

White Paper - Emergency Response Drill, The Port Authority of NY & NJ **Date October 28th, 2007**

Exercise – Port Authority of New York & New Jersey Emergency Response Drill:
Simulated train explosion in subway 300 yards inside tunnel
2000 people on train
200 dead
400 critically injured

Background of Global Mesh Technologies' Involvement:

In August, 2007 Global Mesh Technologies (GMT) was asked to present their interoperable communications software package CAMMS™ (Command Anywhere Mobile Mesh Software) to a group comprised of representatives from FEMA, DHS, New Jersey State Police and Fire, New York Fire, Morris County OEM, Port Authority Police Dept. and other state and local public safety agencies. The presentation was held at the State Fusion Center in West Trenton, New Jersey, known as "The Rock".

Other firms were also invited to present their communication solutions. Of major interest to the reviewing agencies was the video calling capabilities of the communications systems.

GMT president Jerry Underhill presented the complete CAMMS™ solution by first demonstrating CAMMS™ basic features such as file sharing, white boarding, instant messaging, IP camera discovery and resource management. He demonstrated these features over a wireless mesh network created using one laptop loaded with CAMMS™ and one CAMMS™ DFK (Deployable Field Kit). While the other firms demonstrated more traditional video calling methods, GMT chose a different approach. GMT positioned a vehicle in the parking area of the Fusion Center approximately 450 yards from the presentation room. Inside the vehicle, GMT had installed a computer running CAMMS™ as well as a USB camera for video calls and a PTZ IP camera to demonstrate CAMMS™ camera discovery and camera control capabilities. The in-vehicle computer was connected to a CAMMS™ DFK. GMT established communications from the presentation room to the vehicle via the DFKs and then conducted a video call over the wireless mesh network. The wireless connection was made through walls, doors, plate glass windows and the exterior structure of the Fusion Center. All in attendance were extremely impressed at the ease of use and the fact that full communication was achieved from inside the building to a vehicle located 450 yards away.

Following the event, Scott DiGiralomo from the Morris County Office of Emergency Management requested an additional, private demonstration to further review CAMMS™. Deputy Chief Robert Cobb of the New Jersey Fire Department contemplated including GMT in an upcoming exercise to further test CAMMS™ capabilities. The disaster preparedness exercise would include testing all communication systems during a simulated train explosion in an underground tunnel. The exercise had been planned for over a year, however Deputy Chief Cobb felt the CAMMS™ solution held substantial possibilities for improved emergency communications and he pushed to have GMT included in the exercise.

The Global Mesh Technologies Objective at the Exercise:

In mid-October, GMT was asked to demonstrate CAMMS™ at the emergency response exercise in New Jersey. The location of the exercise was the Exchange Place Train Station, located at the foot of Montgomery Street and the Hudson River.

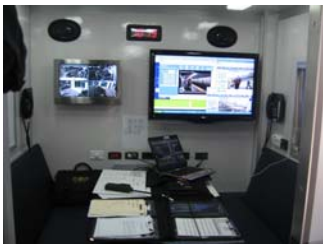
GMT's objective was to successfully connect from a Command Vehicle in the street outside of the train station, through the station building, down 250 yards of escalators, through the tunnel walkway, along the train platform to the actual train tunnel system known as the "Tubes". Communication was to include cameras deployed to view all aspects of the exercise, from the tunnel, platform, walkway, escalators and street level of the station.

Deployment Obstacles and Mesh Products Deployed:

The distance from the Command Vehicle (above ground) to the final camera position (underground) was 3,375 ft. GMT used a total of 6 CAMMS™ DFKs (Deployable field Kits) to create the self-forming, ad hoc mesh network that would be the wireless connection from above ground to underground. The backhaul of information carried over the wireless connection would be via public safety 4.9 GHz 802.11a radios built into the DFK units, with additional connectivity for laptops to the mesh via the 2.4 GHz 802.11b/g WiFi radios also installed in the DFK units.

Six locations were set as follows:

1. Command Vehicle: 1 x DFK, 1 x 120 degree sector antenna mounted on a portable, light weight aluminum tripod stand. The antenna was aimed at the station entrance.



Inside Command Vehicle – CAMMS™

2. 400 yards from location 1: Located at street level inside the station entrance, behind revolving glass doors and concrete/metal walls, next to the entrance to the tunnel's 250 yards of escalators – 1 x DFK with PTZ IP camera to show views of all movement on to and off of the escalators, 1 x 4.9 GHz unidirectional antenna and 1 x 2.4 GHz unidirectional antenna mounted on 1 x heavy-duty, light weight aluminum tripod.



Camera/DFK situated near officer, center of image

3. 250 yards from location 2: Located at the base of the escalator – 1 x DFK floor mounted with 1 x 4.9 GHz unidirectional antenna and 1 x 2.4 GHz unidirectional antenna mounted directly to DFK.



DFK on floor at bottom of escalator

4. 25 yards from location 3: Located at tunnel walkway wall - 1 x DFK acting as repeater as well as providing power to 1 x PTZ IP camera; mounted directly to DFK to provide video surveillance of all movement from the platform to the escalators. Using 1 x 4.9 GHz and 1 x 2.4 GHz unidirectional antenna mounted directly to DFK



Actual image from mesh IP camera

5. 50 yards from location 4: Located on station platform - 1 x DFK with 120 degree sector antenna mounted on a portable, light weight aluminum tripod stand aimed down the track and platform.



Actual image from mesh IP camera

6. 400 yards from location 5: Located at tunnel entrance - 1 x DFK with PTZ IP camera, 1 x 4.9GHz unidirectional antenna and 1 x 2.4 GHz unidirectional antenna mounted on 1 x heavy duty light weight aluminum tripod. This camera was the last point in the mesh, delivering live video at 30 fps of the evacuation and rescue processes in the tunnel and on the recovery train.



Actual image from mesh IP camera

Time to Deploy and Resources Used:

The concept was to show that minimal manpower was required for such a communication deployment. A total of 4 staff were used in the following manner.

1. Overall project manager and underground set up
2. Computer Operator to demonstrate operation of software to those in exercise
3. General above ground runner, if required. (Not Required)
4. Computer Operator to take second computer to EOC approximately 2 miles away to show connection to exercise via Internet

GMT was allocated a specific time frame for deployment: 06:30 – 08:30. Deployment was delayed upon arrival at site, due to credentialing procedures and check in. Actual time now remaining for deployment was 1 1/2 hours.

Deployment was made in two phases. Phase one: install locations 1 and 2 and stow equipment for locations 3,4,5,6 next to location 2.

Phase 1 Deployment began at 07:15 and was complete following full signal test at 07:40.

The exercise began at 08.30.

Phase 2 deployment began at 09.15 while exercise was in full swing. This late deployment was scheduled to simulate the equipment arriving subsequent to the arrival of Command Vehicle. Phase 2 was complete by one person at 9.35am.

As each location was dropped in place and activated, the command post above ground monitored each connection as each location was brought live using CAMMS™ software. Following completion of the underground deployment, the project manager returned above ground to monitor the successfully deployed mesh. On arrival of the Command vehicle, the software operator simply walked into the command vehicle, connected the laptop running CAMMS™ to the Command Vehicle's 40" LCD installed screen and displayed live video from all 4 of the deployed cameras. The ease of installation, connection and use was expressed by Deputy Chief Cobb as "remarkable, never been seen before" and "state of the art".

Deployment At The EOC (Emergency Operation Center)

Following the successful deployment of phase 1 and 2 and the connection of the Command Vehicle to the CAMMS™ mesh network, GMT launched CAMMS™ Web from the computer installed in the Command Vehicle.

CAMMS™ Web allows the local mesh network to be broadcast to the Internet. Any computer with Internet access (and with authentication) can join the mesh and view all that is seen locally at the mesh.

The connection to the Internet was established via an off-the-shelf AT&T wireless card (NVDO card) installed in the computer in the Command Vehicle.

Once CAMMS™ Web was launched at the Command Vehicle, our second operator was taken via fire department vehicle to the EOC approximately 2 miles from the exercise site. On arrival at the EOC our operator was taken to the Operation room, where he simply turned on his laptop, established an Internet connection via another AT&T wireless card and opened the CAMMS™ program. He was able to “see” the mesh at Exchange Place Station. With this connection, the EOC now had views of all deployed cameras from ground floor to deep within the tunnel system. Using CAMMS™, the operator was able to control the pan, tilt and zoom functions of the cameras and also had the ability to text message the Command Vehicle, transfer files and view files from the Command Vehicle, white board on images to or from the Command Vehicle and to take part in face-to-face video calling with persons in the Command Vehicle.

Command Vehicle

While mesh was deployed and CAMMS™ Web connected to the EOC 2 miles away, the mayor of Jersey City, Jeremiah Healy, along with the New Jersey Fire Director and Deputy Chief Cobb, were brought into the Command Vehicle for a 2-minute overview of the deployment. When shown the localized mesh and Internet connection of that mesh to the EOC, they stated what an amazing technology was being used and thanked all for their involvement. Deputy Chief Cobb explained that never before had video and audio feeds been brought from the tunnels to the Command Vehicle and mentioned the obvious assistance this provides in maintaining control of an emergency.

Following Exercise

Upon completion of exercise at approximately 11:40, GMT collected all location equipment and was packed and ready to leave at 12:15.

Deployment Issues

Organization – GMT should have arranged for correct credentials to allow free movement for more GMT personnel at the exercise. The GMT personnel moved freely around the above ground area and in the Command Vehicle, but movement underground was restricted. Had there been any issues with

deployment or operation, GMT may have been unable to rectify these issues due to restricted site access.

Deployment - Placement of components was in an ad hoc manner- not to any pre-existing plan. This fact demonstrates just how adaptable the CAMMS™ package is. The equipment was placed around observers and safety personnel- not necessarily in the best location for ideal communication, but rather in non-invasive locations. This method of placement/deployment highlights the ability of CAMMS™ to enable the formation of a self-forming, self-healing, ad hoc wireless mesh network “on the fly” – which is exactly what it was designed for.

Site Changes - The main sector antenna at location 1 was set in place prior to the arrival of the Command Vehicle and placed where GMT expected the Command Vehicle to be located. When the Command Vehicle arrived, it parked over 100 feet from where originally expected. GMT personnel simply picked up the light weight aluminum tripod stand with 120 degree sector antenna and moved it to the Command Vehicle location and aimed the antenna at the Exchange Place Station entrance. During this move the GMT personnel kept the antenna aimed at the location 2 antenna as best they could, and the mesh stayed active throughout the move. The move took approximately 45 seconds and no loss of mesh, signal or feeds occurred.

Conclusion

Our conclusion from the event is that the CAMMS™ product is even more versatile than tests had previously shown. To use the product in a simulated disaster situation was a great learning experience for the GMT staff and showed that the CAMMS™ solution truly operated in an ad hoc, self-forming manner enabling communications between first responders that has never been seen before. To have been given only 1 week to prepare, and to have delivered all that CAMMS™ promised, showed how versatile the product is. All of those involved in the exercise agreed with this statement and appreciated being able to see CAMMS™ in action firsthand. This was an extremely positive showing and there were absolutely no technical issues to report.