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### **“Developing and Communicating Intent for Distributed Staff”**

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## **Developing and Communicating Intent for Distributed Staff**

### **Abstract**

Modern military operations involve staffs from a broad spectrum of organizations inside and outside the traditional chain of military command. Many of the staff personnel and functions are now distributed, and while operating according to military doctrine, communicate in ways that were not envisioned previously. In addition, the definition of staffs is changing as more experts and organizations outside the military are brought into more complex endeavors. This emerging concept is called “Distributed Staff”.

One of the key aspects of conducting an effective mission is developing and communicating intent. While the process is well understood and documented in doctrine for a military staff, it is not as well standardized when dealing with a number of groups or people working remotely. In some cases, where non-military organizations (such as Non Governmental Organizations – NGOs), are involved, the intent of the organizations may be different. While a commander may have an intent for the staff under his control, it is not clear presently how to work with organizations that do not fall under his control. Theory says that all organizations should be working with one broad intent, but is this so in practice? The evidence seems to be that organizations work according to their own specific intent and that sharing intent is very difficult.

New research results from NATO Modeling and Simulation Working Groups (MSG-048, MSG-085) have shown how to represent complex orders in a digital form. These formats, Coalition Battle Management Language (C-BML) and Command and Control Lexical Grammar (C2LG), give an indication of how intent can be formulated in a more precise manner for less ambiguity. This paper analyzes these digital formats for suitability by distributed staff, and reviews related research from psychology concerning the development of shared mental models and visualizations to develop Common Intent.

### **1. Introduction**

Military staffs have been in use since ancient times and the concept of supporting a Commander with dedicated personnel has not changed fundamentally until the computer age. Now, technology allows staff members to be distributed across a wide geographic area, testing the established protocols and procedures for staff operation. This is called “Distributed Staff” in this paper. This is a Command and Control (C2) issue, as it involves both managing operations and the technology for doing so.

Intent is a key part of C2, and thus a key factor in Distributed Staff. Developing intent is a key staff function (US Army, 2005). While the doctrine on intent for traditional military staffs is very stable, it does not address situations that arise with Distributed Staff, particularly in challenging

situations like Complex Endeavors. It is crucial to the success of any mission to formulate and communicate intent without problems.

Alberts and Hayes (2007) define Complex Endeavors as “characterized by both the nature of the collection of participants who are working toward a shared purpose and the nature of the effects of interest. Put succinctly, complex endeavors are characterized by a large number of disparate entities that include not only various military units but also civil authorities, multinational and international organizations, non-governmental organizations, companies, and private volunteer organizations. The effects of interest go far beyond military effects to include social, political, and economic effects. The nature of the participants makes the collective action space complex while the multi-domain effects space contains complex interactions among effects of various types.”

There is a notable failure of agencies and organizations that perform Complex Endeavors to work together effectively. One contributing factor commonly cited for this failure is a lack of trust (Tatham & Kovács, 2010). This is more extensively discussed in Hieb (2015). Another factor is the difficulty of communicating clear intent among a very diverse group of organizations – both military and other types of organizations (such as non-profit volunteer organizations). Intent works in military organizations because it is instilled in training and executed via well-specified procedures. It is, critically, commonly understood throughout the military organization. This is not the case when going outside the military organization to other groups.

The focus of this paper is how to formulate intent for Distributed Staff in the context of a Complex Endeavor where there are a large number of organizations involved (in the order of 10 to 100 organizations). Simulations are discussed because they can be used to communicate intent (e.g., by visualizing Courses of Action – COAs). In this case Simulations can be seen as providing a C2 capability. The efforts of the NATO Coalition Battle Management Technical Working Group are very relevant (Pullen and Khimeche, 2014)

This paper is organized as follows. First the new concept of Distributed Staff is examined in Section 2. Then the common definitions and new formulations of intent are reviewed in Section 3. Section 4 looks at how intent can be measured, particularly for Complex Endeavors. Section 5 concludes with recommendations for future research for developing new technologies to support Distributed Staff.

## **2. The Context – Distributed Staff**

In an increasingly complex and dynamic world, ad hoc teams from various organizations and cultural backgrounds must cooperate and collaborate in order to solve problems and accomplish desired ends. Multiteam systems (a term from psychology) are collectives that collaborate across traditional team and organizational boundaries, as for example, when teams from multiple agencies must cooperate in response to natural disasters. Individual teams in a multiteam system may possess very different core missions, expertise, structures, norms and doctrine, but they are expected to function in the aggregate – as a team of teams, per se – to achieve integrated actions as would be expected of a traditional organization (Zaccaro, Marks & DeChurch, 2013).

By representing the entities in Complex Endeavors as organizations in a multiteam system, a framework can be constructed that can be used to both represent and study intent in Complex Endeavors. Additionally, the structure of a multiteam system can be modeled as a social network, where not only individuals are represented, but also “teams”.

Enabling effective multiteam systems is critical across a range of DoD capabilities contributing directly to distributed Service, Joint, and Coalition missions. There is a large and growing problem in addressing the requirement for U.S. Combatant Command (COCOM) commanders and staffs to extend control and coordination to a much broader spectrum of organizations, both inside and outside the traditional military chain of command. Moreover, the cultural mix and geographical distribution of these staffs are often in continuous flux, which complicates coordination and trust-building during a rapidly changing crisis, such as a Complex Endeavor.

## 2.1 Distributed Staff Defined

Distributed Staff is a unique concept that builds agility and responsiveness into the staffs of US and allied/partner commands by sharing information and responsibility seamlessly among physically disjoint headquarters. It is explicitly concerned with the social sciences and management issues of how to utilize a networked “team of teams” that operates in a time-critical stressful environment. Although distributed communication tools are beginning to come online, the current military uses of technologies such as “chat” and “twitter” are barely scratching the surface of what is possible.

Networks give us powerful new tools but add the most value within hierarchical military structures focused on local or tactical operations. Operational level staffs controlling/coordinating a broad and rapidly changing mix of organizations are hemmed in by legacy concepts of staff interaction. They are unable to realize and often cannot perceive the benefit of collaboration in a distributed Command Support environment. As a result, COCOMs’ Command Support has limited agility while the mix of organizations they command/coordinate is rapidly outpacing slow traditional planning and execution oversight.

Mission Command and intent are two prominent and well-defined working concepts central to C2 of Joint Operations (Luck, 2013). The incorporation of these concepts into any advanced COCOM C2 solution is an assumption of this cognitive research proposal and both concepts must be implementable by technological products. The two concepts are interrelated and require each other in order to understand either one. One of the challenges, both cognitive and technological, is to accurately and clearly communicate intent through all engaged organizations, such that mission command is realized without further need of guidance in rapid operations or degraded network environments.

In operations with many Mission Partners, each will have their own missions and (in the case of civilian organizations) their equivalent of a Commander’s Intent (Westphal and Lang, 2014). However, their participation with the COCOM is indicative of at least a partial common mission and thus a Common Intent. The COCOM, as the overall commanding/coordinating staff of concern, can only have one Commander’s Intent. The Command Support staff assists the Commander in defining intent. The staff also must determine the degree to which organizations over which the commander does not exercise full legal authority, (i.e., civilian organizations or

the militaries of other nations) are willing to contribute to the COCOM mission. Ultimately, the staff must define each team member's contribution to the COCOM Commander's Intent, such that the mix of Distributed Staff is clearly and continuously striving to achieve that common intent.

## 2.2 Intent in Distributed Staff

As noted above, intent is a key concept in both C2 and Distributed Staff. There have been efforts to distinguish between the intent of a Commander (Commander's Intent) and the intent that pertains to a particular operation (Command Intent). In general decision-making literature intent can be mapped to a broader goal. There is also a concept from psychology of "shared mental models" which accommodates both intent and situational awareness (Zaccaro, Marks & DeChurch, 2013).

Friction in Complex Endeavors can be due to tension between teams that have strong cohesion. It is an interesting phenomenon that teams that work exceptionally well alone may not work well in a multiteam setting. Working on better ways to develop "system" goals vs. individual team goals allow for more effective coordination and cooperation as well as to build trust.

## 3. The Evolution of Intent

Albert and Hayes discuss intent in "Understanding Command and Control" and distinguish between intent, Command Intent, and Commander's Intent [Albert & Hayes, 2006]. Commander's Intent implies a single individual in command, while Command Intent is a newer term that implies a group or collective making decisions. The term intent is a more conceptual and general expression that does not consider where the intent comes from. In this section a transition from a well-established command process relying upon written and verbal communication to a more flexible command environment is discussed. Then a new dimension of intent is considered which considers organizations that coordinate and make requests of each other.

### 3.1 Definitions of Intent

The United States Department of Defense (DoD) defines Commander's Intent as [DoD, 2005]:

"a concise expression of the purpose of the operation and the desired end state that serves as the initial impetus for the planning process. It may also include the commander's assessment of the adversary commander's intent and an assessment of where and how much risk is acceptable during the operation."

The US Army in Field Manual 3-0, Operations [USA, 2001], similarly defines Commander's Intent as:

“A clear, concise statement of what the force must do and the conditions the force must meet to succeed with respect to the enemy, terrain and the desired end state.”

This is expanded in Field Manual 5-0, Army Planning and Orders Production [USA, 2005], which specifies that the Commander’s Intent links the mission to the concept of operations, describing the end state and key task that are the basis for subordinates initiative, along with the mission. In addition, the Commander’s Intent should convey a broader sense of purpose, giving the context of the mission. Doctrine also says that the mission and Commander’s Intent should be understood in lower echelons (either one or two levels down).

In accordance with this definition, FM 5-0 breaks down Commander’s Intent into these three elements:

- End State;
- Key Tasks;
- Expanded Purpose.

We will use these terms later in our work as the basis for formalizing of intent.

The DoD definition assumes a formal planning process, which may not be present in future operations. New planning procedures have a design that accommodates both a formal planning process as well as situations where the planning is done in a more distributed and parallel fashion.

Intent is the input to many conceptual models as well as to many simulation systems. Improving how Command Intent is represented and communicated to improve comprehensibility and to reduce ambiguity. One approach is to develop a formal language so that command statements can be generated and automatically processed according to well-founded theoretical properties and to describe the context of the situation in enough detail to support the intent.

Conveying a clear intent is only helpful if the subordinates are allowed to operate with some degree of autonomy. The idea is that subordinates should do whatever has to be done to fulfil the intent and to reach the goals formulated by it.

### 3.2 Expressing Intent in Current Operations

There are various forms of orders used for commanding forces of different services. The most common form is the Operations Order, which is used by Coalition, Combined and Joint commands. However there are other formats such as the Air Tasking Order, used by national Air Forces.

STANAG 2014 specifies the standard form of an Operations Order for the North Atlantic Treaty Organization (NATO). This five paragraph format is similar to US and representative of other nation’s formats. Military doctrines have leveraged these standards, such that professional soldiers know, by heart, how an Operations Order should be structured and how such an order should be read and interpreted. Intent is a key part of the format of the Order.

Operations Orders are generally structured such that they have 5 sections (paragraphs) in the following order:

- 1) Situation
- 2) Mission
- 3) Execution
- 4) Service Support
- 5) Command and Signal

In the 5 Paragraph order, the intent statement is found at the start of the Execution Paragraph, followed by the Concept of Operations and then task-oriented directions to the forces commanded. Intent statements of the higher Commands will be repeated in the Situation Paragraph in the section that describes friendly forces.

However, the intent (and much of the Operations Order) is formatted as “free text” and as such is extremely difficult to process automatically. While a trained military professional has little problem dealing with this “free text”, current automated systems handle it as a single data field and do not understand Command Intent such that they can represent or communicate it. This paper will provide a formal grammar for Command Intent to overcome this problem.

### 3.3 Formalizing Intent

In order formalize intent, the doctrine in the US Field Manual FM-5 in Section 1.2 is used as a basis. Intent is composed of three terms: End State, Key Tasks, and Expanded Purpose. Therefore the basic rule for intent is (1).

- (1)  $I \rightarrow$  [Expanded Purpose] [Key Tasks] [End State]

The End State describes the resulting situation that is achieved when the mission is accomplished. Therefore the End State is modeled as it would be reported at the successful conclusion of the mission. This can be represented by a combination of basic report expressions, consisting of task, event and status reports. For more detail refer to Schade & Hieb (2007).

The Key Tasks are tasks and conditions that are essential to accomplishing the mission and are formulated as both basic orders and basic reports. The Expanded Purpose is similar to the End State, but expresses more general aspects of the resulting situation. In short, the End State is about the resulting situation from the military perspective whereas the Expanded Purpose also considers other, e.g., political, consequences and results. Being the description of a state, Expanded Purpose again is represented by basic report expressions, but these will include more reports of event type that refer to political situations, such as “POW return” or “peace conference.”

### 3.4 Intent in Complex Endeavors

When it is considered how intent is used in the multiteam systems that respond to Complex Endeavors there are at least three issues:

- 1) Where does intent reside in a multiteam system?
- 2) How can intent be communicated in a multiteam system?
- 3) What factors are important to “develop” intent in a multiteam system?

### 3.4.1 Intent in a multiteam system

When there are a large number of organizations, working to respond to an incident such as disaster relief, there will be different organizational goals. For example, a military unit may have the goal of ensuring security, where a medical NGO may have the goal of rescuing and treating survivors of a disaster. Looked at in the abstract, if there are two organizations in this context, they could either use “Commander’s Intent” or “Command Intent” within their own organizations. However do the two organizations have the same intent?

In Figure a spectrum of intent is portrayed – from the traditional view of Command Intent to two new definitions for multiteam systems. “Shared Intent” is intent that is communicated between organizations but not the same. This accommodates the case where two organizations have different but consistent goals.

“Common Intent” is when all organizations share the same goal. This would theoretically be the most effective response to an incident. In practice, many other factors may be more important than intent.

It raises the case of when two organizations are both working on the same incident but have conflicting goals. Not only is there no Shared Intent, but the organizations are actively working against one another. This may initially be partly due to lack of communication, but will lead to mistrust and lack of effectiveness over time.

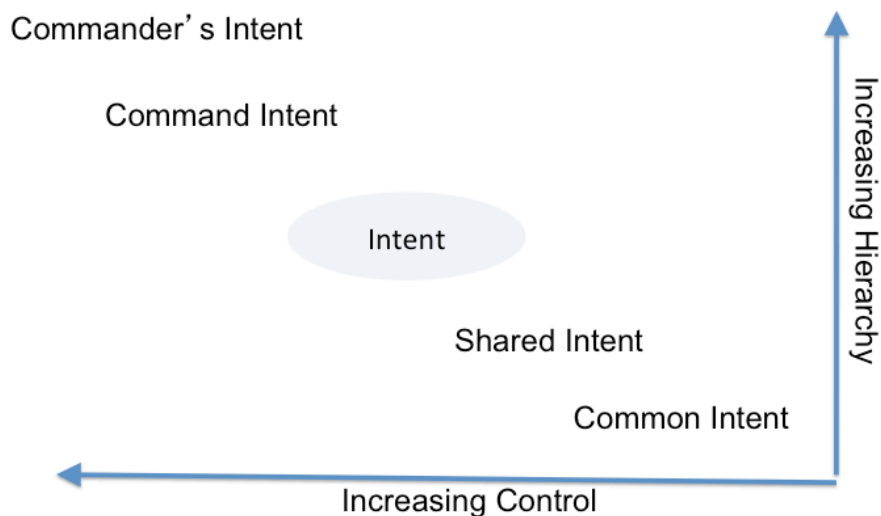


Figure 1 – Dimensions of Intent



### 3.4.3 Developing Intent in a Multiteam System

It is an open question as to how best to develop Common Intent in multiteam systems. Due to a lack of doctrine, or a history of the organizations working together, or joint training, the mechanisms would need to be very general. Visualizations of COAs communicated between the organizations responding to a Common Endeavor would clearly be useful. To the extent that these COAs can be generated and manipulated by simulations, they would be more easily generated and visualized. C-BML would enable a common standard for playing back COAs to various diverse organizations. Each organization may have its own initial COA, but by sharing detailed COAs, organizations could better plan and coordinate with each other.

### 3.4.2 Communicating Intent in a Multiteam System

There are many studies on group decision-making and “sensemaking” in organizations. However there are notably few studies on how disparate teams develop or share intent. In a Complex Endeavor, there may be ad hoc structures that emerge such as coordinating committees with members of teams attempting to synchronize their respective teams actions. However, intent is understood at the team level, and there is not a recognized definition of Common Intent between groups. In the literature this may best be captured by “Shared Mental Models” as noted in Section 2.2 above.

## 4. Measuring Intent

Taking the innovative work that has been done multiteam systems, a new Framework can be used to study intent in and among teams. The Multiteam Systems for Complex Endeavors (MS-CE) Framework takes some of the concepts from the risky trust model in Figure 3 and from the domain of C2. A key characteristic is the ability to model a Complex Endeavor as a social network and calculate measures of trust on relationships between the teams and actions on the environment.

In MS-CE, a team is modeled as an “organization” as shown in Figure 2. It has three types of information that it can share with other teams over time: Goals, Situation Awareness (SA) and C2 types of messages (orders, requests, status, etc.) which is called Coordination in the framework. The organization can take action on the environment (to move towards an goal). In this case the goal is an envisioned endstate. This endstate would consist of a set of conditions and could be augmented with a graphic (sketch on a map) or a visualization of a Course of Action.

Since the framework is modeling a multiteam system, there are an arbitrary number of teams (n) that can potentially interact with one another. Figure 3 presents this framework that can be used to measure a number of C2 concepts and also more general concepts such as trust. In the social network concept of trust, interactions can be measured and calculated (Li et al, 2008), and the overall trust can be a function of the exchanges of the three types of information as well as the actions taken by the organizations.

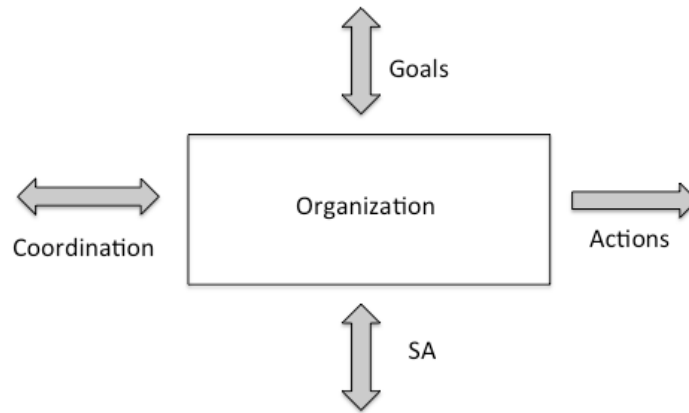


Figure 2 – MS-CE Organizational View

An analogy can be made with intent, where shared intent could be measured by calculating the number of goals (messages containing goals) shared between organizations. There could be two measures, one indicating that the intent has been shared successfully from one organization to another, and a second indicating that the two organizations have consistent or inconsistent intent.

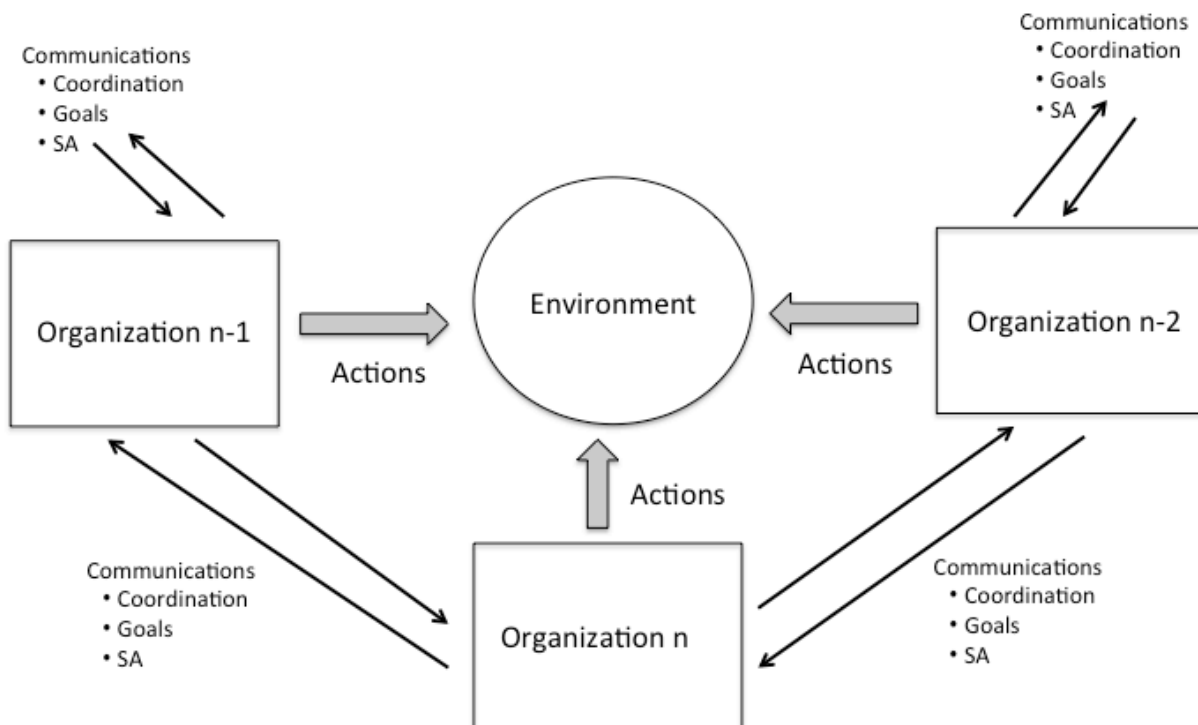


Figure 3 – MS-CE Framework

Then there is the issue of measuring overall Common Intent for the multiteam system. This could be the sum of all of the bilateral Shared Intent scores. The MS-CE framework gives the ability to calculate the shared intent between two organizations as a function of the other inputs and outputs. Does sharing more SA lead to better intent? Do more coordination messages and requests lead to better intent?

An interesting aspect is how intent corresponds to the actions the organizations actually take. This could be measured by looking at the actions each organization takes to see if they are consistent with the measures of Shared Intent that were calculated.

## **5. Conclusions**

The future of C2 will clearly be more virtual and collaborative. What is not clear is what tools will best support C2 in the future. The current methods of developing and communicating intent will need to evolve to accommodate a more general process and diverse set of participants.

Legal and regulatory authorizations related to Distributed Staff stem mainly from the U.S. Code, specifically Title 6 (Domestic Security – DHS), Title 10 (Armed Forces), Title 32 (National Guard) and Title 50 (War and National Defense). Distributed Staff research should include these issues to determine who has authority to give orders and how decision rights are allocated.

In this work, new conceptualizations of intent, particularly in the context of a Distributed Staff, have been examined. There is a large cultural gap between the traditional notion of Commander's Intent and the more recent notion of Shared Intent pertaining to different organizations (or teams) working together. The concept of multiteam systems is useful in how the different concepts of intent can be used.

Intent is best represented in the literature as the envisioned "Endstate" of a mission. Currently this is very difficult to digitize for computer applications or services. However, it can be represented by a map-based graphic or visualization in many cases, and this is particularly relevant to communicating intent in a Complex Endeavor, consisting of many different organizations.

Current work in NATO is heading in this direction. While C-BML provides a digital format for Operation Orders, it can be used to show COAs for evaluation and visualization. This corresponds to identifying the "Key Tasks" aspect of intent. While representing Endstates is difficult due to the lack of a common specification, C-BML can provide the basis for doing so, in conjunction with the "Key Tasks" it already represents. In the future, C2 and Simulation services will be indistinguishable. C-BML is a necessary step in developing and propagating intent for Complex Endeavors.

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