

Commonwealth of Pennsylvania

Governor's Office of Administration
Office of Public Safety Radio Services



nominates the

Pennsylvania Statewide Radio System
PA-STARNet

for the

NASCIO 2009 Recognition Awards
Information Communications Technology (ICT) Innovation

Executive Summary

In the mid-1990s, the Commonwealth of Pennsylvania faced the prospect of replacing an aging analog radio system used by Pennsylvania State Police for statewide dispatch and patrol. Other agencies utilized a variety of other systems. All of these systems were purchased separately, deployed, operated, and maintained using different technologies and portions of the frequency spectrum, with limited ability to intercommunicate.

At that point, the commonwealth made a number of key decisions to:

- Deploy a single system comprising transmitters and receivers across the state, connected and managed centrally through a microwave network
- Stipulate that the new system would support both voice and data communications, freely intermingled
- Place all responsibility for all aspects the new system in an office dedicated to that purpose, charged with delivering wireless voice and data services to the benefit of all agencies of commonwealth government requiring them

Challenges and Solutions: Getting agencies and the first responder community to collaborate on a state managed system approach had been a major obstacle prior to 2005. As the infrastructure has neared completion, the state has moved PA-STARNet ahead significantly with change management initiatives for the PA-STARNet, including:

- Developing individual agency transition plans to move all state agencies onto the PA-STARNet (2006-07)
 - Assigning each agency to a specific transition coordinator to assist them
 - Developing and providing agency specific training
- Hiring two (2) statewide interoperability managers, one for system coordination and the other for engineering coordination (2007-08)
- Connecting all 911 centers to the PA-STARNet (2008)
- Developing an in-house Tactical Communications Unit to be deployed, in emergency situations, to ensure interoperable communications (2008)

Benefits: Through interoperability, the benefits of better communication for coordination and control extend beyond the circle of Commonwealth government to embrace federal, county, and municipal resources. For the agencies charged with homeland security and public safety responsibilities, and ultimately for the Commonwealth citizens whose lives and property they help protect, these services afford significant, and perhaps critical, benefits in a world whose dangers we have come to appreciate much more fully in the years following the World Trade Center attacks.

Business Problem and Solution

Historical Perspective: Departments of the Commonwealth that use mobile radio services had been operating dedicated systems for their own use with little sharing

except for land and towers for several decades. The twenty state agencies had infrastructure and technology that had become obsolete, in disrepair due to a lack of funds, in constant danger of extended outages because of a lack of spare parts, and towers threatening to fall down in the next ice storm. The need for action, developing a new statewide radio system, was justified.

Initiated by Pennsylvania Legislative Act 148 (1996), provided funding for a “[c]ommunication and information infrastructure, including approximately 200 sites located throughout this commonwealth for transmission of voice and data communication connected by a digital microwave system to form a statewide mobile radio network....”

The legislative mandates were championed by the creation of a Radio Program Office within the Office of Administration to manage the development and construction of the statewide system. The initial tasks for this office were the development of cost estimates for a statewide system and development of a Request for Proposal (RFP) for consultant services. In July 1997, a contract was signed with a consultant group to develop a process for awarding contracts involving site development, microwave and radio equipment, and provide design and contractor evaluation. A contract award was awarded in June 1999.

Description of the System: PA-STARNet provides wireless digital voice and data communication services across the commonwealth using the 800-megahertz (MHz) frequency band designated for public safety use. System design and development began with the original objective of replacing incompatible, aging radio systems with a single, centrally managed statewide system supporting both voice and data communications. As planning, design, and deployment evolved, the scope of system development expanded significantly to include creating a framework for interoperable communication that encompasses county and local emergency responders. The original “200” sites envisioned by the legislature have turned into 698 sites (234 high-profile towers and 464 micro-cells) which provide VoIP coverage to over 95% of the state’s 45,000 square mile landmass.

System Technology: PA-STARNet uses trunked digital multicast technology from M/A-COM, Inc., a unit of Tyco Electronics Corporation. M/A-COM’s OpenSky[®] system makes use of both high-profile multi-channel base station sites and low-profile compact microcell sites connected through a microwave backbone to implement a highly efficient packet switching communications network, freely mixing voice and data traffic, based on Time Division Multiple Access (TDMA). TDMA allows up to four (4) simultaneous voice conversations on a single channel. The system incorporates standard components such as Internet Protocol (IP) and off-the-shelf workstations, routers, and database software.

This unique system incorporates a high degree of redundancy for high availability. High-profile sites have backup electrical power sources and are largely independent of commercial communications services. There are dual points of entry to the network, protected by a firewall, located remotely from each other. Both the geographic

dispersion of system infrastructure and the ability of components to operate independently help ensure availability and survivability.

Status of the System: Today there are more than 18,000 subscriber devices authorized to use the system with over 1,000 of those units in the hands of the nine (9) Regional Counter Terrorism Task Forces (RCTTFs); as many as 3,000 users actually connected at a given time, initiating some 100,000 plus transmissions daily. PA-STARNet is one of the largest public safety communications systems in North America, with one of the largest privately constructed microwave networks in the world. To view microwave network map:

http://www.portal.state.pa.us/portal/server.pt/gateway/PTARGS_32_0_232_0_-1_47/http://collaboration.state.pa.us;11930/collab/do/document/overview?projID=5291&documentID=167462

The microwave pipe extends across the state's 45,000 square miles and has a throughput of 45Mbps. It is currently being upgraded to a Multiple Protocol Labeling System (MPLS) which will increase its alternate and restoral capabilities as well as throughput to 55Mbps. Operational coverage currently extends over 95.7% of the commonwealth's landmass and 96.83% of its roads.

Approximately 20 commonwealth agencies use PA-STARNet or are in some stage of transitioning to its use, along with business partners and various public safety organizations in counties and municipalities, including nine Regional Counter-Terrorism Task Forces (RCTTFs), participating under commonwealth agency sponsorship. The use of this system has shown to be a most cost effective means of providing services, protective and other, to the citizens of the Commonwealth.

Some examples of use include:

- As transaction levels from vehicle and criminal inquiries drastically increased, Pennsylvania State Police (PSP) began primary voice communication use in selected locations in spring 2006. PSP continues to expand its use to all stations across the state.
- The Department of Health deployed more than 280 fixed-location radios in hospitals and other medical facilities across Pennsylvania to provide wireless backup and redundancy for its Health Alert Network.
- The Department of Transportation uses some 4,800 mobile, hand-held, and fixed-station radios to coordinate highway maintenance and snow removal operations.

PA-STARNet has proved its effectiveness during a number of planned and unplanned events including:

- Emergency communication during the response to severe flooding in northeastern Pennsylvania in June 2006;
- Tactical communications support for PSP units at the Nickel Mines Amish School shootings in October 2006; and
- Resources coordinated across multiple agencies and counties during the snow emergency of February 2007.

- Planned events such as the Little league World Series, NASCAR Pocono 500 and the U.S. Open

Challenges and Solutions: Unlike the movie *Field of Dreams*, there is no guaranteeing that, “If you build it, they will come.” Getting state agencies and first responders to cede control over their individual, antiquated radio systems has not been a “given”. Getting agencies and the first responder community to collaborate on a state managed system approach had been a major obstacle prior to 2005. Significant change management through the Customer Support branch of OPRS has been required to move beyond the initial “buy-in” and transition agencies onto PA-STARNet. It had become clear that change management was the only solution that could provide the necessary buy-in. The OPRS uses the Commonwealth’s Enterprise Project Management Methodology (EPMM) to manage all projects.

The Office of Public Safety Radio Services assumed the responsibility of interoperable communications in 2006. In response, they hired two (2) interoperability coordinators, an Interoperability Systems Manager and an Interoperability Engineering Manager. Through these individuals, the RCCTFs and the counties have become more accepting of the statewide radio system. Interoperability goes well beyond just agency-to-agency. County connects through our 911 centers provides for county-to-agency interoperability. The state provided all centers with a control station to access PA-STARNet.

Adding to the state’s interoperability quotient has been the setting aside of three (3) profiles for interoperability purposes only. Policy and SOPs are being set in place for the use of these profiles, pre-programmed with the talk groups within each of these three profiles.

- Profile 14 or "INTEROP", has the benefit of true on-the-fly interoperability. The Office of Public Safety Radio Services has developed a monitoring team that will patch individual users together.
- Profiles 15 and 16 are set aside as Global Profiles being NIMS compliant and reserved for Incident Command situations. A “Common” talk group has been established for interoperability between these two profiles.

The OPRS, with input from the RCCTFs and counties developed the State Communications Interoperability Plan in 2007 as our roadmap to the future. This plan continues to be updated with the input of local first responders.

Pennsylvania’s Public Safety Interoperable Communications (PSIC) grant request was approved in 2008. This \$34 million grant includes regional initiative oversight, tactical video and data, VHF and UHF overlays, and, PA-STARNet county connectivity. OPRS took the unprecedented approach of providing the required match for the RCTTF proposals for funding, as there is little to no monies available for local match at that level. OPRS is also managing the overall grant by purchasing all equipment on behalf of the RCTTFs to ensure cost effectiveness.

The OPRS has four Cells-on-Wheels (COWs). One is permanently deployed in southwestern PA; two others are in the process of being permanently deployed. One COW will remain at OPRS, deployment ready for whenever and wherever needed. These COWs greatly strengthen our interoperable communications capabilities in areas where communications links require an assist.

Additional solutions are visualized through: the success of the annual Interoperability Summit started in 2007; expanding the width of the microwave pipeline to provide greater data capabilities; and, successfully moving Public Safety onto the PA-STARNet.

Significance to the Improvement of the Operation of Government

Ability to Communicate Statewide: Communications systems like PA-STARNet exist to enable the exchange of information in support of organizational functions, providing support for control and coordination over a wide area. Accordingly, the principal measure of the system's improvement of the operation of government is its contribution to better communication and, in turn, better control and coordination of significant Commonwealth business processes.

Beyond the circle of state government, PA-STARNet further serves as a platform for communication between state agencies and county or municipal responders. This ability benefits the operation of county and municipal government as well as state government in marshalling, coordinating, and controlling activities and resources among different levels of government. To this end, PA-STARNet is used for daily communications, planned events and emergency/crisis situations.

Among the best practices development, operation, and support of PA-STARNet has exemplified are the following:

- A unified approach to emergency communication, encompassing both Commonwealth agencies and, through interoperability planning and implementation, counties and municipalities across the state;
- Consolidation and standardization of technology deployment for financial responsibility, economies of scale, and shared services as well as interoperability; and
- A governance structure to ensure all stakeholders a voice in direction and establishment of policy.

Benefit of the Project

In its primary role as a public safety network, PA-STARNet offers dramatic improvement in the ability of emergency managers to control and coordinate resources during emergency response. This now common, interoperable platform for voice and data provides better direct communication for incident command in the deployment and coordination of assets and resources, but also data applications.

For example, PSP data transactions include information on warrants, drivers' licenses, missing persons and protection from abuse orders. The PA-STARNet infrastructure also provides automatic vehicle locator (AVL), texts, alerts and license photos. All of this

comes as a byproduct of the VoIP radio system and responses returned to the office in a few seconds. Through the first week in December 2008, PSP had 4,802,927 data transactions compared to 2,191,447 for all of 2007. AVL is built around the Global Positioning System (GPS) capability of installed mobile radios for real-time information to support decision-making and coordination. GPS functionality is incorporated in the radios.

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Return on Investment: Quantifying return on investment for a complex strategic asset such as PA-STARNet is a daunting effort in any event. To date, funding appropriated for development and operation of the system is \$358 million. It is safe to speculate that replacing the aging PSP legacy radio system by itself would have incurred costs similar in magnitude to the statewide system.

The Commonwealth now has a statewide wireless land mobile radio system serving the requirements of all agencies, supporting intermingled voice and data traffic, operating with high availability for roughly the same cost. The infrastructure is decentralized and highly survivable, operating through commercial power outages and is mostly independent of commercially provided communications services. It is entirely responsive to Commonwealth requirements and priorities.

PA-STARNet supports the operational needs of many other Commonwealth agencies and serves as the statewide backbone for interoperable communication across all levels. It has already served the State Police well as a transport for Mobile Office data and as a platform for voice communication and dispatch, a transition that is already well established and expanding across the state.

Finally, as agencies make the transition to use of PA-STARNet as their primary means of wireless two-way voice and data communications, freeing up legacy system assets such as frequency licenses and infrastructure, the reuse of those assets will further increase PA-STARNet's return on investment. More importantly, our citizens, including our most rural areas, have emergency response radio coverage that has already demonstrated its life saving worth on several occasions.