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Mashups and Their Use in the Civilian-Military Planning Process

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Abstract

This paper provides an overview of how Web 2.0 applications, specifically mashups, can be used to support Civilian-Military Operations (CMO) in the AFRICOM Theater of Operations to increase the level of collaboration among the multi-national, transnational, and Non-Governmental Organizations (NGOs). As defined by Wikipedia, a mashup is “a Web application that combines data and/or functionality from more than one source”, thus promoting better decision making. Today’s complex security environment dictates collaborative execution of civilian and military operations by organizations with vastly different cultures, capabilities, and rules of engagement. However, these separate organizations typically develop communication systems focused on sharing information within their organization. The exchange of information outside their organizations is often very challenging. This paper describes various ways to overcome those challenges through the application of mashups.

Keywords: Civilian-Military Operations, CMO, Decision-Making Tools, Mashups

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1 Introduction

This paper provides an overview of how Web 2.0 applications, specifically mashups, can be used to support Civilian-Military Operations (CMO) in the AFRICOM Theater of Operations to increase the level of collaboration among the multi-national, transnational, and Non-Governmental Organizations (NGOs). Mashups are Web applications that combine data and/or functionality from more than one source, thus promoting better decision making. Today's complex security environment dictates collaborative execution of civilian and military operations by organizations with vastly different cultures, capabilities, and rules of engagement. The exchange of information outside their organizations is often very challenging. Collaboration among organizations (e.g., United States [U.S.] Army, United Nations, Doctors without Borders, and the Red Cross/Crescent) is extraordinarily difficult given the wide mixture of culture and capabilities. Frequently, the bureaucratic environment within large organizations makes implementing new technology and processes very challenging.

Many U.S. Joint Publications recognize the difficulty of managing/commanding/controlling CMO missions. According U.S. Joint Publication 3-08¹:

The [U.S.] military tends to rely on structured decision-making processes, detailed planning, the use of standardized techniques and procedures, and sophisticated command and control (C2) systems to coordinate and synchronize operations. Civilian agencies may employ similar principles but may not have the same degree of internal C2 as the U.S. military. Across agency lines, International Governmental Organizations (IGOs) and Non-Governmental Organizations (NGOs) tend to coordinate because there is a perceived mutually supportive interest, not because of any formalized C2. Close, continuous interagency and interdepartmental coordination and cooperation are necessary to overcome confusion over objectives, inadequate structures or procedures, and bureaucratic and personal limitations.

During the response to Hurricane Katrina, Web 2.0 applications were quickly (i.e., hours to a few days) developed to enable information sharing among organizations that had never before worked together. This effort was spearheaded not by formal government organizations, but instead was developed by a grass roots effort that identified a need and developed a solution. This rapid development cycle permitted information to be shared as volunteers were cycled through the area. The true power of Web 2.0 applications lies in its ability to enable information sharing across disparate applications and systems.

Mr. Larry Wentz, senior research fellow at the Center for Technology and National Security Policy, National Defense University,² wrote a report on the necessary coordination between

¹ U.S. Joint Publication 3-08, *Interagency, Intergovernmental Organization, and Non governmental Organization Coordination during Joint Operations*, Vol. I, May 2006.

military and civil organizations in disaster situations.³ Mr. Wentz has authored and lectured on multinational Command, Control, Communications, Computers, and Intelligence Surveillance and Reconnaissance (C4ISR) systems interoperability, Information Operations and Civil-Military Operations in the United States. He has noted that there are many similarities between natural and man-made disasters. These include “significant and perhaps wholesale destruction of basic infrastructure and a breakdown in the societal mechanisms for individuals to obtain security, shelter, and other fundamental needs.” Additionally, Mr. Wentz defines a system that the various responders must strive toward—a Collaborative Information Environment (CIE). Mr. Wentz is quoted as saying that the greatest obstacles to constructing a CIE is not technical, but instead lie in the realm of social, institutional, cultural, and organizational issues.⁴

In spite of multiple “lessons-learned” reports from numerous emergencies, many of the same issues continue to plague the civilian-military response community.⁵ Some of the issues are:

- Little or no “shared informational awareness” to enable a common understanding
- Multiple organizations producing the same information products
- Stove-piped and incompatible systems
- Large amounts of data being *pushed* to multiple locations at multiple times unnecessarily using limited network bandwidth
- Lack of tools, indexes, and metadata markers that would allow those in the field to find needed information or even be aware of what information might be available to them

A recent article in *SOA World* states:⁶

In the increasingly competitive global economic environment, companies are driven to optimize every possible part of their businesses, which often requires ad-hoc access to data hidden inside Intranet and Internet applications to create business “mashups” or dashboards for optimal decision making. But today, approximately 99% of the content, data, and business logic are out of reach for most web application development and integration projects.

The *SOA World* information reiterates that the proliferation of complex operations and related information Websites and portals has helped provide information internally to an organization and as a result has promoted internal information sharing. This development

² http://www.ndu.edu/ctnsp/wentz_bio.htm, accessed 21 February 2008.

³ Wentz, *An ICT Primer, Information and Communication Technologies for Civil-Military Coordination in Disaster Relief and Stabilization and Reconstruction*, Center for Technology and National Security Policy, National Defense University, July 2006.

⁴ Ibid.

⁵ Ibid.

⁶ The Kapow Mashup Server Powers Enterprise Mashups of Internet Data and the World Wide Web, *SOA* (Service Oriented Architecture) Magazine Article, 26 Feb 07, <http://soa.sys-con.com/read/336818.htm>

has evolved into a major challenge and even an impediment for responders external to those organizations since the myriad of portals complicates the task of finding and obtaining useful information. There is an urgent need to develop architecture and data-sharing standards. This urgency highlights the need for an adaptable and agile development approach offered by Web 2.0 mashup technologies.

This document contains seven sections:

- Section 1: Introduces and describes the contents of the document.
- Section 2: Provides a Web 2.0 overview.
- Section 3: Describes CMO in detail.
- Section 4: Discusses AFRICOM goals and current operations.
- Section 5: Presents a CMO Non Essential Evacuation Operation (NEO) use case as it applies to mashup applications.
- Section 6: Discusses possible future research directions of mashup technology.
- Section 7: Presents conclusions.

2 Web 2.0 Overview

Web 2.0 is a *new* way for Internet users to interact with and through the Internet. Web 2.0, a phrase coined by O'Reilly Media in 2004, refers to a perceived second generation of Web-based services—(i.e., social networking sites, wikis, communications tools, and folksonomies) that emphasizes online collaboration and sharing among users. Although the term suggests a new version of the Web, it does not refer to an update to Internet or World Wide Web technical standards. Instead, it references changes in the ways standards are used. Web 2.0 can also be described as the transition of Web sites from isolated information pools to sources of content and functionality to become computing platforms serving web applications to end-users.⁷

Web 2.0 allows users to communicate with the data stored on servers and is typically performed via forms in a HyperText Markup Language (HTML) page, a scripting language such as Sun Microsystems JavaScript, or through Adobe Flash, Microsoft Silverlight, or Java. These scripting languages allow the use of the client computer processor to reduce server workloads and to increase the responsiveness of the application.

Section 2.1 provides a more detailed description of mashups. Section 2.2 discusses Web 2.0 mashup applications.

2.1 Mashup Description

The term *mashup* was borrowed from the pop music scene. In the music business, a mashup describes a new song that is mixed from the vocal and instrumental tracks from two different songs usually belonging to different genres. Like these “DNA-combined” songs, a Web mashup is an unusual or innovative composition of content often from unrelated data sources (e.g., video and text). As paraphrased from Wikipedia, a mashup is a Website or Web application that combines content from more than one source.

A mashup application has three components: the content/information provider(s), the mashup site, and the client's Web browser. These components are logically and physically disjoint and are likely separated by both network and organizational boundaries. The information content being “mashed” originates from the content providers. Frequently these information providers are unwitting of how their information is being used downstream. A mashup is not limited geographically for execution as mashups can be implemented via traditional Web applications using server-side dynamic content generation technologies like Java servlets, common gateway interfaces, a hypertext preprocessor (HTML-embedded script) (PHP) or an application service provider. The client Web browser allows the user interaction and the rendering of the application and data.

⁷ Wikipedia

Concerns exist in many communities regarding the openness of Web 2.0 applications. Possibilities exist for nefarious actors to publish erroneous and misleading information; however, the benefit of an open and collaborative environment allows for rapid correction of the erroneous or misleading information.

2.2 Web 2.0 Mashup Applications

Mashup applications have been released by leading companies in the information industry, such as Google, Yahoo, IBM, and Microsoft, along with smaller niche players, such as Kapow Technologies. A significant positive effect of this type of development effort is that it allows Internet users who lack programming experience to contribute to the thousands of freely available mashups. This section describes four Web 2.0 mashup applications and demonstrates the use of an application in the Use Case section (Section 5). These applications are Yahoo Pipes, Open Kapow, Flickr, and YouTube, described below.

2.2.1 Yahoo Pipes

Yahoo Pipes is a free online service that allows people without programming experience to remix popular streams of content types (e.g., Really Simple Syndication [RSS]) and create data mashups using a visual drag-and-drop editor. These mashups are referred to as *pipes*. Yahoo Pipes provides a library of pipes, which currently number in the thousands, enabling users to copy, reuse, and modify pipes. Yahoo Pipes allows a user to create a more focused set of news feeds than traditional feed aggregators offered by sites such as My Yahoo. The My Yahoo site allows the user to select news from a pre-designed menu; whereas, Yahoo Pipes allows the user to design the specific view with only the data sources and information of interest. Yahoo Pipes also allows analysis of data feeds that were previously inaccessible due to conditions such as high volume of data or foreign language constraints. Another unique attribute of Yahoo Pipes is that it allows a Web publisher to include RSS feeds on individual pages without the need for specific pre-configured server-side software. Alex Iskold is the Chief Executive Officer of Adaptive Blue and has been involved with and has written about Web 2.0 technology for years. He compares the power of Yahoo Pipes to the revolution started by relational databases.⁸ Mr. Iskold claims that Yahoo Pipes is “the first [graphical user interface] GUI builder for the biggest database in the world – the web itself.”

The screen displayed in Figure 1 is the Yahoo Pipe Development Environment.⁹ It shows the widgets along the left side that can be dragged by the user onto the canvas and wired together to produce the mashup.

⁸ Yahoo Pipes and the Web as a Database, Alex Iskold, www.readwriteweb.com/archives/yahoo_pipes_web_database.php

⁹ <http://pipes.yahoo.com/pipes>

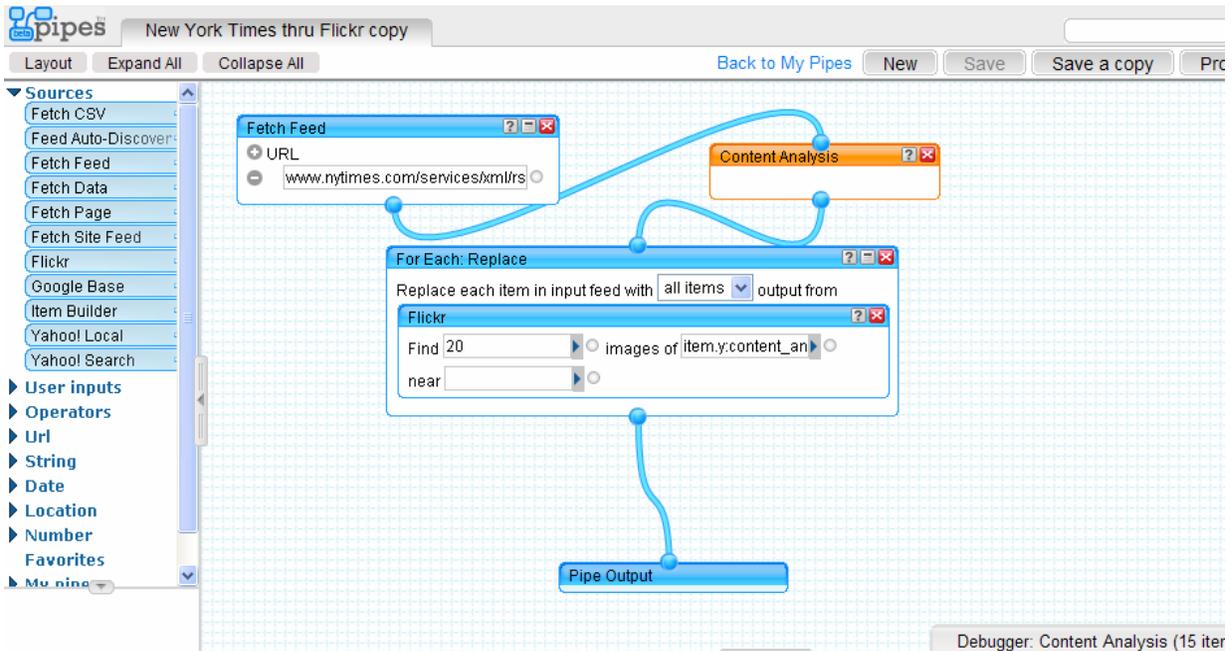


Figure 1 - Yahoo Pipes Development Canvas

The screen displayed in Figure 2 is an example of a Yahoo Pipe. This pipe allows the user to enter a place type, zip code (or location), a description of a photograph (e.g. “white van”) and a distance (e.g., radius) from the desired location. This information is filtered through a Yahoo Local Search and returns a list of pictures that meet these criteria. As a specific example, the pipe can return pictures of trees in parks within a user defined distance of a certain address or return a picture of a white van that happened to be near the Baghdad Market Square.

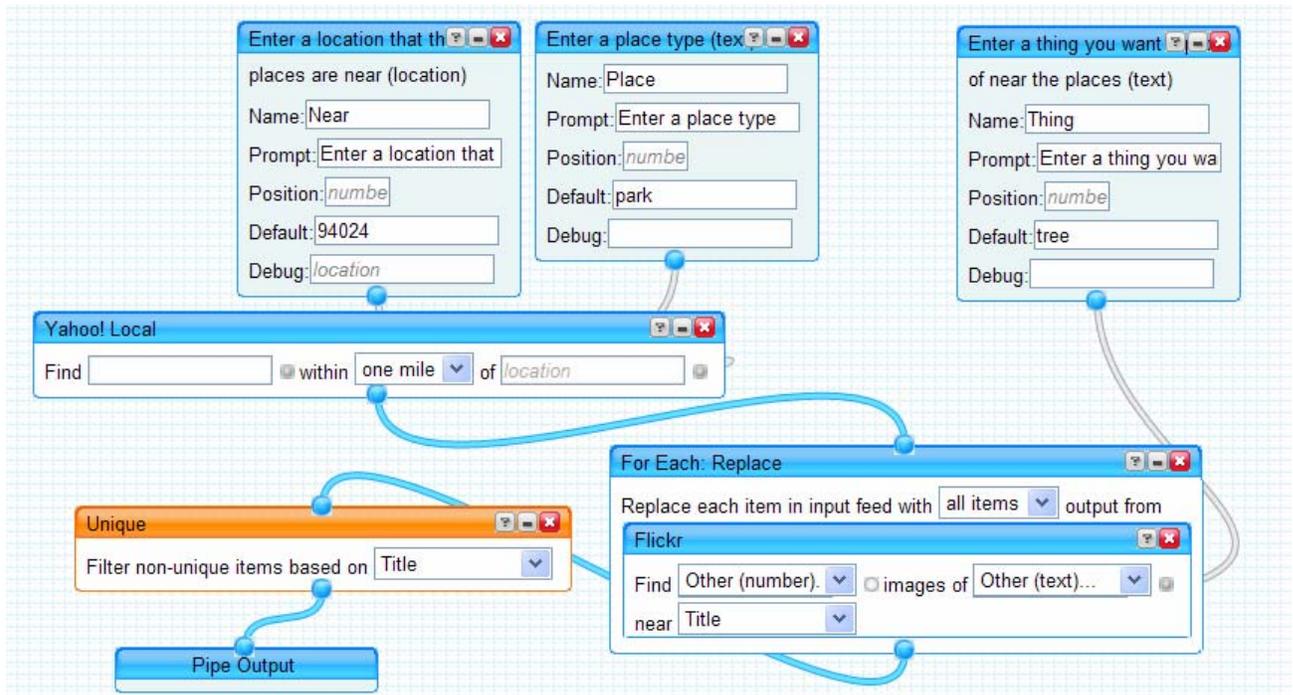


Figure 2 - Find Items Near Locations Pipe

2.2.2 Kapow Technology

Kapow Technology provides tools that enable users to access and manipulate the extremely large amounts of information on a network (i.e., the Internet or an internal organizational intranet) that is not readily accessible by a defined Application Programming Interface (API). An API is the traditional method used to access information from different systems where the owner of the system defines the data that is accessible to outside applications.

There are currently more than one hundred fifty million Websites available on the Internet; however, only 542 of them have published an API.¹⁰ The Kapow Technology tools allow users much greater access to this “hidden” data by enabling API-like access to a wide variety of structured data in databases and unstructured data, such as video and text. The Portal Content Edition provides a point-and-click interface to clip or “scrape”¹¹ Web content. The user can also incorporate the login and security mechanism resident on many sites. The Kapow server is a Java-based application that supports all leading operating systems, databases, and data exchange formats.

¹⁰ January 2008 Web Server Survey, http://news.netcraft.com/archives/web_server_survey.html, accessed 5 February 2008.

¹¹ The term scrape is used to indicate the use of a computer program to extract data from the display output of another program. Wikipedia definition, http://en.wikipedia.org/wiki/Screen_scrape

The output from the Kapow tools can be used directly by the consumer or can be used as input to other tools, such as Yahoo Pipes.

2.2.3 Flickr

Flickr allows users to search through pictorial databases maintained on Flickr servers by retrieving pictures marked with meta-tags. Flickr provides a significant mashup opportunity as it provides an API that enables other programs to access tags, photos, user names, and contacts. Third party developers have written wrappers for the Flickr API that make it usable within other programming environments such as Flash, PHP, Python, Java, Perl, and Ruby.

2.2.4 YouTube

YouTube is a video-sharing site that allows users to upload videos to the YouTube server and make them “findable” by others by adding descriptions (tags) to the videos. The site contains a wide variety of different video styles such as movie and TV clips, music videos, video-blogging, etc. Users can post videos in a number of different formats: WMV, AVI, MOV and MPEG. The YouTube site translates the file into the Flash Video (FLV) format. This format is very useful because of its compatibility with most web browsers which enables users to provide a link to a video or embed it within another web page because each video is accompanied by the full HTML markup. This allows the video to autoplay within the web browser.

3 Civilian-Military Operations

Today's complex security environment dictates a collaborative execution of civilian and military operations by organizations with vastly different cultures, capabilities, and rules of engagement. Often, these organizations develop communication systems focused on sharing information only within their organization. As a result, there are significant cultural and technical challenges for organizations to share information with external organizations. According to Department of Defense (DoD) Directive 3000.5, *Military Support for Stability, Security, Transition, and Reconstruction (SSTR)*:

Integrated civilian and military efforts are key to successful stability operations. Whether conducting or supporting stability operations, the Department of Defense shall be prepared to work closely with relevant U.S. Departments and Agencies, foreign governments and security forces, global and regional international organizations, U.S. and foreign nongovernmental organizations (i.e. NGO), and private sector individuals and for-profit companies.

The sharing of information among the various organizations responding to a crisis is essential to ensure a successful outcome. There is no single organization that can be the source of all the required data and information.¹²

The U.S. military has a rigid hierarchy of command and control. This scope of C2 often includes Command, Control, Communications, and Intelligence (C4I) data. This rigid hierarchy is a stark contrast to many civil and NGO organizations that use a less rigid means to accomplish goals. NGOs share through Cooperation, Coordination, Consensus, Communications, and Assessment (C4A).¹³ Although the approaches have some similarities, these systems are complex and as such they are composed of interconnected parts that as a whole exhibit one or more properties that are not obvious from the properties of the individual parts.¹⁴ Dave Alberts and Richard Hayes have done considerable research on C2 and complex systems.¹⁵ They describe a Civilian-Military Operation as a complex system since it involves a large number of disparate entities involving military units, civil authorities, multinational and international organizations, non-governmental organizations, companies, and private volunteer organizations in dynamic environments operating with imperfect and incomplete information.¹⁶ A typical CMO environment involves:

¹² Ibid.

¹³ *Good Practices: Information Sharing in Complex Emergencies*;
<http://www.usip.org/virtualdiplomacy/publications/reports/11.html>.

¹⁴ Wikipedia, http://en.wikipedia.org/wiki/Complex_system, accessed 13 Feb 2008.

¹⁵ Alberts and Hayes, *Planning: Complex Endeavors, CCRP, The Command and Control Research Program*, 2007.

¹⁶ Ibid.

- No clear chain of command or a completely shared purpose
- Independent, possibly sovereign, entities that cooperate due to the perceived potential benefits
- Different traditions, organizational and national culture, goal structure, commitments, priorities and processes, equipment, rules of engagement, and Techniques, Tactics, and Procedures (TTPs)
- The environment within which a CMO must operate often involves:
 - Natural disasters and the aftermath
 - Political activism
 - Agricultural shortages
 - Outbreak of disease
 - Deterioration of police and justice system

3.1 CMO Organizations

Civilian-Military Organizations operate in complex environments where traditional military planning processes are not appropriate. Each participating organization has a different chain of command and different objectives. It is beyond the scope of this paper to address each of the numerous entities involved in Civilian-Military Operations; therefore, for purposes of simplification, only two basic types (military and non-military) will be presented.

3.1.1 Military

The military force of each host country may have vastly different capabilities; however, many military organizations share a similar rigid C2 hierarchy. Military communications systems are typically closed in an attempt to maintain security and are called C4I (Command, Control, Communications, Computers, and Intelligence) systems.

The U.S. military uses Civil Affairs (CA) units to coordinate with local non-military entities during peace time, or Phase 0, operations. CA planning is affected by legal obligations and constraints found in the U.S. Constitution. These CA officers have expertise in areas that extend beyond the traditional “war-fighter” to include specialties such as doctors, lawyers, engineers, police, farmers, etc. The CA methodology requires the persons to have the expertise to assess, decide, develop and detect, deliver, evaluate, and transition. This varied expertise provides the local military commander with more accurate assessments of the needs of the local populace.¹⁷ Through this varied expertise, the CA units can assist the stabilization through the Rule of Law, governance, infrastructure, economic stability, public education and information, and public health and welfare.¹⁸

¹⁷ http://en.wikipedia.org/wiki/Civil_Affairs; accessed 21 February 2008.

¹⁸ GTA 41-01-004, *Joint Civil Affairs Operations and Joint Civilian-Military Operations Planning Guide*, Sept 2007

3.1.2 Non-Military

The various non-military units also share common characteristics. These organizations typically have a less rigid hierarchy and a more limited logistic capability. As a result of the organizational style and the sheer number of non-military organizations involved in a crisis, there is seldom a single person in charge with the responsibility and authority to direct all of the non-military organizations. Given these attributes, the non-military organizations rely on C4A instead of C4I. C4A has a similar construct to C4I, but the processes execute in an entirely different manner. Non-military organizations also tend to rely on open communications systems, such as the Internet and cell phones.

A wide variety of organizations may be involved in a Civilian-Military Operation:

- Military Forces
- Country Aid Teams
- United Nations (UN) Agencies
- Non-UN International Organizations
- NGOs
- Host-nation governments (e.g., national, regional, and local)
- Private Volunteer Organizations

3.2 CMO Planning

When faced with a complex civil-military environment, planners must understand the various stakeholders and constraints that comprise the overall environment (e.g. civil, military, and social). The most challenging and important aspect of planning in a civil-military environment involves embracing the principle of *agility*.

Hayes and Albert state that based on the fluid nature of each CMO mission and within each operation, a standard one-size-fits-all set of C2 processes is not appropriate. Agile systems need to be developed that can be modified to fit the come-as-you-are nature of civilian-military operations. Web 2.0 mashups support this concept through a rapid development process that allows users to develop solutions rapidly.

3.3 Information Needs

The complex and dynamic CMO environment make it very difficult to identify specific information exchange requirements. However, two attributes of information outweigh all others – accessibility and trust.¹⁹ In an integrated CMO each organization must have access to as much information as possible from the other organizations. In addition, each organization must believe that all participants have posted information that is reliable and as complete as possible. Through this belief, a relationship will be established and the organizations will reap the benefits of posting/sharing information. In other words, they will learn to *trust* each other. Trust is very difficult to achieve in complex environments where

¹⁹ Trust in this context includes information integrity and open release of all relevant information

the organizations are thrown together perhaps for the first time. Mashups can be of considerable assistance here as the organizations typically will not have time to establish formal Communities of Interest, exchange XML schemas, etc.

As stated by Gombert, the user of a CMO system must be of primal importance – not the system itself.

“User primacy means not only immediate access to any relevant information on the network but also the unhindered ability of users to collaborate with other users horizontally as circumstances require. This is especially crucial in COIN [Counter Insurgency], which must be collaborative to succeed but for which collaboration cannot be preplanned.”²⁰

3.3.1 Information Accessibility

Developing and adopting a minimal set of international open data standards can greatly benefit the cooperative CMO planning process. These standards must be kept to a bare minimum to encourage participation from a maximum number of organizations. Each report generated by an organization should ideally include the following attributes: information source, date-time stamp, and a common geo-referenced location.

3.3.2 The Importance of Establishing Trust

As stated above, dynamic environments populated with organizations with diverse cultures that have not extensively worked together before must establish a level of comfort and trust to increase the likelihood of reaching a successful conclusion to their mission. Some of the areas that must be addressed to establish this trust include:²¹

- Trust between and among the organizations
- Perception of competence
- Interoperability (technical, semantic, and willingness to share information and knowledge)
- Shared awareness (situation characterization)
- Shared understanding (cause and effect and temporal dynamics)
- Collaboration about purposes, decisions planning, and execution

3.4 Artificially Imposed Information Barriers

It is beyond the scope of the paper to describe in detail all the security issues that relate to CMOs; however, one key point that many people debate is the fact that security trumps all other requirements or concerns when sharing information with coalition partners or NGOs. This point fails to recognize that the basic need to share is central to a successful multi-

²⁰ Gombert and Gordan, War by Other Means: Building Complete and Balanced COIN Capabilities, Rand Counterinsurgency Study, 2008

²¹ Alberts and Hayes, Planning: Complex Endeavors, CCRP, The Command and Control Research Program, 2007

organizational CMO. A single organization, even the U.S. military, does not contain all of the necessary information, assets, or jurisdiction to deal adequately with the myriad of issues involved in CMOs. To paraphrase Marine Colonel (Ret.) Hammes, the problems in a CMO crisis thrive on the seams between the various military and non-military organizations.²² Hammes goes on to say that CMO planning must erase artificial boundaries imposed by organizations if they are to be successful in responding to complex situations. In a recent Rand study, the authors concluded that of the 160 information exchange requirements necessary to support a Counter Insurgency Operation, less than ten percent of the information would be generated from classified sources or methods.²³

4 AFRICOM

In February 2007, the Bush Administration announced a plan to create a new unified Combatant Command, AFRICOM, to focus on issues on the African continent.²⁴ Previously, the African continent had been divided among three U.S. Combatant commands: United States European Command (USEUCOM), United States Central Command (USCENTCOM), and United States Pacific Command (USPACOM).²⁵ The creation of AFRICOM (see Figure 3) allows the entire continent (except for Egypt) including the adjacent bodies of water, to be managed under the purview of AFRICOM.²⁶ AFRICOM will have a close relationship with the Department of State to emphasize the development of humanitarian objectives and focus primarily on conflict prevention operations that would be executed thru CMO.

4.1 AFRICOM Current Operations

Two US missions are currently operating in Africa: one in the Horn of Africa, and the other in the Trans-Sahara Region. A dominant aspect of both of these missions is that they are heavily reliant on CMOs. Information sharing among these military and non-military organizations is needed to ensure effective mission accomplishment. These two missions are discussed below.

²² Hammes, *The Sling and the Stone, On War in the 21st Century*, Zenith Press, 2006.

²³ Gombert and Gordan, *War by Other Means: Building Complete and Balanced COIN Capabilities*, Rand Counterinsurgency Study, 2008.

²⁴ CRS Report for Congress, *Africa Command: U.S. Strategic Interests and the Role of the U.S. Military in Africa*, Congressional Research Service, December 2007.

²⁵ Ibid.

²⁶ Egypt will remain under USCENTCOM purview due to the country's close linkage with the Middle East.

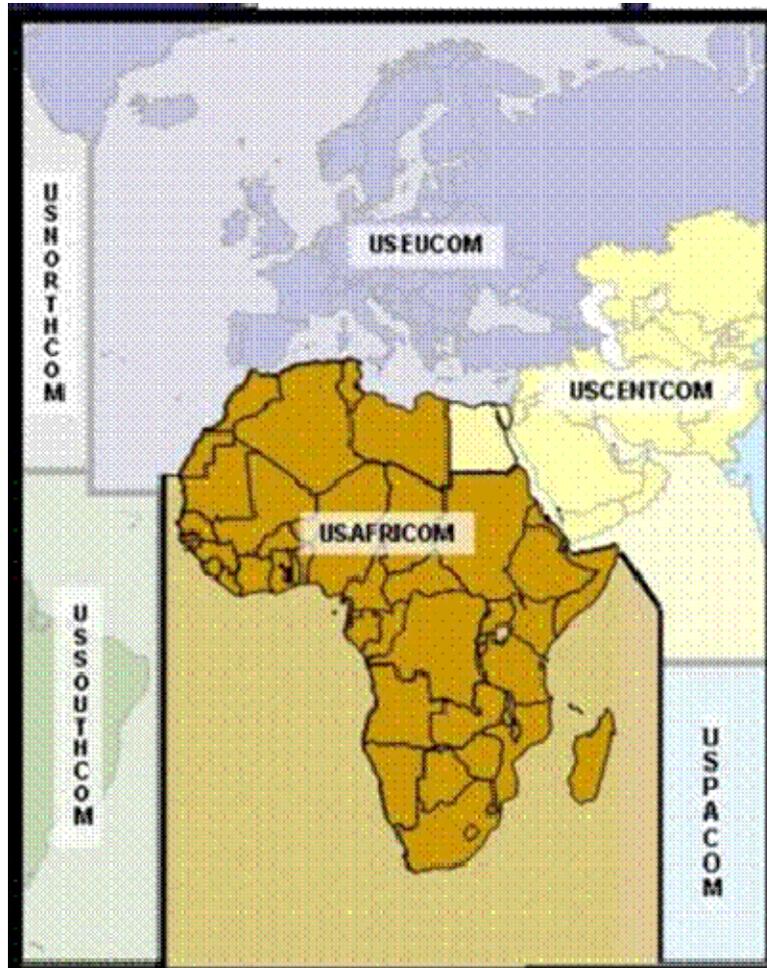


Figure 3 - AFRICOM Area of Operation

4.1.1 Combined Joint Task Force – Horn of Africa

In October 2002, USCENTCOM established the Combined Joint Task Force – Horn of Africa (CJTF-HOA) (see Figure 4). The CJTF-HOA has a semi-permanent base at Camp Lemonier in Djibouti with approximately 1,500 military and civilian personnel.²⁷ The CJTF-HOA is charged with conducting maritime security operations to protect shipping routes in the Gulf of Aden, Gulf of Oman, Arabian Sea, Red Sea, and Indian Ocean. The CJTF-HOA is composed of military units from a number of North Atlantic Treaty Organization (NATO) and allied countries. These countries are Belgium, Canada, France,

²⁷ Ibid.

Germany, The Netherlands, Spain, Italy, United Kingdom, Australia, New Zealand, Pakistan, Djibouti, Somalia, and Ethiopia.

The CJTF-HOA also provides training assistance to in-country military forces and works with NGOs to provide support to nation-building activities, such as digging wells and building schools, roads, and hospitals.



Figure 4 - CJTF-HOA Area of Operations

4.1.2 Trans-Sahara Counter-Terrorism Initiative

In 2002, the U.S. Department of State started the Pan-Sahel Initiative (PSI) Program to increase border security and counter terrorism in four West African Countries.²⁸ In 2005, the Bush Administration expanded the reach of the program to include five additional countries (see Figure 5) to focus on improving the organic intelligence, command and control, logistics, border security, and the ability to conduct joint operations against terrorist groups.²⁹ This operation was renamed Operation Enduring Freedom – Trans Sahara (OEF-TS). It represents the US military component of the Department of State Trans-Sahara Counter Terrorism Partnership (TSCTP). As such, OEF-TS planners coordinate and execute programs across DoD and DoS agencies. Additionally, EUCOM currently executes OEF-TS through a series of military-to-military engagements and exercises designed to strengthen the

²⁸ CRS Report for Congress, Africa Command: U.S. Strategic Interests and the Role of the U.S. Military in Africa, Congressional Research Service, Dec, 2007

²⁹ Ibid

ability of regional governments to police the large expanses of remote terrain in the trans-Sahara.³⁰

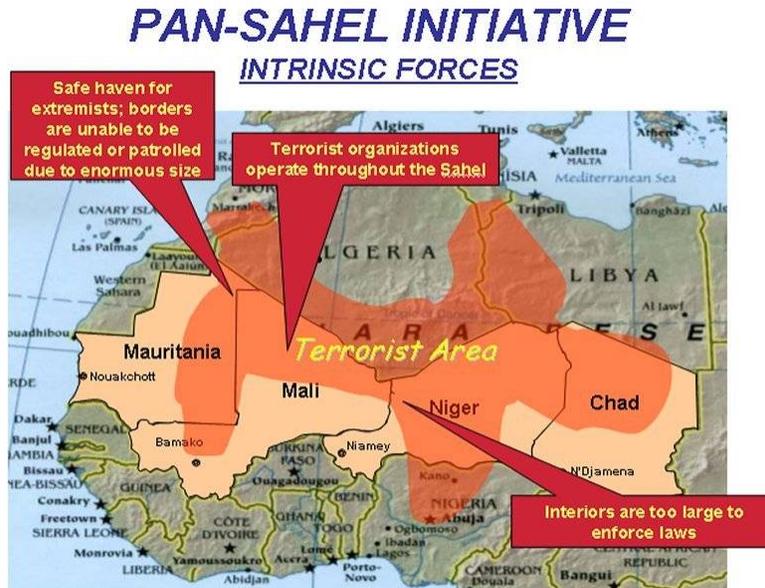


Figure 5 - OEF-TS AOR

7

5 CMO Noncombatant Evacuation Operation Mission Mashup

The use case described in this section is fictional, but based upon actual conditions in various locations on the continent of Africa. A Noncombatant Evacuation Operation (NEO) was selected for this study, but a thorough analysis of a NEO is beyond the scope of this paper. This section will highlight particular portions of NEO missions where Web 2.0 mashups could enhance the ability of the US to execute a NEO.

5.1 NEO Mission Overview

All US Embassies have an Emergency Action Plan (EAP) that covers crisis situations including NEOs.³¹ The EAP contains information including evacuation sites, anticipated number of evacuees, assembly areas, supply routes, etc. Joint Publication 3-68 states,

³⁰ Operation Enduring Freedom – Trans Sahara (OEF-TS), Global Security.org Website, <http://www.globalsecurity.org/military/ops/oef-ts.htm>, accessed 18 Jan 2008

³¹ A recent report by the Government Accounting Office (GAO) found numerous problems with many EAPs, State Department: Evacuation Planning and Preparations for Overseas Posts Can Be Improved, GAO Report, Oct 2007

“Noncombatant evacuation operations (NEOs) are conducted to assist the Department of State (DoS) in evacuating U.S. Citizens, Department of Defense (DoD) civilian personnel, and designated host nation (HN) and third country nationals whose lives are in danger from locations in a foreign nation to an appropriate safe haven.”³² The U.S. Ambassador is the senior government official responsible for execution of NEO missions. The U.S. Department of State may request assistance from the U.S. DoD. There have been 80 evacuations of US government personnel and US private citizens over the last 5 years, but very few have involved the DOD.³³ There are three basic threat scenarios for NEO planning:

- Permissive: The host nation government and /or local troops are basically cooperative and the security situation makes it unlikely that opposition will occur
- Semi-permissive: The host nation government is perhaps not in full control and armed action might occur to interfere with the evacuation
- Non-permissive: Armed opposition to evacuation is likely

The US Embassy personnel are responsible for understanding the host nation environment and are in the best position to establish the necessary personal relations with segments of the Host Nation government and civil organizations to obtain some of the needed information described in the following sections.

A recent GAO report highlighted shortfalls in keeping a current-up-to-date listing of location of US citizens in country.³⁴ When a crisis develops sufficiently, the Department of State orders the embassy to begin evacuation procedures. The typical EAP directs for the embassy to ask the assistance of local hotels, and businesses that might be helpful in conducting a NEO. Assistance might be in the form of providing a means of communicating to US citizens. These messages are often conveyed via phone trees³⁵ and faxes that describe potential security threats and directives of go/no-go areas to include where and when to gather in the event of an evacuation.

5.2 NEO Use Case Background

The use case will consider a mid-size country in Africa with friendly relations with the United States. The country has a small army composed of a number of light infantry battalions and several thousand national and local police troops. Additionally, the country has a small air force with limited reconnaissance, strike, and transportation capabilities. A large portion of the army is concentrated in the country's interior, especially around the Capital City, leaving great sections of the border unwatched. The strategic communications between the national leadership and deployed forces rely on personnel runners and long range High Frequency (HF) radio systems that are adversely affected by terrain and weather.

³² Joint Pub 3-68, Noncombatant Evacuation Operations, 22 Jan 2007

³³ Ibid

³⁴ Ibid

³⁵ One person calls three people – and each of the three people call three additional people

A formal colonial power maintains a light infantry battalion and a small contingent of fixed and rotary aircraft.

There are a number of foreign nationals operating in the country performing roles in business and philanthropy (e.g., NGOs workers in the petroleum industry, and diplomatic missions in the Capital City). The various NGO's have peopled scattered around the country in large cities and small towns. The country has a limited traditional telephone infrastructure, and communication with the NGOs require a cell phone or satellite phone.³⁶

Rebel forces invade the country with approximately 3,000 troops in 300 vehicles. The rebels are armed with assault rifles, RPGs (Rocket Propelled Grenade Launchers), and a few machine guns and mortars. The force is road-bound and advances toward the capital along the major west-east highway.

The nation's ground forces are concentrated in the large cities and around the capital and they do not immediately detect the invading rebel force. This slows the military and civilian response to the invasion.

Based on the advance of the rebel forces, it is decided to evacuate all non-combatants via the planned Noncombatant Evacuation Operation.³⁷

5.3 NEO Mission Enhanced through a Mashup Approach

This analysis separates the NEO mission into two phases. The initial phase is the *Information Collection Phase*. The second phase is the *Execution Phase* and includes the notification of evacuees and the actual evacuation itself. The technology described in this section is available today and consists of mostly free or low cost tools. Depending on the intended use, the information can be maintained on secure networks, such as the SIPRNet, or made publically available through the Internet.

5.3.1 NEO Task Part 1- Information Collection

During NEO missions it will frequently be necessary to coordinate or at least de-conflict actions with various Host Nation organizations such as Police, Military, Fire, and Local businesses. The type of information that needs to be collected includes items such as location of assets, number/type of assets, capability, etc. This type of information can be gathered by local U.S. Embassy officials using readily available items such as a GPS-equipped digital camera.³⁸ Photos collected can easily be displayed on an Internet geospatial viewer (e.g., Google maps) on the Embassy server. In addition, the US could encourage

³⁶ For an interesting look at a low tech solution to cell phone coverage, check out the SkySite product at Spacedata.net

³⁷ Joint Plan for DoD Noncombatant Evacuation and Repatriation, November 2005

³⁸ The Ricoh cameras model 500SE, and Nokia N95 are two examples of this type of technology

Host Nations to create web sites listing this type of information.³⁹ If this information is collected regularly then the Embassy Security Assistance Officer (SAO) could have mashups prepared and ready for use ahead of the NEO. Moreover the relative ease and flexibility of mashup creation allows the Embassy SAO to develop additional mashup functions as the crisis unfolds.

Information is readily available on the Internet from a multitude of International Organizations that the U.S. Embassy could use as input to EAP. One example is information on the presence of endemic and epidemic diseases. The United Nations World Health Organization (WHO) maintains a list of disease outbreaks around the world by type, location, and severity.⁴⁰ The data feed for this information could be extracted and made into an overlay on the mashup maps provided for members of the NEO extraction team and used when determining the location of assembly and extraction zones. Additionally, operational Security (OPSEC) is a significant area of concern for NEO missions. The Embassy SAO can predetermine on-line information sources (e.g., newspapers and blogs) that feed mashups to have situation awareness during a crisis. During a NEO mission these on-line information sources can be a useful source of information by creating a Yahoo Pipes mashup to aggregate and filter the information thru a web 2.0 application that language translation (e.g., babel-fish).

5.3.2 NEO Task Part 2 – Execution

Before the crisis occurs the US Embassy has developed a working relationship with an umbrella UN organization that coordinates the movements of the various NGO personnel in the country. The UN has developed a database of each NGO worker that contains personal contact information, preferred language. This information also contains a mobile phone number and a recent photograph. The UN maintains this database on a protected server in Geneva. The UN provides a user name and password to enable the US Embassy to access this information in a crisis. The US Embassy official creates a Kapow Robot mashup that can access this database to obtain all information about NGO personnel in the country. The mobile phone numbers are entered in an auto-dialer emergency alert system that sends voice and text messages alerting the recipients to the unfolding crisis and provides a Website uniform resource locator where the persons can get updated information on evacuation zones and go/no go areas. The mashup auto dialer utilizes the known language preference for each individual and automatically translates the message into the users preferred language. The text/voice messages are automatically sent hourly until a reply confirms receipt. The contact information and pictures of each individual are inserted in a rescue team's operations order.

³⁹ The Multinational Information Sharing Initiative (MISI) is currently deployed in Africa. Additionally it is currently developing processes for partner nations contribute content as a part of the information sharing strategy to support CMO in the OEF-TS AOR.

⁴⁰ World Health Organization (WHO) Epidemic and Pandemic Alert and Response (EPR), <http://www.who.int/csr/don/en/>, accessed 1 Dec 07

The current location of NGO personnel is obtained thru the E911 chip contained in his/her mobile phones. The embassy official uses a Yahoo Pipe application to aggregate information from a geospatial map and information from the UN database to provide current information to and about each of the NGO personnel that may need to be rescued (see Figure 6). The Yahoo Pipe is stored on the US Embassy server and automatically updates hourly to ensure the information is current. This information is available to the rescue team and NGO members through Internet access.

The US Embassy has preexisting understanding with a local mobile phone provider to access the company's database in an emergency. The US Embassy creates a second Kapow mashup application that filters the mobile phone numbers of all users in the country. A text message is sent advising them of the rebel activity and asking for their assistance. A (free) tip-line is established to allow locals to call in rebel activity information. This information is extracted from the tip-line and displayed on the geospatial viewer.⁴¹ The embassy also establishes a private Flickr account and YouTube account and encourages locals to submit their files. The embassy staff and rescue team can search and sort thru these repositories to gain valuable understanding of conditions on the ground at various areas throughout the country.

⁴¹ For information on how this technique was used to alert the public to the recent fires in San Diego, see <http://www.programmableweb.com/mashup/san-diego-wild-fire-mashup>

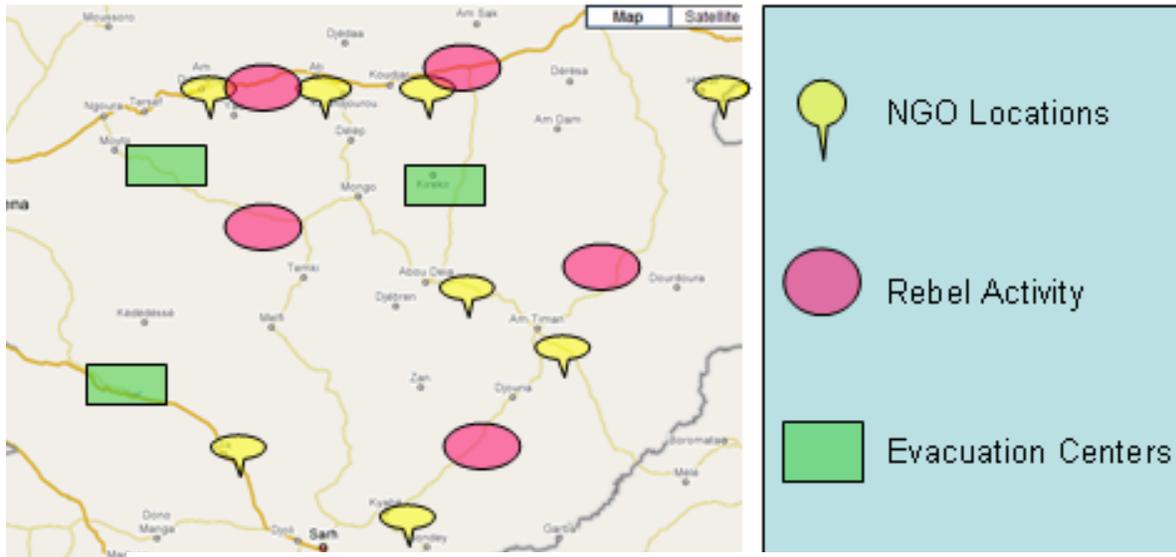


Figure 6 - NEO Situational Awareness Mashup

6 Future Research

As expected, there is a great deal of work that can be done in this area to include developing simulations and conducting exercises to test the concepts presented in section 5. Various CMO missions such as counter-narcotics, counter-terrorism, and natural disaster responses could benefit from analyzing how mashups can assist in improving organizational responsiveness and effectiveness. A final goal is to develop mashups using actual data sources from multiple CMO organizations.

7 Conclusions

Civilian-Military Operations occur in complex environments. The collaboration tools and technology available for use during CMO crisis situations must be flexible. The paper demonstrates that the approach espoused by mashups effectively fulfills that need. There are many times when new data sources are identified in the midst of a crisis or perhaps the original plan does not work as expected. Using the extraction techniques resident in Web 2.0 applications (e.g., Yahoo Pipes and Kapow) in addition to the ability of local personnel to provide input to the system provide a powerful ability to better understand the dynamic conditions in a CMO environment.

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