The Defense Department has recently identified the “mega-trends” that are reshaping “command and control” in the information age:

• The extremely broad availability of advanced information and communications technologies that place unprecedented powers of information creation, processing, and distribution in the hands of almost anyone who wants them—friend and foe alike;
• The increasing complexity of endeavors as military establishments form coalitions with each other, and partnerships with various civilian agencies and nongovernmental organizations;
• The rising importance of decentralized, net-enabled approaches to command and control;
• The data deluge—the unprecedented volume of raw and processed information with which human actors and C4ISR systems must contend.

All of these trends are stimulated by the rapid rise of social media, where data streams may ultimately become useful for command and control of military operations during crises. But it will not happen soon. In the meantime, many military analysts are conducting research that will give insight into how social networks can be exploited, especially during humanitarian assistance operations.

The Emergence of Proactive Humanitarian Assistance

To help frame and inform studies about the true value of humanitarian “soft power” missions in the future, the Center for Strategic and International Studies (CSIS) released a study in March 2013 of “U.S. Navy Humanitarian Assistance in an Era of Austerity.” Chaired by Admiral Gary Roughead (USN Ret.), formerly Chief of Naval Operations, the study discusses the emergence of proactive humanitarian assistance and the need for deeper civil-military integration. This will be a challenge unless the military has the cultural knowledge to know who to communicate with in humanitarian missions.

There are still major barriers to using social media for military operations when warfighters respond to crises:

• How can we “mine” social networks for theater operations in such a way that the data can be combined with traditional command and control tools (usually classified) for military operations?
• How can we use social networks for predictive analysis to help decision makers when there is such a considerable challenge in maximizing the “signal-to-noise ratio”?
• How can we combine data from both civilian and military command and control operations when the civilian sector currently defines command and control as horizontal “cooperation and collaboration”?

Until recently, most basic research has focused on developing technical solutions to automate the data mining process and to vet and validate the sources. But this is starting to change. Attempts to avoid massive “noise” in large data sets associated with social networks are beginning to move away from technical approaches to filter signals from noise in online social media. There is less emphasis on techniques such as keywords to filter or classify social network data into meaningful elements and more emphasis on introducing new methodologies to come to a conclusion about the importance, utility, and meaning of the data.

The Emergence of “Emergent Intelligence”

The Office of Naval Research (ONR) is sponsoring a program in social net-
works and computational social science that will be helpful in providing a structural approach to the incorporation of cultural knowledge in adaptive behavior models. Much of the research builds on dynamic network analysis combined with experimental game theory and has enabled a new class of strategic adaptive models to be built and validated. These models will be used largely to develop the basic science and its applications in social networking, social computing, computational social science, and other social sciences related to human security domains of military operations. ONR’s specific program goals are: 1) to improve understanding of human security domains through development of theory, models, and algorithms using novel information sources; 2) to develop new capabilities to monitor, analyze, visualize, and utilize human security relevant information sources for situation awareness, planning, mission monitoring, and execution.

CNA has also been looking for alternative methodologies to evaluate the impact of incorporating information from social media streams in humanitarian assistance operations. Analyses have shown that the Navy often lacks the regional cultural knowledge to know whom to communicate with in humanitarian assistance missions and must build working relationships with new groups of stakeholders and responders for each mission. Both problems require that the Navy quickly develop the cultural connections needed to conduct its mission, and the operational data shows that this process often takes too long. These observations suggest the Navy should explore the application of “emergent intelligence” approaches to let participants’ network use define the right groups of people to include in mission-critical communications.

CNA argues that current research on noncentralized social networks communications could be a starting point for a methodology to quickly identify the right people with whom to share information during humanitarian assistance missions.

Social media are changing the way information is diffused and decisions are made, especially for humanitarian assistance missions when there is increased emphasis on Navy commands to share critical information with other Navy command sites, government, and official nongovernmental organizations. As the community of interest grows during a crisis, it will be important to ensure that information is shared with appropriate organizations for different aspects of the mission such as evacuation procedures, hospital sites, location of seaports and airports, and other relevant topics. For example, in the first 14 days of the US Southern Command’s Haiti HA/DR mission, the community of interest grew to more than 1,900 users!

Operational conditions vary considerably among incidents, and coordination between different groups is often set up in an ad hoc manner. What is needed is a methodology that will help to find appropriate people with whom to share information for particular aspects of a mission during a wide range of events. CNA has developed such a methodology.

The Model
CNA’s model mimics the famous experiments of social psychologist Stanley Milgram, who provided the first empirical evidence of “six degrees of separation” when constructing paths from friend to friend as in a social network. Using a unique message addressing rule, the model takes an “emergent intelligence” approach that constructs social networks as events occur. It is an approach to intelligent agent-based computations that builds on behavioral models of animal colonies. These animal models show how colonies can detect and respond to unanticipated environmental changes without a centralized communication and control system. For example, the ant routing algorithm tells us that when an ant forages for food, it lays pheromones on a trail from source to destination. When it arrives at its destination, it returns to the source following the same path it came from. If other ants have travelled the same path, the pheromone level is lower. If every ant tries to choose the trail that has higher pheromone concentration, eventually the pheromones accumulate when multiple ants use the same path and evaporate when no ant passes.

Just as an ant leaves a chemical trace of its movement along a path, CNA’s simulated agent attaches traces of previous contacts by means of “digital pheromones” to each message that it sends. This is done by ensuring that all communicators along the path are kept informed of all previous communicators in the path. Suppose, for example, that “A,” “B,” and “C” are three communicators (nodes) in a social network. “A” starts a path on a particular topic by sending a message to “B.” “B,” in turn, decides to send a message to “C” on the same topic. Thus far, this is similar to the Milgram experiment, in which a “path” was created as a letter was forwarded from friend to friend until it reached a designated “target” in the network. However, in this case, the target “emerges” from the interaction of A, B, and C. Another major difference is that a simple message-addressing rule is used that asks each communi-
cator to “copy” all previous communicators on a topic when it chooses to send a message on that topic. This message-addressing rule achieves two major objectives:

- It guarantees that all nodes along the path are automatically kept informed of all previous communicators in the path on the topic. This provides the important feedback that socio-technologists have shown to be very important in the control of large-scale coordination during evolving operations.

- It avoids keywords by defining a topic through communication that represents a path in a social network. This provides a way to deal with changing topics and an uncertain organizational structure in an evolving crisis.

**Conclusion**

CNA has developed an approach to coordinate activities during humanitarian assistance missions as the military continues to see greater use of nonhierarchical communications for complex interactions. Collaboration with partners external to the military is expected to grow when conducting humanitarian missions. If a social network of trusted coordinators were established before a crisis occurred, military and civilian commanders would already have working relationships with each other and could plan humanitarian missions in advance. Deeper civil-military integration could be achieved using social media to exchange information and the right group of trusted collaborators would be pro-actively identified. Such an approach would assist in sustaining planned humanitarian assistance in an era of global austerity.

**About the Author**

Marjorie Greene is a research analyst at CNA. She has more than 25 years’ management experience in both government and commercial organizations and has recently specialized in finding S&T solutions for the US Marine Corps. She is active in both MORS and IEEE, where she serves on the Medical Technology Policy Committee and the Bioterrorism Working Group.