INFORMATION AND COMMUNICATION TECHNOLOGY FOR HUMANITARIAN ASSISTANCE/ DISASTER RELIEF WORKSHOP

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Introduction

The Information and Communication Technology for Humanitarian Assistance/Disaster Relief (HA/DR) Workshop was designed to provide a forum for HA/DR partners to hear about and discuss technology use in response to domestic and international disaster events. The Trauma, Health and Hazards Center (THHC) at the University of Colorado at Colorado Springs organized and hosted this event with generous support from the Office of Naval Research and private sponsorship from ESRI. The THHC, founded in 2000, is a multi-disciplinary research center dedicated to examining the effects of extreme events on human behavior and improving the lives of responders and survivors. The workshop was held May 25-26, 2011, at the Marriott in Colorado Springs, Colorado.

This workshop grew out of recognition that social media and “smart” technologies are transforming humanitarian assistance and disaster relief for disaster survivors, first responders, and the world at large. However, as technological solutions emerge, it also becomes clear that social relationships are critical in facilitating the exchange of information in relief and recovery efforts. Key questions surrounding the use of these new technologies for HA/DR purposes include the following:

- How can government partners, humanitarian organizations, and other entities productively and safely share information?
- What are the guidelines?
- What should information technologists know about creating tools for responders and affected communities?
- What should communities expect?
- What should communities demand?

This workshop was designed to discuss these questions using lessons learned from recent disaster responses and international virtual exercises. Workshop speakers highlighted information sharing issues including data collection and sharing, visual imagery, and coordination and collaboration between disparate organizations.

An organizing committee of subject matter experts from U.S. Northern Command, the U.S. Agency for International Development, academia, and the volunteer technical community selected workshop speakers. Attendance at the HA/DR workshop was by invitation only. Participants represented the U.S. government, non-governmental and international relief organizations, military communities, the private sector, and academia and had relevant knowledge or experience in disaster response and relief efforts using online technologies.

The workshop began on Wednesday, May 25, with introductions and a keynote talk followed by panels and breakout sessions. Extended lunch breaks included volunteered, five-minute talks from workshop participants, which furthered the knowledge exchange and focused on aspects of the use of information technology in HA/DR that were not represented in the structured talks. The workshop concluded mid-day on Thursday, May 26. Lodging and meals were provided at the Colorado Springs Marriott.
Session:
Keynote Address

Topic: Developing a Medical Common Operating Picture for Humanitarian Assistance and Disaster Relief Missions

Speaker: James Terbush, U.S. Navy

To kick off the conference, keynote speaker Captain James Terbush with the U.S. Navy spoke about the humanitarian response in Haiti, logistical challenges and successes, and lessons learned. Given the scope of the disaster, the number of human lives affected, and the multitude of organizations that rushed to respond, the coordination of aid—medical and otherwise—was a significant challenge.

Many U.S. Navy resources were able to reach the affected areas within 72 hours, including the aircraft carrier *USS Carl Vinson* and the medical ship *USNS Comfort*, which carried more than 1,000 medical care specialists on board. Nearly 10,000 patients received treatment on the Comfort.

At the same time, more than 1,000 non-governmental organizations were also engaged in response efforts. After the airport was opened, the priority became coordinating efforts of the thousands of volunteers with various levels of crisis response knowledge/expertise. In some cases, foreign militaries were offering their own relief efforts as well, and, not surprisingly, not all of them were known to the U.S. Navy, the United Nations, the Red Cross, or any of the other managing organizations.

Among the lessons learned from Haiti were the following:
- Respond quickly and effectively (logistics are key)
- Establish a joint taskforce
- Build partnerships with key players (in advance if possible)
- Support the lead federal agency
- Achieve unity of effort
- Establish and continuously reassess priorities
- Anticipate challenges with displaced persons

In addition, in regard to communications, lessons learned stressed the importance of pre-event messaging; situational awareness; a shared language (or translators); common terminology; virtual meeting rooms; familiar tactics, techniques, and procedures; shared communications; and practice.
Session:
Recent Humanitarian Assistance/Disaster Relief Events

Topic: Beyond Crowdsourcing for Humanitarian Assistance/Disaster Relief
Speakers: Shamanth Kumar and Huiji Gao, Arizona State University Data Mining and Machine Learning Lab

Shamanth Kumar from the Data Mining and Machine Learning Lab at Arizona State University (ASU) discussed the use and challenges of crowdsourcing and social media in humanitarian aid and disaster relief (HADR) efforts and the related work being done at ASU. Notably, crowdsourcing leverages participatory social media services and tools to collect information, allows capable crowds to participate in a variety of HA/DR tasks, and can be a powerful tool in HA/DR efforts when integrated with crisis mapping.

For individuals, social media and crowdsourcing can be used to get early warning of disasters, locate shelters, medical resources, and missing people; get in touch with officials and relief workers; and get information about relief work progress. Agencies can use them to get situation awareness from citizen reporters, establish a coordination platform, send updates on progress of relief work, discredit rumors, and get feedback from the public.

Some of the challenges with current crowdsourcing systems are that information is massive and it can be noisy in social media. Information can come from a multitude of unfamiliar social media sources that cannot be verified, and it’s not easy to sift through it all, which hampers situational awareness and the associated response. Ultimately, all this information needs to be filtered, visualized, and analyzed to influence decision making. ASU is building crowdsourcing systems to address some of these challenges that will also improve coordination among relief agencies.

Huiji Gao, also from ASU’s Data Mining and Machine Learning Lab, demonstrated three tools that the lab is developing:

- The ASU Coordination Tracker (ACT) aims to enhance the coordination among different organizations for disaster relief.
- BlogTracker collects crowdsourced data from blogs. By analyzing the blogs’ content, it obtains feedback and situational awareness. It is used as an evaluation tool to measure the relief efforts of ACT or other coordination systems.
- TweetTracker is similar to BlogTracker, but it collects crowdsourced information from tweets in real time. It is used as an external crowdsourced database for ACT.

Social Media and Networked Political Activisms in Egypt and Beyond

Speaker: Merlyna Lim, Arizona State University

Merlyna Lim from Arizona State University spoke about her work on how humans have used social media during popular protests. Lim’s talk focused on how social media served as a catalyst for the recent uprising in Egypt that led to the removal of President Hosni Mubarak.

In this example, social media was the tool that provided the “space” for the establishment of human agency and the expansion of social networks for collective action. This facilitated:
• The sustaining of existing and the development of new social networks for the opposition of the Mubarak regime,
• Connecting various networks that previously were not associated,
• Uniting distinct groups with common issues and not isolating them for their separate ideology,
• Globalization of the movement, and
• A dialog that questioned the traditional authority/governance.

Activists had to navigate the use of social media to ensure that the movement was about the “right” issues and shared contentions among the united networks. This involved:
• Transforming complex and abstract narratives and framing them to become more tangible narratives,
• Identifying symbolic representation to strengthen narratives, and
• Connecting the online correspondence to what happens offline.

Lim also noted that social media was successful in Egypt in part because it attracted very youthful participation in the movement because of the “cool” factor, and it easily expanded through peer pressure.

**Topic: Watch Making: A Toolkit for Understanding Online Communities and Collective Action**

**Speaker: Sina Mossayeb, Navanti Group**

Sina Mossayeb from the Navanti Group gave a presentation on using online communities to counter violent extremism and radicalization, applying the ideas of social movements to social media. Mossayeb broke down the analysis of social movements into three key elements:
• Episodes – specific types of movement
• Processes – the dynamics of the movement evolved and where the breakdown occurs
• Mechanisms – the key elements of movements (environmental, cognitive, and relational)

In a social movement, free space is very important because it allows protestors to take to the streets, mobilization to happen, and freedom for people to do what they want (at least until the police show up). The virtual environment that social media promotes is virtual free space, as it provides a fairly safe area for protestors to operate without being subjected to brutality and legitimacy for a movement.

The Navanti Group wants to create online communities as a safe alternative to radical extremism. A successful online community must create a level of trust with the end users, be authentic, create a safe space with a sense of connection where everyone is respected, create a sense of purpose, and empower users, enabling them to take ownership.

Collective interaction with all groups must be part of the online community that includes activists, sympathizers, observers, indifferents, and hostiles. A successful online community will bring empowerment to the entire crowd. In creating a social movement, worthiness, unity, numbers, and community must be instilled.

Mossayeb concluded by asking the audience to think about a question: In addition to responding to crises, how can we step back and create a community now that can respond to certain challenges?
Session:
Combatant Commands

Topic: Leveraging the Power of the Web to Help Save Lives

Speaker: Ed Buclatin, U.S. European Command

Ed Buclatin, the public affairs officer for U.S. European Command (EUCOM), focused on the end-user perspective of humanitarian assistance and disaster relief (HA/DR) through a discussion of Exercise24 (X24) Europe, a five-day exercise organized by EUCOM that took place in March 2011. The focus of the exercise was on social media, crowdsourcing, and collaboration, and it generated significant interest from the military about what data can be harvested from social media. Buclatin shared the procedures used by public affairs personnel, lessons learned, successes, and future plans for action.

X24 was EUCOM’s first-ever unclassified information sharing exercise. It brought unclassified information access to a military base—a very difficult and very rare feat—and simultaneously worked with non-traditional partners. Participants used Google Apps, a very low-cost way to communicate, for data access, implementation, and execution and were aided by the efforts of a cadre of international volunteers. The planned execution was done in six months, roughly half the time the military usually allots for an exercise, and had very limited funding. And, it was found to be very effective.

Direct results from X24 include a tasking for EUCOM to create tools that monitor and analyze social media for HA/DR that will be useful to foster a steady-state model in the United States. EUCOM also built important functional relationships with crisis response communities that they plan on nurturing and utilizing in the future.

Questions about the legalities of sharing classified and unclassified information between partners was one of the key challenges encountered during the exercise. Access to imagery data was also identified as a key issue: everyone wants it but not everyone has it. The greatest challenge for EUCOM centers on steady-state data mining and who in the United States can effectively facilitate or guide EUCOM’s focus and procedures for data mining to take action more effectively. Yet another challenge is determining the role the U.S. Department of Defense can play in global cyberspace HA/DR.

Topic: Building an Unclassified Event/User Defined Operational Picture (E/UDP); Leveraging the Cloud and Social Networks (i.e., Crowdsourcing the E/UDOP)

Speaker: Gary Koch, U.S. Northern Command

Gary Koch from U.S. Northern Command (NORTHCOM) talked about the processes used to build unclassified event/user defined operational pictures. He defined two major foci for NORTHCOM: homeland defense and civil support. While homeland defense is the top priority,
civil support has become a common activity given NORTHCOM’s role in assisting with planned special events and responding to unplanned events and disasters. Koch emphasized that NORTHCOM is not a law enforcement agency and does not create policy or allocate resources.

Koch’s vision is to see the military apply its planning and coordination techniques to information operations in humanitarian assistance/disaster relief situations and to “wage peace” by translating data to help people in need. It’s important to “sense” the information and get it out as quickly as possible to those who can act on it. At the same time, it’s important to understand social, economic, and cultural networks.

Using geospatial tools that allow the collection and dissemination of information on an unclassified cloud with the goal of building knowledge and understanding, as well as relationships, are key. Koch noted that intelligence and operations working simultaneously at the same speed are also vital. Dovetailing with this issue is the current U.S. Department of Defense perspective on soft technology, which needs to be altered from rejection to acceptance to take advantage of the data it provides.

Another priority is partnering and creating working relationships based on trust. To do this, there needs to be changes in data sharing standards to allow partners to more easily share/provide and access necessary information. Koch stresses relationships between individuals as the forum to eventually turn these visions into reality.

**Topic: U.S. Northern Command: Situational Awareness Geospatial Enterprise 101**

**Speaker: Chris Mayfield, U.S. Northern Command**

Chris Mayfield from U.S. Northern Command (NORTHCOM) spoke about Situational Awareness Geospatial Enterprise (SAGE), a geospatial program that allows any NORTHCOM mission partner access to unclassified data. This data includes geospatial data; location data that tracks military and people helping military missions; Homeland Security Infrastructure Protection data, which consolidates critical infrastructure data; mission-specific geospatial data; and more.

Out of SAGE’s current 2,826 users, the National Guard makes up the largest group. However, non-governmental organizations and national labs use SAGE as well. Access to all unclassified SAGE data is limited to federal agencies as well as partners working with NORTHCOM on major missions. Non-federal partners can view the data but do not have full access.

Issues and challenges for NORTHCOM in regard to data sharing include the Posse Comitatus Act, tracking the location of forces (federal forces and/or mission partners), strict procedural rules that do not account for what is really going on, and trusting and vetting on-the-ground information. Because federal agencies are slow to accept crowdsourcing and data mining of social media, NORTHCOM intelligence comes from news networks, after the fact. How can NORTHCOM help first responders if NORTHCOM does not even know what first responders know?
Mayfield cited the Nielsen rule, noting that 90 percent of people who look at websites just look, 9 percent contribute a little, and 1 percent contribute everything. To make this process easier and receive vital feedback, the trick is to interact with users and allow them to easily respond to the data you provide. Another goal is to help federal agencies synchronize their data and work together to streamline humanitarian assistance/disaster relief efforts in the future.
Session:
Technical Challenges in Information Sharing: Multiple Perspectives

Topic: Role of Data Aggregation and Verification in Crisis Response

Speaker: Jon Gosier, Appfrica
Jon Gosier from Appfrica spoke on behalf of Swift River and Ushahidi about the role of data aggregation and verification in crisis response. In a crisis scenario, real-time information is very important, and it is crucial that it is not used in a way that will jeopardize response efforts.

Swift River utilizes concepts and constructs to filter data for specific user groups. These constructs include both temporal and geospatial indicators that help add context to real-time data. The Swift River platform is built on the premise of “simplicity” to ensure accessibility and user-friendliness. The platform provides geolocation, translation on the fly, and information aggregation to put real-time crisis data into context. The modular nature of the Swift River platform allows different user groups to customize their visualizations on the platform.

Current research problems in Swift River include location disambiguation, collection of unique datasets and place names, natural language processing, and human behavior, such as user expectations and application of Swift River tools.

Topic: Rapid Ethnography

Speaker: Kathleen Carley, Carnegie Mellon University
Kathleen Carley, a professor at Carnegie Mellon University, introduced the concept of “rapid ethnography.” Rapid ethnography uses technology to enable anthropologists and ethnographers to do their work in a matter of minutes rather than over a number of years, which it usually takes. It involves turning written information about human relations and locations in time into networked data, which can be plotted and simulated on maps to show the progression and complexity of a crisis.

Rapid ethnography can be significant to humanitarian assistance and disaster relief (HA/DR) operations during the recovery and reconstruction period after a crisis or disaster. It can also be used to predict elements of a crisis (e.g., the emergence of leaders, key actors, and issues). A relationship has been detected between the increase of complexity within a network and the emergence of conflict; this is currently being investigated further.

The core challenges faced in a crisis scenario include how to form the network data in a way that it will connect the dots to explain and predict behavior, as well as assessing that data in a time-sensitive situation. Future steps for rapid ethnography include linking this technique to other kinds of HA/DR data.
Topic: Modelers’ Perspective on Humanitarian Assistance and Disaster Relief Technology Challenges and Information Sharing: Representing East Africa with the MASON RiftLand Agent-Based Model

Speaker: Claudio Cioffi-Revilla, George Mason University

Claudio Cioffi-Revilla from George Mason University spoke about the important challenges concerning Humanitarian Assistance and Disaster Relief (HA/DR) technology and information sharing using the MASON RiftLand model as an example. RiftLand is an agent-based simulation model that captures the complexity of East Africa in a scale that has never been used before. The model covers an area of 2.56 million km² with a population of 120 million. It integrates layers of data from the natural and biophysical environment, human and social relations, and human-engineered systems to analyze and understand complex scenarios.

The model is based on MASON, which is a simulation toolkit, basically a Java library, which is free and open source. Cioffi-Revilla and his partners have added a fairly extensive set of GIS tools to MASON. This set of tools, called GeoMASON, allows the implementation of a variety of features of the model that did not previously exist.

GeoMASON enables users to work with multiple datasets, and a simplified ontology includes natural, social, and built environment components, which include communications media. This is run within a high performance JAVA agent-based simulation platform, where the agents are heuristic (they learn and adapt their behavior).

Among the challenges are the size of the population involved, the ecosystem diversity of East Africa, the availability of acceptable social science, and the tight coupling between the natural, social, and built environments. In conclusion, Cioffi-Revilla noted that RiftLand is an example of a model that can represent a new frontier in computational social science. It combines both basic science and applied science and will allow the analysis of a new generation of scenarios that have been intractable because of the complexity of the issues. Communications media are a very important part of the modeling exercise, and more research is being done in this area.

Topic: The Interface of Domestic Animals and People in Disaster

Speaker: Kenneth Nusbaum, Auburn University

Kenneth Nusbaum from Auburn University spoke about the issue of foreign animal disease and the economy, using the concepts of One Health, the idea that human and animal medicines are closely linked, and strategic public health, to frame the discussion. He discussed courses for military personnel serving overseas and used the April 2011 Alabama tornado as a case study for the connection between domestic animals, humanitarian assistance and disaster relief (HA/DR) issues, and economic implications of disasters (in terms of structures and systems).

The Alabama tornado caused over three-million bird deaths and severe losses to the infrastructure of the poultry industry in an economy where 82 percent of agricultural income relies on broiler chickens. In addition to the economic impact, another problem caused by the bird deaths was the potential hazards to public health resulting from the disposal of the
carcasses, which was exacerbated by the level of health care available to the typical poultry worker.

Using force protection to prevent trauma and increase personal safety in a post-disaster situation can be difficult. In Alabama, establishing authority over the area was difficult due to poor communication, cultural attitudes, and the limited bandwidth typically available in rural areas, and chicken producers were often resistant to sharing their information, which impacted the use of GIS. New strategies for improved communication across jurisdictions will improve the handling of domestic animals in HA/DR situations such as the Alabama tornado.

**Topic: U.S. Government Technical Challenges in Information Sharing**

**Speaker: Paul Bartel, U.S. Department of State Humanitarian Information Unit**

Paul Bartel, representing the U.S. Department of State Humanitarian Information Unit, discussed government technical challenges in information sharing between civilian and government actors. Primary to these challenges is the increased number of actors that operate outside of the government, other government agencies, regional agencies, regional government organizations, and intergovernmental organizations, all communicating and collaborating using the Internet.

Many of the challenges arise from this increased number of actors and their diversity. These challenges include technical capabilities, specifically as they relate to security, connectivity, and access to and use of communications tools (e.g., PowerPoint, Web 2.0, paper). It is important to understand how information is absorbed by the actors involved.

Situational awareness is a necessity for all decision making in a humanitarian crisis. This includes transforming raw data into information and then into knowledge and then getting someone to act on that knowledge. Access to data is imperative for developing solutions, but this data must be accurate, reliable, up-to-date, shareable, and interoperable. Once the data is transformed, it is important to understand which technologies to use to facilitate the decision making.

Highlighting a best practice, Bartel introduced a process used in Africa called Global Dialogues on Emerging Science and Technology, which involves building on existing mapping capacity and initiatives. Specifically, it involves working with partners from government, academia, and non-governmental organizations to take imagery and voluntary and expert-derived data to create baseline data sources and build them up to an agreed upon standard. The key point for data acquisition relies on collaboration and reciprocal relationship, demonstrating the links between the “Whole of World” and the “Whole of Government” for disaster relief.

Bartel concluded that the world is increasingly interconnected in terms of requirements, expertise, and capabilities, and the problem set and actor network really drive the data and technological requirements. In addition he stressed how the new approaches, particularly in terms of social media utilization, engage and empower a much wider set of actors.
Session:
Humanitarian Assistance/Disaster Relief Breakout Sessions on Information Sharing

On the first day of the workshop, a breakout session was held that focused on information sharing between disparate organizations during humanitarian assistance and disaster relief (HA/DR) events. Participants in each of the breakout groups expressed a desire to foster a culture of information sharing and raised a number of barriers and related questions that must be addressed to facilitate information sharing. These questions included the following:

- What information is needed during a crisis?
- What organizations maintain this information?
- What data sharing policies need to be developed?
- What relationships and memorandums of understanding need to be established prior to an event?

Participants explained that emerging technologies such as social media and crisis mapping can facilitate rapid data collection and information sharing, which in turn may improve HA/DR. But, the ability to use and share tools, information, and analytic capabilities is hampered by several factors, including legal and policy issues (e.g., out-of-date policies, lack of data sharing agreements, data ownership and licensing issues, and liability concerns), privacy, risk aversion, security, misuse of information, cost to collect and share data, profit motives, organizational cultures, and need for trusted partnerships.

Participants explored these barriers within the context of real-time information access and planning and decision making, raising questions for the future and suggesting best practices and ethical guidelines.

Real-Time Data Sharing
Real time data sharing is recognized as valuable for all organizations involved in humanitarian aid and disaster response. However, as one participant noted, the United Nations is but one organization that is cautious about adding individuals outside of their organization to distribution lists. Another participant provided an example of data secrecy when he described how the planned departure times for key response capacities are often kept secret even though resource departures will affect all response agencies. He shared how information about the departure of USS Comfort from Port au Prince, Haiti, was tightly guarded. Non-governmental field hospitals were equally secretive when they packed up.

Planning and Decision Making
Legal and Policy Issues
Data ownership, licensing, terms of use, and liability are not fully understood, and legal concerns can impede the use of critical data and imagery during a crisis. For example, many
partners in the HA/DR community lack awareness about data access policies that may restrict access to high-resolution imagery.

**Privacy**

Privacy and data sovereignty is another aspect that needs to be considered during a crisis. One participant cautioned against sharing data that would allow people to be tracked if it might put them in harm’s way. Another countered that in Haiti the telecommunications companies tracked the locations of cell phones and were able to determine to which communities people had fled. This had important implications for the provision of housing and services. Medical information and information about missing persons may also require privacy protections, raising questions about the applicability of policies such as the Health Information Privacy Protection Act (HIPPA) in international contexts.

Participants agreed that solutions to problems about data privacy will require informing users, providing individual control, establishing legal frameworks for protecting rights, and adopting standards. Standards can provide different ways for information to be shared such as open data, anonymized data, trusted networks, and individual-to-individual permission.

**Risk Aversion, Security, and Misuse of Information**

Some participants raised concerns about security and the potential misuse and abuse of information. One participant commented that information sharing presents potential risks to the individual who contributes information, to the organization that acts on or shares the information, and to the general public who responds to the information. Knowing the source of the data is important for determining the validity of the data, the participant noted, but in some cases, revealing a source’s identity can put his safety at risk.

It was agreed that the environment in which relief workers operate—peaceful, war-torn, criminal (kidnapping, looting, etc.)—affects how information is shared. For example, different rules may apply when sharing information in a hostile environment.

The following questions were also raised:

- How do we limit misinterpretation of the data and the spread of misinformation?
- How do we evaluate the validity of the data or the trustworthiness of the information provider?
- Who can have access to what data or subsets of data, and how is that determined?
- What approach is needed for handling sensitive unclassified information (e.g., when forces are leaving)?

A number of questions about data accuracy were also raised:

- At what phases of a mission is 70-80 percent accuracy sufficient?
- How might risks be mitigated without total loss of access?
- Where is the appropriate balance between “waiting for truth” and “taking necessary action” when time is of the essence?
Some participants suggested that responding agencies might need to move from 100 percent accurate and secure information to “mission-based risk assessments,” while others reiterated the importance of building trusted communities. One person remarked that when working in trusted communities for humanitarian response, the question should be “what do I not share” rather than “what do I share.”

Cost
A few participants discussed the high cost of collecting and maintaining data and advocated for receiving compensation for sharing it. One person pointed out that attempting to recoup these costs could have serious negative consequences, possibly impeding the effectiveness and timeliness of a response. He cited a situation in which a state emergency manager had to pay a high fee and sign a license agreement without his corporate counsel present to obtain publicly funded parcel data and imagery from a local government in the immediate aftermath of a tornado.

One participant suggested that resistance to sharing information might be overcome by clearly demonstrating the value proposition through documented case studies of the benefit and opportunity costs. Others underscored the need for reciprocity with data sharing, which may work best in smaller self-policed distributed networks.

Organizational Cultures and the Need for Trusted Partnerships
Participants commented on the difficulty of maintaining trusted networks given the high turnover of humanitarian aid workers, responders, and volunteers during a crisis. The military has “relief in place” passdown procedures so when someone steps down the next person can pick up where the other left off. For non-governmental organizations and others, however, the hand off to incoming volunteers may not be very robust. Such lack of continuity affects the willingness and ability to maintain contacts for information sharing.

Participants also discussed the role and functionality of the All Partners Access Network (APAN https://community.apan.org), which facilitates the sharing of unclassified data within the U.S. Department of Defense. Participants noted that APAN is not widely accepted and raised questions about linking APAN and United Nations’ (UN) systems. (Currently, policy and technology barriers prevent this possibility from being a true solution). Others suggested the need for an information sharing “free zone”—outside the boundaries of companies and the military—to share data and information.

Best Practices and Ethical Guidelines
Participants asked how they might come up with useful guidelines for HA/DR information sharing when events and their responses differ so significantly (i.e., conflict event versus natural disaster). Several participants emphasized that volunteer and technical communities need to be responsible, reliable, and consistent in order to gain the trust of traditional humanitarian organizations. One participant cautioned that while collecting information from affected communities through crowdsourcing may allow for more rapid data collection and situational
assessment, the ethical practices, controls, and restrictions typically imposed by formal systems may not be in place. Because of the lack of norms and cultural sensitivity for appropriate sharing in larger informal information networks, there is potential for harm as well as good. These groups, another stated, need to foster a culture of ethical information sharing. To this end, training may be needed on international practices and standards, treaties, and laws that impact actions and behavior.

One participant suggested that responding volunteer technical communities adhere to four humanitarian principals: autonomy, neutrality, humanity, and operational independence (http://ochanet.unocha.org/p/Documents/OOM_HumPrinciple_English.pdf). In addition, the global network of participatory mapping (http://ppgis.net/) offers resources that address local knowledge and data ownership as well as ethical best practices for data collection in local communities. Some volunteer and technical communities also require members to adhere to a code of ethics (e.g., GIS Corps’ Code: http://www.giscorps.org/index.php?option=com_content&task=view&id=63&Itemid=70).

When evaluating a situation, a participant noted, the UN Office for the Coordination of Humanitarian Affairs considers the conditions (hostile or not), data use (potential for harm), impact (will lives be lost), and organizational issues (legal and financial constraints). In essence, is the information coming in neutral and impartial? Is the information going out the door going to cause harm or negatively impact operational independence? Is it the humane thing to do? A participant in the military, however, countered that these humanitarian principles do not protect the soldier, sailor, or marine if he or she shares information inappropriately or in a manner that puts him or others in danger.

Another commented that technology provides a new ethical space that will require the development of ways to control bad behavior. What are the sorts of things we can do to protect people and allow for selected transparency and authenticity? This participant also noted that selective transparency is critical and that users need to be authentic about what information they do share in order to develop trust.
Session:
Volunteer Technical Community

Panel Chair: Heather Blanchard (Crisis Commons)

Panelists:

- Willow Brugh (Geeks without Bounds)
- Christine Thompson (Humanity Road)
- Jen Ziemke (CrisisMappers)
- Shoreh Elhami (Urban and Regional Information Systems Association’s GIS Corps)

Led by Heather Blanchard from Crisis Commons, this panel explored the role of technology volunteers in disaster relief, how they've been collaborating with other technical communities, and how these collaborations can be better facilitated. Blanchard asked each of the panelists to introduce themselves and their role within the volunteer technical community and then asked them to relay their experiences with technology volunteers, how they think the role will evolve in the next two years, and the challenges and opportunities they present.

Among the takeaways, good communication is a vital part of successful operations and is important before during and after all operations. Using new forms of communication such as social networking and mobile devices has proven to be both a challenge and a learning opportunity for traditional first responders. The opportunity to use local crowdsourcing for information is always available, but the biggest challenge is to separate the signal from the noise in these situations.

In addition, trust is critical. Volunteer organizations need to be able to build a level of trust so that other organizations are willing to work with them. Multiple types of trust were discussed, and it was noted that telling the truth and keeping a secret are two completely different concepts.

The subject of trust led to a brief discussion on tasking, in which trust and communication play key roles. Communicating the situation to everyone and updating and maintaining information can be a very powerful tool in a crisis, but this information must be coming from a trustworthy source.

Blanchard also asked the panelists how they collaborate internally and externally. Internal collaboration is usually done in the cloud. Working in an open space and having transparency to build a trusting relationship make it easier for some organizations to collaborate externally. External collaboration is not always easy. Stereotypes and preconceived notions are some of the toughest barriers to overcome for external collaboration. At this time, documentation is the most used tool for passing knowledge around an organization.
Session:
Optimizing Collection, Distribution and Use

Topic: The Importance of Information Sharing and Collaboration Between NGOs and the Military: A Case Study from Afghanistan

Speaker: Dave Warner, MindTel
Dave Warner from MindTel used a 2006 Jalalabad, Afghanistan, case study to illustrate the importance of information sharing and collaboration between and among non-governmental organizations and the military (and governments) for the purposes of situational awareness and stability operations. In this instance, no one was sharing information, and those that were willing to share had no means of distributing information, and there was a lack of imagery.

In response to these challenges, a plan for improving communication was developed. The plan involved getting people together once a week to get them to socialize and, in the process, share information. Additionally, sharing data was facilitated by rewarding those who shared unclassified information. It really came down to relationship building. The types of data collected included field data about villages and polling sites (imaging of polling sites later allowed for election monitoring in real-time) and micro-hydropower information (which revealed a lot of micro-hydropower potential), etc.

The problem of lack of imagery was solved by bringing in external imagery and using overhead pictures to do assessments. Cameras with the ability to capture 360 degree pictures and live videos were also used. This allowed for the capture of more information that could be shared with others as needed.

There are many things one can do with imagery. In this case study, imagery provided the ability to see camps to determine the number of resources needed as well as the ability to see the location of water, flooding, and erosion sites. Imagery was also used for public health purposes. In Afghanistan, in order to get medical resources, you have to prove the presence of a population. Imagery allows for sharing information with the Health Ministry to prove the need for resources.

Topic: Disaster Response 2.0: The Future of Information Sharing in Humanitarian Operations

Speaker: John Crowley, Harvard Humanitarian Initiative
John Crowley, from the Harvard Humanitarian Initiative (HHI), presented research on imagery and information sharing in humanitarian operations, focusing on a number of recent humanitarian and conflict events. He explained that in the Haiti crisis, imagery and other datasets were made available within a short period of time, and geospatial experts became the
primary contacts for information about what was going on as they mapped refugee camps and response efforts.

A number of major problems emerged over the course of this humanitarian response. Metadata (characteristics of datasets) could not be released due to policies. There was no script to automate and map the collection of images; single images were individually mapped, which required extensive human resources. Coverage was also a problem. And, Haiti was not well-mapped.

This latter problem was addressed by using OpenStreetMap (OSM) processes to map the country, which enabled analysis of open source imagery data. OSM volunteers downloaded the map onto mobile devices or printed it out so they could navigate in the field and locate additional data points. There were 640 mappers who made 1.4 million edits in two and a half weeks, mapping parts of the country for which there was no available imagery. Crowley suggested that this is the first known application of crowdsourcing at this level to map a country.

Other responses stand in contrast to the successes in Haiti. In Pakistan, data and imagery were not available to volunteers, and OSM had no workgroup capability and no security, so volunteers were not able to respond in conflict-ridden areas. In Libya, crisis mapping was used for social media networking to provide information to the United Nations, but, unlike in Haiti, the lag time was too long. In Banda Aceh, imagery had no problem reaching Djakarta and regional centers, but getting it into the theater was a major issue. And, in Sudan, where open source intelligence was used to provide evidence of human destruction (via the Satellite Sentinel Project), a number of challenges emerged, including issues related to verification, the diaspora, cybersecurity, and a lack of sustainable and reliable operations.

These challenges and more are discussed in the Disaster Response 2.0 report, which also notes the need for a neutral space for the volunteers, militaries, governments, and non-governmental organizations to work out the issues that emerge in mapping and imagery and find ways to move forward. Players will need to include people in the field who understand the traditional system and can bring it together with the new technology and an academic consortium to understand how information is being monitored and evaluated and document lessons learned for future crises.

**Topic: “Imagery” in Context of Expectations for Humanitarian Assistance and Disaster Recovery**

**Speaker: Eric Frost, San Diego State University Visualization Center**

Eric Frost, director of the Visualization Center at San Diego State University, presented recent lessons learned on imagery access and sharing in humanitarian assistance and disaster relief (HA/DR) events and talked about what it could look like in the future. He explained that the new paradigm is using the cloud to share information across government, non-governmental organizations, and emergent or trained volunteers while combining imagery, GIS, and governance.
Frost noted that making the imagery usable is the biggest challenge for HA/DR efforts. OpenStreetMap can be converted to other data files to facilitate sharing and/or distribution. Individual pieces of imagery can also be fit together to create complete maps.

Access to imagery is also a challenge, and Frost discussed relationship building for imagery sharing as one key to successful data access. For example, on Facebook, “friends” are already helping “friends” in disaster. This strategy should be applied to HA/DR responses. That is, an HA/DR “Facebook” could be created that facilitates the global sharing of accurate imagery, information, and solutions, fostering usable relationships. A number of tools have already been created to share imagery, including the Global Fire Information Management System, Spatial Analysis for Emergency Risk, and U.S. Northern Command’s Situational Awareness Geospatial Enterprise.

**Topic: Imagery Rules!**

**Speaker: Chris Mayfield, U.S. Northern Command**
Chris Mayfield from the U.S. Northern Command (NORTHCOMM) spoke about the basics of NORTHCOMM imagery distribution and access, noting that homeland security rules and regulations dictate what can and cannot be accessed (there is more leeway overseas than at home).

The current NORTHCOMM rules for imagery access and distribution are as follows:

- Federal and non-governmental mission partners (e.g., Red Cross, humanitarian agencies, etc.) have full access to unclassified raster library sets.
- State emergency management and National Guard forces can view almost any imagery collection, but no transfer of imagery is allowed unless it is part of a NORTHCOMM mission.
- Ad-hoc requests are handled on a case-by-case basis (these requests are rare).
Session:
Ignite Talks

Speakers:
- Jeff Baranyi, ESRI
- Christine Thompson, Humanity Road, Inc.
- Bruce Skarin, Aptima, Inc.
- Marty Chamberlain, Office of Naval Research
- Kathleen Miner/Peter Natiello, U.S. Agency for International Development Office of Foreign Disaster Assistance
- Suzanne Frew, The Frew Group

Ignite sessions were held at the conclusion of each lunch hour during the two-day Humanitarian Assistance and Disaster Relief (HA/DR) Workshop. These sessions were designed to allow attendees to hear five-minute talks from their colleagues and to introduce concepts or topics that were not included on the workshop agenda. In total, there were six ignite presentations, which represented a variety of perspectives and sectors.

Topic: GIS Tools and Resources for Disaster Response

Speaker: Jeff Baranyi, ESRI
Baranyi spoke about ESRI’s disaster response program that supports organizational technology users during a crisis. This support includes helping users with things such as data management, damage assessment, situational awareness, and fire spread predictions (for wildfires). Recently, ESRI turned to social media and crisis mapping as information sources. Baranyi noted a trend toward volunteered geographic information, which allows collective intelligence through individual users of GIS and is being picked up by governments. In addition, a broader range of operators are now able to contribute and use geographic information. ESRI actively supports open standards and has created products that are open source. In regard to its HA/DR efforts, ESRI aims to support and learn from the community, provide support during disasters, and evolve tools and templates for community use.

Topic: Social Media In Disaster: Communicating in Catastrophic Conditions

Speaker: Christine Thompson, Humanity Road, Inc.
Thompson discussed how social media is being used every day to help people connect with other people and communicate with them during disaster, reminding the audience that sometimes it’s not about collecting information; sometimes it’s just about providing immediate assistance. She used an example from an earthquake in Turkey to demonstrate how social media (e.g., text messages and tweets) can be used to communicate about and with missing loved ones.
**Topic: Aptima Research in Humanitarian Assistance and Disaster Relief**

**Speaker: Bruce Skarin, Aptima, Inc.**

Skarin spoke about three ongoing HA/DR projects that Aptima is working on:
- Epidemiological Modeling of the Evolution of Messages (E-MEME)—The purpose of E-MEME is to measure the flow of ideas and then model that information to predict possible social changes in certain situations.
- ADEPT—The goal of ADEPT is to construct and utilize social networks on the local level, empowering people to take control of their situation through the implementation of social media.
- Collaborative Assistance and Rapid Team Optimization System (CARTOS)—CARTOS looks at teams and aims to develop tools to capture the spread of ideas and model possible outcomes.

**Topic: Naval HA/DR Sense and Respond Fiscal Year 14 Future Naval Capabilities (Enabling Capability) Candidate**

**Speaker: Marty Chamberlain, Office of Naval Research**

Chamberlain presented an overview of the Office of Naval Research’s (ONR) Future Naval Capabilities Program, a funding source within ONR that will bring new capabilities to the U.S. Navy, Marine Corps, and Coast Guard. Key factors include technology transition, provision of value-added to naval forces, and combatant commander advocacy. The four focus areas are mining cybernetworks for HA/DR logistics response, creating live virtual constructive environments for the preparation of naval first responders, providing naval opportune lift to get supplies/equipment into a theater quicker and more cost-effectively with a transportation exploitation tool, and creating the ability to quicken the delivery of supplies and equipment to responding naval forces.

**Topic: USAID Haiti Habitability Assessment**

**Speakers: Kathleen Miner and Peter Natiello, U.S. Agency for International Development (USAID) Office of Foreign Disaster Assistance**

Miner and Natiello presented an overview of a USAID-funded project in Haiti that used technology to assist data collection efforts on the ground. In order to get people out of the camps, three key questions needed answered: How many buildings were destroyed, how much rubble needed to be removed, and where should the rebuilding happen, in the rubble pile or somewhere new? To help answer these questions, the decision was made to do a habitability assessment. The data, which represented roughly 400,000 structures, was collected by local engineers and uploaded to an electronic database and was analyzed to support rubble removal and repair and reconstruction.

**Topic: Moving the Conversation**

**Speaker: Suzanne Frew, The Frew Group**

Frew talked about moving the lessons of the workshop from conversation to practice. She offered thoughts on how to focus on the individual details of HA/DR issues, the big picture, and
how to disseminate that picture to the general public. She raised questions about empowerment of the local community and disenfranchised people who are affected by disaster; how the HA/DR model can become a model of collaboration for future responses; when to bring this model of collaboration to disaster response; and why this should be done. She suggested that moving forward, we need to mainstream, sustain ongoing efforts, integrate and share information (break the silos), and be flexible and prepared to address new and unforeseen issues as they arise.
Session:  
Key Issues for the Future

Participants at the Information and Communication Technology for Humanitarian Assistance/Disaster Relief (HA/DR) Workshop were asked to provide their thoughts on key issues for the future in three areas: research, policy, and technology. Most participants self-selected into two discussion groups to identify issues collaboratively, some chose to answer independently and submitted a short write-up prior to departing the conference. Participants focused on the two overarching but related issues of information sharing and coordination among HA/DR response organizations, emphasizing strategies and processes to integrate communication across technologies and between disparate organizations from the defense, public, and private sectors and volunteer communities. The results from these discussions and write-ups are presented here.

Research
Future research needs were spread across two primary domains: social science research needs and information science. Social science research focuses largely on human behaviors in relation to HA/DR efforts. Information science research focuses primarily on issues related to establishing trusted relationships and processes for information sharing. Research questions posed by the participants include the following:

- How can we make use of social networking for early warning versus response?
- What are the social and institutional processes in place at the intersection of information and communication technology and economic, political, and legal structures and how does information and communication technology influence the behavior of the overall system?
- Drawing from existing research, can we identify future spatial-temporal information needs and prepare for those needs prior to disaster?
- What is the expected effectiveness of prepositioning supplies and equipment in locations near where disasters are likely?
- Where are the gaps in policy and technology for HA/DR and information sharing?
- What are the key factors that need to be considered in terms of information sharing (i.e., the security environment, perishable information, etc.)?
- Under what conditions is accuracy of information most important? When does the risk of sharing unverified information outweigh the benefits?
- How can continuous collaboration occur between different sectors and groups who are responding to HA/DR events?
- What can be learned from investigators in the fields of social network analysis, epidemiological studies, and computer science that can inform HA/DR response efforts?
- What can be done to establish both data/information security and trusted relationships within the flow of information during an HA/DR response.
- How can data (especially SMS and micro-blog posts) be assessed and validated for quality and reliability in real time?
- What humanitarian aid security issues must be taken into consideration when designing information flow systems?
Policy
Policy issues spanned three general areas: organizational policies for information coordination, sharing, and access; information policies for data acquisition, archiving, and release; and technology policy for technology use, standards, and management. Workshop participants noted the following needs for more effective response to future HA/DR events.

Organizational Policy (Coordination, Sharing, Access)
In regard to organizational policy, there is a need for the following:
- The design and use of strategies to coordinate information sharing across organizations
- Policy to establish continuous collaboration among different sectors and groups
- Policy to facilitate interaction between various organizations and individuals (i.e., the volunteer technical community, non-governmental organizations, the U.S. Department of Defense, academics, etc.) working in the same response space
- Policy on triaging and prioritizing responses to members of the public who post requests for help during an HA/DR event
- Pre-coordination and selective engagement in technology partnerships to solve HA/DR problems and to make interoperability easier
- Policy on interoperability of technology and data sharing when multiple organizations, both domestic and international, are involved in the HA/DR information sharing space
- Ethics policy associated with sharing and dissemination of data that describes the conditions under which data should or shouldn’t be shared, who should have access to data, etc.
- Policy that defines proper bandwidth utilization in a congested international network
- Policy that describes what can be done (in terms of information access and information sharing) in non-permissive environments versus permissive environments
- The removal of severely restrictive account sign-up policies and procedures by the All Partners Access Network

Information Policy (Acquisition, Release, Archiving)
In regard to information policy, there is a need for the following:
- Ethics policy for data acquisition and fees for access
- Data release policy by the U.S. government for critical imagery
- Ethics policy for the creation, archiving, and release of mapped information
- Policy regarding data security and the security of individuals affected by HA/DR events
- Policy regarding what can be shared and with whom and how to keep some data private
- Security policy that protects sensitive personal information

Technology Policy (Use, Standards, Management)
In regard to technology policy, there is a need for the following:
- The removal by the U.S. Department of Defense on the moratorium on the use of Skype in the HA/DR environment
- Policy on the use of radio frequency space and frequency spectrum management issues
- Policy on bandwidth management issues
Technology
Future issues in technology focused on two areas: collecting, extracting, filtering, processing, and using data for HA/DR and technologies useful for information sharing in HA/DR response. Importantly, participants noted that technology development should be driven by requirements rather than fitting requirements into existing technologies. Technology-related needs highlighted by participants are noted below.

Collecting, Extracting, Filtering, Processing, and Using Data
In regard to collecting, extracting, filtering, processing, and using data, there is a need for the following:

- Increased bandwidth to support the variety of mechanisms in use during HA/DR response
- Technology that incorporates voice recognition and video image recognition as part of data extraction
- Technology that is scalable (can adapt to large amounts of incoming and outgoing data) to meet the significant needs that can arise in a HA/DR event
- Technology that can handle large amounts of information quickly (i.e., can collect large amounts of data, filter on the fly, process data through chain of command, identify actionable data, establish common operating picture)

Information Sharing Technologies
In regard to information sharing technologies, there is a need for the following:

- Acceptance of the culture of open data, applications contests, and “third spaces”
- The availability of IP infrastructure and Internet access options, along with interoperability options and capabilities, for all HA/DR response organizations
- Information sharing and collaboration spaces in real-time with limited bandwidth in an austere environment, including in small communities
- A standard for the visualization of a common and effective picture of relief efforts required and completed based on the standards of involved HA/DR organizations
- Common knowledge and clarification on technologies appropriate for information sharing—particularly when the information is restricted to a certain organization
- Common knowledge on how to use "non-community" networks, especially for those who use a community network (such as the Non-Secure Internet Protocol Router Network) for normal daily routine