

Business Continuity and Disaster Recovery

Pennsylvania Emergency Management Agency (PEMA) Satellite Warning System/Rapid Notification Network

Executive Summary

Too often emergency management communication networks remain idle until they are activated and used during emergencies. While these networks are critical to incident management and disaster recovery, it is an inefficient use of valuable resources. Additionally, it can create problems with operator unfamiliarity and access to critical system status. PEMA deemed this inconsistent with Governor Ed Rendell's objectives of more efficient government service and wanted to create a system that is used as part of normal business operations in addition to supporting emergency situations.

PEMA set out to modernize its decade old satellite warning system and in its place is deploying a state-wide, multi-agency Internet Protocol (IP) over Satellite (IPoS) communications network delivering converged Voice over IP (VoIP), data and video services. The system enables emergency communication in times of disaster when normal terrestrial communications are unavailable. The highlight of the system is its ability to disseminate information rapidly to large and customized audiences via voice and/or data. It combines Hoot-N-Holler technologies with IP multicasting to provide an efficient delivery mechanism for widespread voice communications. It also allows more conventional methods such as station-to-station calling.

PEMA's initial project supports 108 sites including fixed and mobile communication facilities. The network ensures continuity of operations in case of terrestrial equipment failure, man-made or natural disasters. PEMA standardized platforms across information technology and radio communication programs delivering critical interoperable communication. Leveraging commercial-off-the-shelf products to provide unique services coupled with an open network architecture, we are prepared for future growth as well as integration of emerging communication technologies.

As result, PEMA greatly enhanced service delivery; more effectively used available resources without increasing PEMA's monthly recurring costs.

Project Description

Pennsylvania Emergency Management Agency's (PEMA) decade old satellite communication system was the primary means for rapid information dissemination to seventy-three Public Safety Answering Points (PSAPs) throughout the Commonwealth of Pennsylvania. The warning system provided private emergency Hoot-N-Holler voice services, intranet, e-mail notifications and weather alerts to county Emergency Management Agencies including most 911 centers. Additionally, it supports the National Weather Service (NWS)/National Oceanic & Atmospheric Administration (NOAA) IFLOWS flood monitoring and warning system.

The communication network was proprietary in nature with no ability to expand or integrate new forms of emergency communication. Additionally, the network sat idle until an incident warranted activation. While the old system was reliable, it offered limited value for its infrequent use.

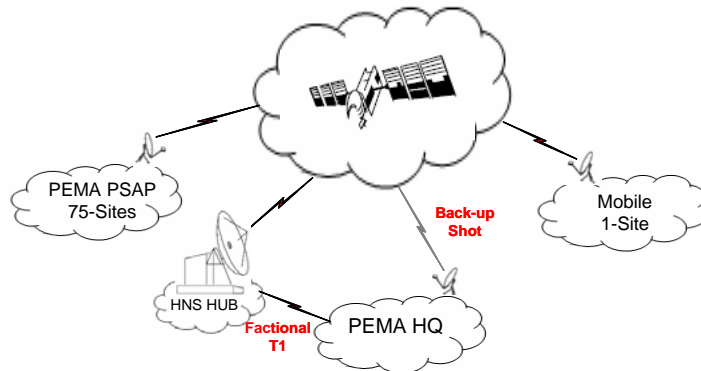


Figure 1 Original Network

Following are highlights of the challenges and requirements born out of the old communications network:

Limited Scalability: PEMA needed a foundational network capable of providing converged communication services including emergency management specific applications. The network needed to scale easily allowing for connections into existing networks and the ability to support new technology insertion.

Broadcast Only Voice Services: Traditional analog Hoot-N-Holler voice services worked well for rapid information dissemination. Calls were immediately broadcast to all end points on the network. While this was appropriate during a statewide alert, it did not permit one-to-one communication or an incident specific call group. During heavy traffic periods, users that were not affected by the incident turned the volume down making them unreachable, defeating the purpose of system. PEMA needed a way to leverage Hoot-N-Holler technology but customize it to the intended audience.

Limited Data Services: Data services were limited to intranet e-mail and weather alerts. PEMA needed a way to provide these services while building a secure, common foundation for new services including Internet access. Delivering updates to end user systems to ensure security and currency of applications was also required.

Limited Flexibility: PEMA and other PA public safety entities needed a system to support a virtual environment enabling a response regardless of where a disaster occurred. Mobility coupled with web-based emergency service requests and resources will allow PEMA to perform it's duties anytime, anywhere.

Limited Interoperability: PEMA needed a common communications protocol to permit converged voice, video and data communications to occur among federal, state, local, first responders and commonwealth citizens. The Internet Protocol (IP) is universal, permitting communications interoperability between a wide variety of media including phones, radios, PDA's, laptops and cell phones.

Effective Use of Costly Bandwidth: PEMA's satellite warning system is critical during times of emergency and is a necessary homeland security asset. However, PEMA needed to enhance communications capabilities and improve the return on their investment without increasing the monthly recurring cost for satellite bandwidth.

With these limitations, challenges and needs identified, the PEMA project team established the overall project goal as:

To provide value and security to the organizations we serve while facing increasing threats and responsibilities.

The primary objective of the satellite warning system – rapid notification network is:

***To securely deliver the right information, in the right format
to the right person at the right time.***

With these as their guiding compass, the PEMA project team partnered with Hughes Network Services (HNS), Vodis Partners, Cisco Systems and the Commonwealth Office of Information Technology to design and deploy an advanced emergency communications network.

Given the rapid adoption of IP as a universal communications protocol, PEMA made a strategic decision to build their foundation around IP. The Internet Protocol enabled them to select communication technologies that would interoperate inside the PEMA network as well as with external federal, state and local agencies.

The project was segmented into the following stages:

1. Establish and develop system baseline capabilities (early 2006)
2. Evaluation of design alternatives, technologies and products (mid 2006)
3. System selection and baseline testing
 - A. Multicast and Point to Point IP satellite communication services (late 2006)
 - B. Hoot N Holler voice services based on IP telephony (late 2006)
 - C. Audio and web conferencing (late 2006)
 - D. Wireless comms. for mobile emergency operation centers (late 2007)
 - E. Controllable access to the Internet (late 2006)
 - F. Security infrastructure including firewall and intrusion protection (early 2007)
 - G. Education for PEMA project staff responsible for deployment, operations and first level support. (early 2007)
 - H. Second and third tier product and service support. (early 2007)
4. Material fielding of baseline system (early 2007 through mid 2007)
5. Communications interoperability with the Commonwealth's 800 MHz Public Safety Radio Network as well as with other federal, state and local first responder organizations (mid 2007 to late 2007).
6. Broadcast video capabilities to support distribution of public notifications, distance learning and video conferencing. (late 2007)

The following capabilities are deployed at each of the participating facilities:

PEMA Headquarters

- Cisco Call Manager VoIP with redundant call processor located at HNS enabling in and outbound broadcast, multi-cast Hoot N Holler, point to point calling and audio conferencing services
- Clustered e-mail servers with Level 5 RAID to ensure access to critical e-mail communications
- Outbound, interactive web conferencing and video streaming services used for continuing education and emergency management
- NWS satellite system with weather server customized to route weather messages to effected locations.
- IFLOWS Datawise web server to provide web-based access to stream/river level information (flood)
- Remote client update services to maintain currency of operating systems (OS), applications, and anti-virus software...
- PSTN access
- Public safety radio interoperability with Statewide Public Safety Radio Network

- IP communications interoperability to permit conference among pre-defined and adhoc call groups

Hughes Network Operation Center (NOC)

- VoIP redundancy should primary PEMA HQ based services become unavailable
- Multicast generation for audio/web conferences and announcement services
- Secure access to Internet service provider
- Firewall access control and intrusion protection services

PSAPs, State Agencies and Fly Away Kits

- Voice Services
 - Direct dial VoIP and PSTN service
 - In and out bound audio conferencing
 - Group based in bound web conferencing and video streaming
 - Announcement services delivered statewide, to pre-defined call groups or single entities based on nature & scope of event.
- Data Services
 - Emergency Internet access
 - Bi-directional E-mail communication services
 - Update services for OS, applications & anti-virus software
 - NWS weather alerts
 - IFLOWS web services

Mobile EOC Van

- All of the above services
- Interoperability with PA Public Safety Radio Network
- RIOS Bridge to provide scene of incident commanders a radio bridge with first responders
- Additional PSTN services
- Video services



With completion of the final phases in late 2007, the new satellite warning system/rapid notification network will integrate the following locations delivering the advanced services outlined above:

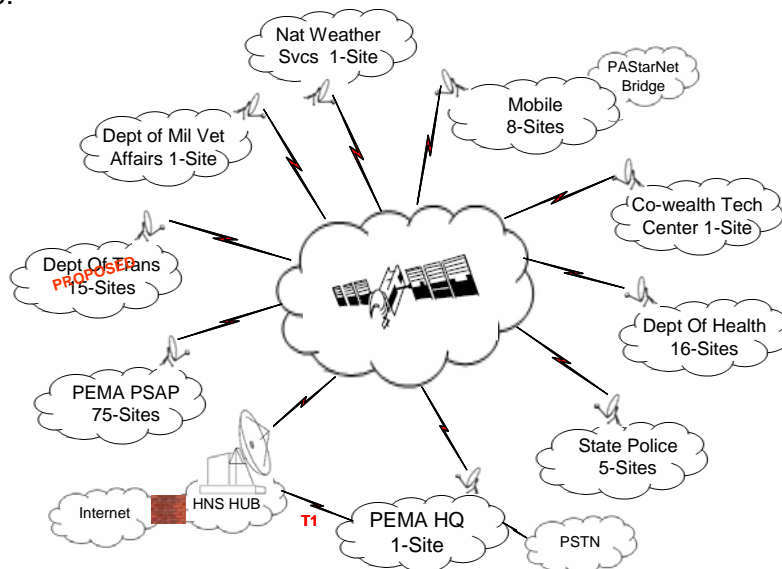


Figure 2 New Satellite Warning System/Rapid Notification Network

Significance of the project to the improvement of the operation of government

- Greatly enhanced ability to communicate across federal, state and local first responders during time of emergency and disaster
- Increased asset utilization without increasing monthly recurring costs
- Secure delivery of critical information to the right person, in the right format at the right time
- When traditional terrestrial and wireless communication networks fail, the Commonwealth is capable of coordinating first responder resources during times of emergency or natural disaster
- Investment protection through the use of a universal communications protocol and platform
- Flexibility and scalability to deploy existing and new resources when and where they are needed
- Standards compliance permitting insertion of new standards-based technologies
- Continuity of operations due to enhanced resilience of IP communications versus the limitations of terrestrial based infrastructures that are subject to failures from fire, earthquake, power outage and physical damage.
- Ability to reduce incident costs through secure sharing of resources between multiple agencies and departments.

Public value of the project

- Improved quality and format of information dissemination
- Customized delivery of information on a need to know basis
- No increase in budget needed to deploy enhanced communication services
- New platform that supports communications across a variety of communication media permitting delivery in a format useful to the recipient
- More effective deployment and coordination of first responder resources resulting in greater ability to mitigate loss of person and property
- Enhanced coordination between federal, state and local agencies during times of emergency
- Unified command and control capability at the incident site, at the PSAP and back at PEMA headquarters
- Ability to deploy command and control services when and where they are needed without physical limitation
- Enhance skills development through distance learning
- Faster response time through direct communication among personnel using different communications devices and media.