototype developed at The MITRE Corporation called Translingual Instant Messaging (TrIM). TrIM consists of an IM protocol developed within MITRE integrated with commercially available translation systems. Sponsored by the Commander, US Naval Forces Europe (CNE) under the Coalition Chat Line (CCL) program, TrIM has been fielded at locations such as Combined Endeavor '03, BALTOPS '03, RESCUER '03, and to the Multinational Division in the Iraqi theater of operations. The experience from these operations has been invaluable in learning about translated Instant Messaging, its strengths and limitations, and how it can be best used within coalition operations.

It is important make users aware of the limitations of translated IM before they use any of these systems. Making users aware of potential problems not only decreases the likelihood of confusion or misunderstandings, but helps them build a sense of the best way to communicate with their foreign language counterparts. Some of the most common problems we've noticed in using translated IM include:

- ◆ The use of proper grammar. Most translators currently available were designed for translating whole documents, and expect full sentences that complete a thought. Using slang expressions or sentence fragments often won't translate correctly. Some translation systems do allow for updating of the vocabulary it uses; if some expressions are important enough to be translated, look to see if adding this expression

to the translator's dictionary is possible. Some common IM expressions may be allowable (e.g. LOL corresponds to "Laugh out Loud" on IM systems), however make sure all parties understand these acronyms.

- ◆ The importance of correct spelling. A common mistake, especially since rapid IM exchanges can easily cause misspellings or typographical errors. Additionally, IM systems as a general rule do not include spell checking features. If a particular word or phrase seems to be misunderstood, always check to ensure the spelling is correct.
- ◆ Awareness of words with multiple meanings. During the RESCUER '03 exercise, exchanges took place between English and Russian speakers. We noticed that the expression "I am fine", when translated from English to Russian, then back to English, produced the expression "I am penalty". The translator was using the definition of *fine* to mean *a financial punishment* rather than *doing well*. In this case, using the expression "I am well" translated the user's meaning correctly.
- ◆ The value of short statements. As sentences become longer and more complex, the possibility that words can take on different meanings becomes more likely. By keeping sentences short the meanings of the words usually remain quite clear.
- ◆ Encourage the use of tested phrases and sentences. As translated conversations take place, users will become aware of sentences or phrases that translate well into other languages. Testing the system with experienced human translators also helps to find these expressions. Persuade users to remember these phrases and use them whenever possible. A user guide of common phrases that translate well might be provided.
- ◆ Familiarize users with common foreign phrases. For some reason, particular words or phrases may not be translated correctly. If users are aware of some common foreign words or expressions, they may more easily capture the meaning of what is being said to them.

Adherence to these guidelines should be continually reinforced as users carry on translated conversations. This can be most easily accomplished by having users gather into chat groups, and encouraging users to correct problems dynamically as they notice them. While not a common practice for normal IM conversations, encouraging users to correct each other will often help to eliminate errors or misunderstandings. Additionally, users should be encouraged to "negotiate" the meaning of a foreign phrase. Observations from past experiments have shown that by asking for a word or phrase to be restated often lead to a better understanding by everyone involved.

Another area being researched currently is the bridging of multinational IM across computer security boundaries. Although some experimentation with this technology has taken place [3], it remains in its infancy and no system is yet accredited. It is hoped that experiments taking place in the near future will lead to advanced testing, accreditation, and fielding of this technology.

Training Users in a Multinational Environment

Readiness is built on training and practice. However, most Active Duty, Guard and Reserve members have full-time jobs that usually will not employ the same tools they use

when going to war. It is essential then for these tools be as simple as possible and easy to remember. The challenge for training, especially for IM systems, is to not only provide adequate training for warfighters, but to look at providing ways of enhancing the training through civilian life experiences.

IM systems have some distinct advantages in this area. As a general rule IM systems are relatively easy for users to learn. Most IM systems include standard GUI components: a text entry area, a text feedback area, and a buddylist providing presence of one's friends and coworkers. Once familiar with these components, training for the use of an IM system progresses quickly. After fielding a prototype IM system during the Advanced Process and Technology eXperiment (APTX) '01, we were able to get users up and running on their IM clients within 20 minutes. The simplicity of the computer interface gives users a sense of familiarity. In addition, because IM has become such an influential tool on the Internet, users have a chance to see IM systems every day.

We've noticed that basic training for IM systems even to multinational forces is relatively easy. For RESCUER '03, a prototype multilingual IM tool was built inside of the Groove [17] collaboration environment. Groove itself is a more complex tool, and training multinational users, especially those who weren't experienced computer users, was a challenge. Users generally didn't understand all the subtleties of a virtual environment, and much of the training time available was used for helping them understand Groove's many features. This left the training for the IM tool as an "over the shoulder" exercise. In spite of the curtailed training, users were quickly able to grasp how the IM program operated. Having only a text entry area and a feedback window, they became quite enthusiastic in their ability to type in their own language and seeing translations to the other languages.

What does take longer when training users is overcoming problems they may encounter. Because IM systems are easy to use and quite intuitive even for novice users, overlooking the recommendations for successful IM use is very easy. Training the guidelines for appropriate IM use outlined above will normally take longer than teaching the operation, or "buttonology", of the tool. Often, because of time considerations, teaching these finer points of IM may be left as an "On the Job Training" (OJT) exercise. If training in this manner, it is important to have experienced users who are cognizant of common IM problems and are willing to educate others. Users will need to be aware that this OJT is taking place, and that they aren't being criticized for how they communicate on IM, but that following certain guidelines improves the quality of translations and increases understanding. Of course they will also need to learn to be open minded when reading translated text or they may misunderstand the meaning intended.

Many experiments observed to date attempt to establish a set procedure for the interactions to take place within IM. Although this will greatly diminish the informality and ad hoc nature of the tool, it does provide some advantages. Not only will individuals know when to communicate and what to say, but they will of necessity be drawn into conversations with foreign members of the team. While establishing procedures for accomplishing certain tasks within IM is certainly acceptable, users should also be encouraged to build upon the working relationships created to develop more informal and varied interactions with other team members.

Finally, an important aspect of training multinational collaboration using IM is making individuals aware of cultural differences. Research has outlined several dimensions where individuals from differing cultures may encounter problems cooperating on tasks, to include [18]:

- ◆ Revering hierarchy. How individuals interact with superiors depends on how great they envision the gap between themselves and others of different managerial levels.
- ◆ Individualism versus Collectivism: The extent to which people regard themselves as individuals rather than part of a group.
- ◆ Assertiveness and Toughness: Whether a culture values the direct approach to "getting a job done" rather than nurturing interpersonal relationships as a preface to working together.
- ◆ Risk Avoidance. Determining whether a culture encourages taking chances to finish a job, or stresses a greater reliance on risk avoidance and stability.
- ◆ Long-term Orientation: Whether a culture emphasizes longer term goals rather than the "here and now".
- ◆ High Context versus Low Context: Determining how much to read into the words that are spoken. In High Context cultures, communication occurs not only through the words that are spoken, but also who is speaking, the surroundings or conversation context, and the social perspectives of the speaker and audience. This leaves much of the communication unspoken. Low Context cultures do not use as much symbology, and rely on the words to communicate their message.

Naturally, dealing with different cultures is an extremely complex task just between two cultures, let alone amongst several, and would be difficult to address through classroom training. Teaching the awareness that these differences exist and exploring where the trainees' culture fits can go a long way towards preparing individuals. With this awareness and a means to communicate with different cultures, users will more quickly gain the experience necessary to establish productive relationships. Hopefully, the emergence of translated Instant Messaging tools will help to build these new relationships.

Fielding Multinational Instant Messaging

As mentioned previously, two basic architectures exist for IM systems. Since the multilingual Instant Messaging system developed by MITRE consists of standalone servers that can be fielded within an enterprise, our experience lies mainly with this IM architecture. Over the past 2 years, we have installed these servers at various locations and have gained an insight into common problems that may occur [11]. Not addressing these problems in a timely manner could negatively impact the readiness of the IM system for the tasks to which it is assigned:

1. Ensure hardware and software to be used is appropriate for foreign participants. In several experiments, the US has provided computer systems for multinational participants to use. However, in several instances, keyboard layouts, language font

packs installed and localized software systems were not compatible with the needs and experiences of the foreign participants. Without these items, users fumble with unfamiliar keyboards and see messages on their screens in unfamiliar characters.

2. Make every attempt to obtain the best machine translation engine possible. Poor quality translations will quickly cause frustrations in all the participants and the IM system will not be as effective. Because machine translation is still very much an evolving technology, and many languages pairs aren't well supported, every attempt should be made to first evaluate and then obtain the best technology for the particular deployment.
3. Achieve as much "buy-in" as possible. If only a small subset of users participate in IM sessions, the full power of the technology won't be realized. By promoting the benefits of IM and working the tool into the Concept of Operations, more users will make use of the tool, resulting in a critical mass of users, creating a sense of community and enhancing the virtual team.

Conclusions

Although Instant Messaging systems have only recently become part of the business collaboration process, they have quickly been accepted into this role. By providing a means to determine a person's availability, ask a quick question, and maintain continuing relationships with others, IM fills an important role. The ease of use that characterizes typical IM systems gives them a receptive audience in most organizations. Additionally, with the problems of excessive messages and Spam making Email more difficult to use effectively, IM provides a solution for those who wish to avoid that medium. All these points remain true even when we consider using IM to communicate across the boundaries of language, nationality, and culture.

However, much of successful collaboration using IM deals not only with the operation of client software itself, with the quality of interactions among the users. Research and experience have shown that to ensure successful collaborations, all appropriate individuals need to be involved, everyone must have the opportunity to contribute, and discussions must remain focused. Tools and procedures are not enough in the multinational coalition environment. On top of the language ambiguities introduced by machine translations, social and cultural differences can play a significant role in how collaborative sessions take place. Our training and resulting readiness for future expeditions with coalition partners will depend in part on our readiness to collaborate effectively.

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