Maryland First Responders Interoperable Radio System Team

State of Maryland – Department of Information Technology

Category: Information Communications Technology Initiatives

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Executive Summary

Following the horrific events of September 11, 2001, and the terrorist attacks on America, the State of Maryland ("State") recognized the need for an interoperable public safety radio communications network capable of linking federal, State, and local government first responders. As an immediate first step, Maryland initiated a statewide program to build communications infrastructure throughout the State in support of its agencies and local governments. With an enhanced infrastructure of communications towers and backhaul microwave in place, Maryland initiated a program in 2008 to construct a statewide public safety land mobile radio network utilizing the newly created 700 MHz frequency band to provide communications interoperability. This network is known today as Maryland FiRST. When complete in 2020, every jurisdiction in Maryland will be able to enjoy access to a standards-based interoperable network capable of operating at the local, regional, or statewide level. Already, approximately 60,000 communications devices owned by federal, State, and local agencies, are programed into the network.

Maryland FiRST also addressed the critical issue of air-ground communications in support of public and private air ambulances. Prior to Maryland FiRST, the Federal Communications Commission ("FCC") had no frequencies in any public safety frequency band dedicated to air-ground communications. Maryland worked with the National Public Safety Telecommunications Council ("NPSTC"), a nationwide organization that serves as a communications link between the FCC and public safety, and submitted a Petition for Rule Making. This five year process culminated in 2014 with an amendment to the FCC's rules that established eight new 700 MHz frequency pairs solely for air-ground communications. As importantly, through a clarification of Federal law relative commercial air ambulances operating on a public safety frequency, Maryland introduced a communications platform that supported commercial air-ground communications with State aircraft as well as hospitals linked through the central EMS communications center in Baltimore.

In addition to providing public safety communications interoperability, Maryland FiRST provides an economical platform for local governments to use in lieu of supporting separate networks. To date, eight counties in Maryland have elected to join the State's network as their primary communications system. Through the program, local governments need only pay for consoles, subscriber devices, and any unique components required to serve their communities. They also avoid the costly expense of supporting 24 X 7 maintenance as well as technological upgrades to the fixed radio network and backhaul elements. In consideration of the annual costs of radio maintenance as well as upgrades to maintain a contemporary network, each local government

user saves well over $1,000,000 annually by using Maryland FiRST as their primary communications system.

Concept

The Maryland First Responder Radio System Team ("FiRST") is a Statewide APCO Project 25 Phase II 700 MHz trunked Land Mobile Radio ("LMR") system with encryption capabilities for public safety. This system is designed to provide radio communication across the entire State. When completed, a public safety official located at Deep Creek Lake, in the far Western part of the state can talk with their counterparts in Ocean City. The system also provides air to ground channels for public safety flight operations.

One of the major findings of the United States Department of Homeland Security and the 9/11 Commission Report's was; "Improve interoperable communications at all levels of government." Following the Report, former Governor O'Malley adopted the need for public safety communications interoperability as a Homeland Security priority for the State. Governor Larry Hogan has continued to support strongly Maryland FiRST and the services provided by the system to first responders. Since 9/11, the State has vacated a world with extremely limited public safety communications interoperability to the present day Maryland FiRST system which provides a robust statewide platform linking Federal, State, and local government first responders. When the project is completed in 2020, public safety communications at the State level will be interoperable with Federal and local government partners. Additionally, special 700 MHz nationwide interoperability stations managed by the State Emergency Management Agency were added to Annapolis, Baltimore, and Lamb's Knoll capable of facilitating interoperability with resources coming from out of state areas.

Using Maryland FiRST the State can maximize its limited communications resources while achieving interoperability by funding into the Department of Information Technology ("DoIT") to support a consolidated communications platform meeting the land mobile radio requirements of the major agencies; e.g., State Police, Natural Resources, Department of Transportation agencies, Emergency Medical Services, National Guard, etc. Prior to Maryland FiRST, there were virtually no consolidated radio systems on a statewide level resulting in disparate networks that hindered attempts at interoperability even when agencies desired improved communications.

After 9/11, the State initiated a multi-phase program to construct communications towers and microwave systems throughout the State. These resources initially served to support the requirements of agencies and local governments seeking short-term fixes for communications. However, even though there were short-term benefits, users recognized that the ultimate purpose of the new towers was to support the anticipated statewide system. Today, Maryland

FiRST uses approximately 155 State, federal, local government, or privately owned communications towers throughout the State. Because of this investment in communications infrastructure, only approximately ten additional towers have been required to support the radio equipment providing communications.

The Maryland FiRST System success is assessed daily by the support that it provides for thousands of first responders. Multiple formal assessments have been established to ensure the success of the program. These assessments are:

- Testing the radio coverage of the system in every county within Maryland. Testing was conducted with members of State agencies as well as participating local governments and representatives of the federal government using the network for daily operations and interoperability.

- State audit and review of all network components both pre-configuration and post installation.

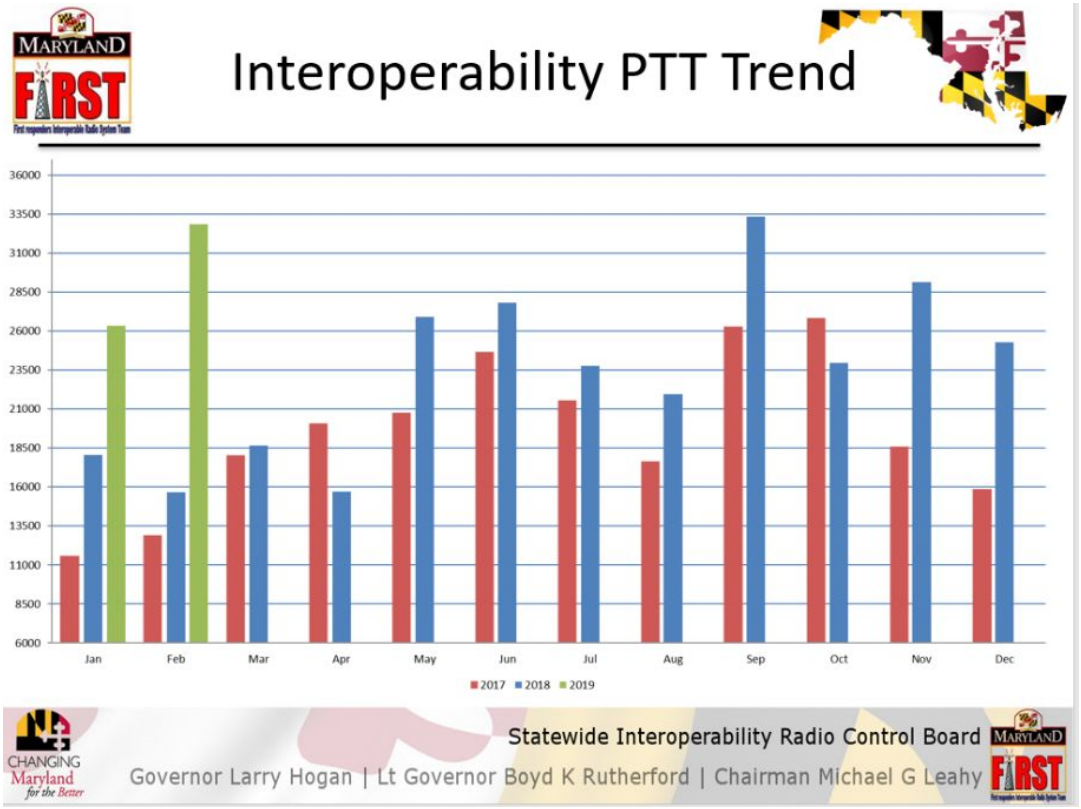
- Continuously monitoring the health of the network continuously through automated tools.

- The Maryland Legislature established the Radio Control Board ("Board") to provide for the shared governance of the Maryland FiRST system. The Governor appoints members of the Board from major State agencies and local governments who meet routinely to receive reports from system managers and users and provide guidance as to the operation of the system. Any operational issues from users can be reported either to the Chief of DoIT Public Safety Communications or Board members. Through this distributed system of governance, user reports are reviewed as system assessments on a continuous basis.

DoIT has complete oversight for the project and works with the Radio Control Board to ensure that user initiatives and outcomes are addressed appropriately. As examples; Talbot County identified a requirement for enhanced "in-building" coverage in a discrete portion of their jurisdiction. With the County agreeing to be the funding source, Maryland FiRST identified spectrum and performed all required licensing for the site and coordinated connectivity with the statewide network. Talbot also requested additional capacity for their simulcast cell. Maryland FiRST worked with Motorola Solutions to expand the cell capacity. The State contacted the Regional Planning Committee for 700 MHz and obtained two additional frequency allotments. With additional spectrum provided, Maryland FiRST applied for a new FCC license and the capacity of the cell was expanded.

In an effort to ensure accessibility while also maintaining information security, Maryland FiRST operates using the standards based P25 Phase II architecture and private networks for backhaul communications that link all radio and console sites. This includes specifications for tools to protect access or system integrity. Part of the protocols include the Advanced Encryption System ("AES") protocol for security. AES is the only system used for encryption that has been approved by the United States Department of Homeland Security. The system also employs a tool that authenticates a radio before permitting access to the system. This software also monitors radio identification numbers and alerts system managers to possibly cloned radios attempting to surreptitiously gain access to Maryland FiRST.

Training has been a significant part of the system's implementation. At the State level, almost all of the member agencies had limited experience with trunked radio technology as used with Maryland FiRST. Similarly, they had little experience with interagency interoperability. These were hurdles overcome through training persons within agencies and local governments to re-train their users in both the operation of trunked radios as well as interoperability communications throughout the system. Data are recorded within the system and by early 2019, users were approaching 33,500 interoperability calls per month. Prior to Maryland FiRST, interoperability by State first responders with the State colleagues was virtually zero.



Significance

The project's scope has been to address public safety communications interoperability for State agencies and local governments as well as federal law enforcement. Through this effort and as previously identified, all major State agencies requiring regional or statewide communications support are primary users of the system. Eight local county governments have joined the system as primary or full-time users. All other counties may use the system only for interoperability and related discrete use. The communications requirements of federal agencies for statewide radio coverage have also been addressed.

Maryland FiRST has been a unique project because it caused so many former communications norms affecting public safety communications systems not only to be replaced, but to be transformed. As an example, the Maryland State Police were utilizing multi-channel simplex analog communications in the 39 MHz band; essentially, 1930 technology. The system suffered from interference generated by systems hundreds of miles away from Maryland. The Maryland FiRST system operates utilizing contemporary digital trunked radio systems which are state-of-the-art. To paraphrase Gordon Bethune, MSP communications went "*from worst to first*[1]" after joining Maryland FiRST.

Public safety communications are real time events and can be critical to the saving of lives and protection of property. Failures of communications systems may be dramatic events that affect first responders and citizens by widespread adverse publicity. As a part of planning for Maryland FiRST, the State's planners were cognizant of problems associated with other statewide systems resulting in negative media coverage. This has not been an issue for Maryland FiRST as the system contains large amounts of redundancy in radio coverage as well as network backhaul transmission systems. The vast majority of Maryland FiRST sites are connected through diverse fiber optic cables and/or microwave radio systems. The result is that users rarely experience or even perceive system failures. Concomitantly, in areas where users have reported some communications "dead spots," Maryland FiRST administration has established a list of priorities for strengthening communications in the future.

Impact

The Maryland FiRST system has become a model for shared public safety infrastructure. It brings State and local governments closer together through common communications platforms and governance. Through the use of industry standards, federal users can easily migrate into the system for communications interoperability. With the implementation of Maryland FiRST, users went from old noisy analog technology to modern digital communications that typically eliminate interference from almost all sources. The State's first responders can now communicate over wide areas including if necessary, statewide.

No State agencies were using a contemporary standards-based public safety communications' system before Maryland FiRST. The State Police and State Highway Administration used

[1] From Worst to First : Behind the Scenes of Continental's Remarkable Comeback by Gordon Bethune, John Wiley & Sons Inc., August 30, 1999.

low-band, the Department of Natural Resources were in the VHF high-band, and emergency medical communications used the UHF band. Almost all of the local governments were operating in the 800 MHz band. Today, all State agencies that have migrated to Maryland FiRST and enjoy robust interoperability with their State colleagues as well as every local government.

The initial $345,000,000 investment for Maryland FiRST transformed public safety communications from un uncoordinated combination of disparate systems where interoperability was at best complicated to a state-of-the-art program supporting first responders at every level of government. The project has remained on budget while absorbing some unexpected infrastructure costs such as remediating or constructing a small number of new towers. Local governments that join the system avoid the cost of common infrastructure, maintenance, and upgrades which translate into millions of saved dollars annually.

Through Maryland FiRST, users have access to a state-of-the-art public safety communications systems that provides comprehensive levels of public safety communications interoperability. In an emergency, lives may be saved and property protected by virtue of interoperable communications. This was a sad lesson learned by the New York City Fire Department on 9/11 when 343 firefighters were killed. With statewide radio coverage and configurations that permit all federal, State, and local governmental first responders to interoperate, Maryland FiRST provides a unique level of service that can only be provided through a statewide network.