Mobile Access Solutions – The CommHub System

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Ed deployed into New Orleans on September 2nd, 2005, and continues to provide technology services to the City of New Orleans Government.

Introduction

Access to information has become critical to our lives, both personal and professional. Nowhere is this more true than in the world of emergency services. First Responders rely on situational awareness to guide them in their efforts. And in the world as we've come to know it, situational awareness is dynamic. It exceeds the capabilities of the older technologies and methods, such as "simple radio" communications and hard-copy maps. Those tools are now simply augmentations to the real-time data needed by these front-line troops.

In light of the events of 9/11, new threats and situations must be considered. The threats of biological and even nuclear terrorism loom large in our lives. And natural disasters – floods, hurricanes, fires and the like, coupled with man-made ones such as power outages, only compound the problem. We in America have experienced first-hand the chaos that ensues during such crises. We also, unfortunately, have experienced the impact that a weak communications system can have on our First Responders.

Hurricane Katrina's impact on the infrastructure of New Orleans and the entire Gulf Coast highlights a truth of emergency response: **communications is the centerpiece of any emergency response system**. These systems should be a key element of any Disaster Recovery Plan. In fact, they are mandated to be so, by the National Incident Management System (NIMS). But fortunately, systems and technologies are available to help us to improve our response capabilities, assuming they are appropriately integrated and deployed.

Based upon the evidence of recent experiences in the Gulf Coast Region, serious issues exist with the majority of continuity plans. In fact, this author submits that 80 percent of what is currently written in these plans is questionable and the other 20 percent is just plain wrong. Therefore, many government organizations and private sector companies are not ***disaster resilient***. For example, most business continuity plans currently:

- lack pre-established "instant infrastructure" capabilities
- rely on people who might not be capable (psychologically or geographically) to assist in responding to a crisis situation.
- count too heavily on availability of communications networks that are likely to be destroyed or damaged by the crisis event

Each of these points can directly affect the communications capabilities of the First Responder.

CIOs of government organizations or multi-branch/location private sector companies should immediately re-evaluate what they know about emergency planning and disaster preparedness, with a focus on highlighting which solutions have worked and which have failed in the case of New Orleans, 9-11 and other major disasters. Organizations should consider "ready response" capabilities that need to be put in place, in advance, to ensure that an organization is truly ***disaster resilient*** in the face of a cataclysmic event.

One important approach to such solutions can be found in the use of satellite technology - a technology that has been available to us for only about 40 years. Even with the amazing amount of wire and fiber-optic network capacity buried in the ground, strung on poles and placed under the sea, we still depend on satellites for a significant portion of our mission-critical communications. No other technology offers the ubiquity of coverage, nor the broadcast / multi-cast capabilities of satellite.

Tying It All Together

While not every city is subject to the potential ravages faced by the American Gulf Coast each year, or the potential of catastrophic earthquakes, ***every*** city is a potential terrorist target. In fact, according to the final report of the 9-11 Commission, it isn't a matter of *if*, it's a matter of *when* the next attack will occur.

Imagine the scene of a disaster scenario such as described in Tom Clancy's book, "The Sum of All Fears." In this book, terrorists detonate a nuclear device in a crowded stadium in a large metropolitan city - a scenario that, only a few years ago, seemed much less likely than it does today. As the First Responders arrive at the scene, it's clear that the area involved includes buildings that serve as communications switching centers and others that serve as cellular antennae nodes. The Responders need immediate and accurate situation data, including maps and floorplans of the affected area.

In the perfect response scenario, the local government is prepared. They have planned and drilled for a situation such as this, and have invested in systems to support their resources. Into the scene rolls a Command Vehicle, equipped with a satellite-based Mobile Communications Hub (CommHub).

As the Command Vehicle rolls to a stop, the team inside swings into action. They fire up the generator, providing power to the CommHub. They pop the protective cover off of the VSAT dish on top of the vehicle, engage the auto-locate system, then watch as the system seeks out and locks on to the satellite feed. As this is happening, dual cellular modems are attempting to synch with any available carrier signal from diverse service providers.

While this is happening, the First Responders are suiting up. They don their protective gear, and their communications vests. Each is equipped with radio communications devices, GPS transponders and a wearable PC device. Their protective masks include a heads-up display, capable of projecting floorplans and maps of the area. All are connected back to the Command Vehicle, and to each other, via wireless technology. They are also connected to an Emergency Command Center (ECC) via the multiple channels being established from the CommHub in the Command Vehicle.

As the Responders deploy, they occasionally drop a wireless repeater, each becoming a relay point for the signal. The devices automatically establish a self-healing network between the First Responders and the Command Vehicle. Thanks to GPS, the location of each person can be tracked, both from the satellite feed and from the wireless net on the ground. Each can be seen on a display in the Command Vehicle and in the ECC.

While the scenario described is a nightmare none wishes to experience, the capabilities of the First Responders are very real. And importantly, they are available today.

Elements of the CommHub System

In the context of "Mission-Critical", the environment served by the system described in this paper extreme. Reliability, redundancy, availability and security are paramount. In order to accomplish these goals, the CommHub combines multiple technologies and multiple access methods. The elements are described below:

Router Technology

A core element of the CommHub is the router technology. This device is the key to providing connectivity through multiple means of network access, and is filed-proven, battle-tested technology.

VSAT

Very Small Aperture Terminal, or VSAT systems, are a means of establishing private satellite communications networks for organizations that typically have several widely dispersed locations. Newer applications include providing access to high bandwidth for individual subscribers to Internet Service Providers. Depending on bandwidth requirements (data speed and/or communications channels), VSAT systems can be relatively small (.75 to 2 meter antennae) and are easily installed. In the system described in this paper, the VSAT dish is mounted in a transportable case, with a robotic system engineered to automatically locate and lock on to the appropriate satellite.

VSAT terminals communicate via larger hub stations, known as Master Earth Stations (MES), allowing a wide area network to be established relatively inexpensively. MES' may be shared or privately owned by the enterprise. In this type of configuration, VSATs

can communicate only via the MES and not directly from remote terminal to remote terminal. This configuration is sometimes called a "Star" configuration. In this configuration, the MES broadcasts data to all the VSAT terminals at higher rates than the VSATs can communicate to the hub. Typical inbound (VSAT-to-MES) speeds range from 90Kbps to 256Kbps. Outbound speeds range upwards to 1Mbps. These VSAT systems typically utilize Single Channel Per Carrier (SCPC) access methods for communicating with satellite transponders.

Along with the earth-bound components of a VSAT system, a geostationary satellite is also employed. These "birds" are positioned at 22,300 miles above the earth, in a band located above the Equator. On board the satellite, transponders handle the relay of information between the earth elements of the network. Which satellite is used depends on a number of factors, including the choice of service provider, the "footprint" of the satellite signal, and in some cases, the signal power provided by the satellite.

Through use of a VSAT network, users will have access to a variety of data, both from the master database of the ECC, as well as from other First Responders equipped with CommHubs. Further, access to other government agencies and / or other relevant data providers can be made available through this access method.

As previously mentioned, a Master Earth Station (MES) is required. Having the MES outside of a potential threat radius helps to ensure its ability to meet the goals of this program. A mirror image of the ECC database could be housed at the MES, with primary connectivity to the ECC via leased line and backup connectivity via satellite and / or laser or microwave networks, ensuring access to critical data in support of First Responders.

Cellular

Through use of the router technology described above, coupled with dual cellular data modems, the First Responders will also have access to dual cellular networks, with the capability of supporting multiple network encoding schema (i.e.: EVDO, CDMA and GPRS). This capability can provide not only voice, but an alternate means of data connectivity in the event that the satellite is inaccessible from the deployment location.

802.11b/ 802.11g

First Responders in the local area of the CommHub will be connected to each other and to the CommHub via secure wireless technologies, such as 802.11b/g Wi-Fi LAN and/or proprietary systems based on evolving technologies.

GPS

Including GPS technology in the CommHub and on the First Responders allows for ECC monitoring of their exact location through use of a GPS tracking system. This will also allow for clear visibility of the proximity of any GPS-equipped First Responder to any given COMMHUB.

Server Technology

The CommHub also contains a server. This device will house a local database and local files necessary to the First Responders. Static data elements are stored on the server at all times, in preparation for deployment. Once deployed, situation and location specific data are pushed down to the server from a master system. During the deployment, the server is in constant communication with the ECC, ensuring that the most current information is available to the First Responders. First Responders, in turn, retrieve their data directly from the CommHub-contained server, ensuring speedy access to the information they need.

Summary

Every Emergency Manager, along with Chief Information Officers and others, share an obligation to ensure that First Responders are equipped with the best possible suite of capabilities. NIMS mandates interoperable communications.

In an emergency situation, every minute counts. And communication is the critical factor. First Responders need to be confident that they can have immediate access to the information that may mean life or death to the people around them, and to themselves. Rapidly field-deployable communications systems such as described in this whitepaper, and available today, are the key to ensuring that communication.