Communicate. Locate. Interoperate.

MeshNetworks Enabled Architecture (MEA™) Solutions for Emergency Response Agencies

INTRODUCTION

A reliable and efficient communication system is the backbone that supports critical emergency response operations in times of crisis. When individuals or command control centers cannot effectively communicate with, or locate people and assets, this disconnect can have devastating, even life-threatening effects. Emergency Response agencies learned this during the 9-11 attacks when the local public safety network infrastructures were first overwhelmed, then destroyed. The New York Times reported that:

> *"Even as smoke was still rising from the attacks on the World Trade Center and the Pentagon, security and safety officials were focusing on serious weaknesses in communications that stymied rescue efforts. Firemen were trapped in the burning Twin Towers partly because they never received police-department messages warning that the buildings might collapse. At the Pentagon, radio traffic was so overwhelmed that foot messengers were the best means of communication."*

When Emergency Response personnel cannot be communicated with effectively and reliably, the situation can quickly get out of control. Assets become under-utilized and location of personnel can be difficult or impossible to determine. Reliable and efficient communications is essential in these situations, whether it is a local incident, like a terrorist attack or wide area disaster like a hurricane.

THE CHALLENGE

The problem faced by cellular and tower based wireless communication systems is that they are physically vulnerable, and have been subject to capacity overloads from civilian demand during an emergency. An outage at a single cell tower or repeater can eliminate communications capabilities for miles around. Nor are these systems capable of locating and tracking assets, particularly inside buildings. Furthermore, wireless technologies currently used by Emergency Response agencies do not offer broadband data communication capabilities. This limits access to critical information and applications, which can adversely affect how incidents are managed. Finally interoperability between different agencies, networks and systems must be solved.

THE SOLUTION

Responding to the need of Emergency Response Agencies, MeshNetworks has developed a complete wireless communications system tailored to provide an integrated approach to both wide area and incident communications networks. By leveraging technology originally developed for battlefield communications, a self-forming, self-healing network that supports mobile broadband data, video, voice messaging and geo-location capabilities is now available in its MeshNetworks Enabled Architecture (MEA™) solution. MeshNetworks' patented Multi-hopping® routing technology embedded in every MEA device creates a wireless mesh of coverage that offers the following benefits:

Self-Healing and Self-Forming Networking

Mesh-Enabled products use a peer-to-peer technology that eliminates single points of failure by enabling every device in the network to act as a router/repeater for all other devices in the network. This means that each user can "hop" through neighboring devices to communicate with each other - and to reach Intelligent Access Points (IAPs) that connect them to wide area data and voice networks. The result is a robust, interconnected network that automatically routes around congestion, failures and line-of-sight obstacles. The fact that mesh architectures are highly survivable is one of the main reasons the wired Internet was built using a mesh network topology.

Users of MeshNetworks' technology simply turn on their devices to instantly create a new, or join an existing network. Routes and links are automatically formed between users, as well as network infrastructure when available. No user configuration required. Arriving users can immediately join the network when they come into range or turn on their device. This unique capability of MEA technology enables instant incident communications networks anywhere, anytime.

Communicate Into and Out of Large Structures

Communicating between incident command centers outside of large structures and emergency response personnel located in these structures is problematic and typically unreliable. Current radios must try to blast their way through concrete, steel and stone to reach all personnel. Vehicle-mounted high power radio systems help in these situations, but the portable radios carried into the structure do not have the power to reliably send or receive through these obstacles.

MeshNetworks offers a different approach to solving this problem. By utilizing its Multi-hopping technology, communications can be extended deep within buildings and other structures. Battery operated wireless routers can be quickly deployed as personnel enter and move throughout the structure. These devices automatically form links between themselves and create a mesh of wireless communications paths

into, out of, and within the structure. Everyone carrying a Mesh-Enabled device also acts as a router/repeater in the network – making communication even more robust.

Supports Incident, Metro and Wide Area Communication Networks
MeshNetworks solutions enable instant broadband wireless communications at an incident, without the need to deploy infrastructure or towers. If network infrastructure is available, Mesh-Enabled devices can connect to Public Safety, Internet, telephone, or private data networks. With MEA technology users not only have a robust local communication system, but also the ability to communicate with just about any network worldwide.

Provides Megabit Data Connectivity
MeshNetworks' mobile broadband solutions wirelessly deliver high-speed data rates, with burst rates up to 6 Mbps. MEA networks support end-to-end Internet Protocol (IP), so any IP device or application works transparently and seamlessly. This allows Mobile Data Terminals (MDT), PDAs, laptops and other mobile computing platforms to get connected at speeds previously available only over wired broadband connections with DSL or cable modems.

Locate and Track Personnel & Assets
Patented geo-location technology is built into every Mesh-Enabled device. Using this technology users know where they are and can instantly find out where any other user is, without having to rely on GPS satellites. This means that locations can be determined in places that GPS satellite signals cannot penetrate, like in urban canyons, buildings, tunnels, or other obstructions. Location information is generated quickly and accurately: typically users can be located within+/- 10 meters or better in under one second.

Cost-Effective and Rapid Deployment
MEA networks are less expensive and quicker to implement than conventional cellular or other "tower based" wireless alternatives. For incident communications, little to no network infrastructure is required, since every user acts as a router/repeater for everyone else. Users extend the range and robustness of the local network. This "peer-to-peer" networking eliminates the need for vulnerable and expensive radio towers.

Deployment of wide area (metro, county or state-wide) networks also benefit from

MeshNetworks' peer–to-peer technology. IAPs and Wireless Routers can be deployed on light poles, buildings or other available structures to form a blanket of wireless coverage. The same Mesh-Enabled user devices that create the infrastructureless incident communications networks are 100% usable in these wide area networks.

And because Multi-Hopping technology keeps transmit power, and hence interference to a minimum, valuable radio spectrum can be used over and over – increasing efficiency and total network throughput. This lets MeshNetworks solutions operate in unlicensed frequencies, so existing frequencies used for Public Safety voice radio communications are not impacted. In the event that additional spectrum is allocated for Public Safety agencies (i.e. 4.9 Ghz), MeshNetworks technology can be applied to these as well.

Mobile Connectivity
MeshNetworks offers a true mobile wireless solution. Data connectivity and geo-location are available at all times – even to cars, trucks, helicopters, etc. moving at high rates of speed. Unlike other wireless solutions that require the user to be stationary or in close proximity to a hot spot, MeshNetworks offers a solution that meets the needs of the highly mobile and on-scene First Responder.

MESH-ENABLED APPLICATIONS

A MeshNetworks' communications and location network uniquely enables numerous critical operations for First Responders and their command and control infrastructure.

Incident, Metro and Wide Area Networking
MeshNetworks solutions create scalable wireless broadband networks that can cost-effectively meet the needs of the smallest incident location or the largest wide area communication network installation. Support for data, video and voice messaging applications are available no matter what size network is deployed.

Automatic Vehicle Location and Personnel Tracking
Dispatchers and Command and Control centers, whether at the incident or back at a permanent facility can quickly and accurately locate personnel and other critical resources. Location information can be determined for assets deployed over wide outdoor areas or even when they are located within a building.

Biometric Monitoring of Personnel

Emergency and hazardous materials response teams can be equipped with biometric vests and sensors that monitor vital signs and environmental conditions. Data from these systems can be transmitted via the Mesh-Enabled wireless network to a command and control center or on-site incident commander.

Voice Communications Backup

Voice communications are the primary method of assessing a situation and directing the actions of First Responders and associated assets. Failure of this system can lead to delayed responsiveness and worse loss of life. MeshNetworks offers a backup voice capability to the primary voice radios used by First Responders. In addition to direct voice back up, Instant Messaging an Email can be used to provide vital real-time communications until the primary voice radio network has been restored.

On-Scene Video Monitoring

MeshNetworks' solutions provide sufficient bandwidth to enable First Responders to wirelessly receive video feeds from helicopters, public safety vehicles, security and traffic cameras, etc. This video information can be critical to remote situation assessment and even traffic control by showing actual conditions in areas that require close monitoring.

Networking of Biological, Chemical and Other Sensors

MEA technology can be used to network both permanent and temporary sensors into an integrated network. Systems can be permanently mounted or mobile, since Mesh-Enabled solutions support mobile sensors moving at high speeds. All data can be collected and managed in one central location, and/or wirelessly communicated to appropriate field units.

PARTNERING FOR COMPLETE SOLUTIONS

MeshNetworks has working relationships with many partners who provide total solutions for Emergency Response applications. Custom engineering, applications, devices and other services are available from this team to meet the needs of the smallest or largest organizations.

SUMMARY AND CONCLUSIONS

Emergency Services Agencies face one overarching challenge - the push to "do more with less." Their increasing role in the context of Homeland Security and disaster response has increased the urgency for a survivable wireless network that performs consistently in both day-to-day and incident management situations. Enhancements to existing voice and low bandwidth data communications systems are a must if these agencies are to successfully meet their new objectives with the limited personnel and assets at their disposal. Finally, the need for interoperability with other agencies and systems cannot be understated.

MeshNetworks' Mesh-Enabled Architecture offers an integrated wireless networking solution for high-speed data, video, voice messaging and location services for both wide area and incident communications. Robustness and survivability are maximized by leveraging battlefield communications technologies within a distributed network infrastructure. Even though these capabilities clearly go beyond those of cellular or tower based systems, MeshNetworks, along with its partners, are offering these solutions today.

To learn more about MeshNetworks and it partners, MEA products and other MeshNetworks enabled solutions, please visit http://www.meshnetworks.com/.