

iXP



**Commonwealth of
Pennsylvania
Office of Information
Technology**

**Statewide Public Safety
Radio System Project
Review
Consulting Services**

Final Report

1 Executive Overview

The Commonwealth of Pennsylvania is currently implementing a Statewide Public Safety Radio System. The Project was authorized in 1996 with funding through Legislative Act 148 and the initiative formally began in 1998 with the release of the Request for Qualified Contractors (RFQC) procurement document and was originally scheduled to be completed within 20 months. The RFQC document included the following statement, which served to define the system:

“The Commonwealth of Pennsylvania, Office of Administration, Radio Project Office, is building a statewide mobile radio system for use by all state agencies and possible shared use by federal and local governmental entities. This system requires installation of a radio system to support wireless voice and data applications on a statewide basis.”

This statement was published in 1998 as the definitive description of the new statewide radio communications system. It was intended that each of the Commonwealth’s agencies migrate from their existing stand-alone legacy radio communications systems onto an integrated communications system that could support both voice and data.

The ability of local government entities to “piggyback” (become a user) onto the statewide system as their primary radio communications system was not intended nor mandated, but would be reviewed on a case by case basis. The primary ability of local government entities to communicate with users of the statewide radio system was envisioned to be accomplished via interoperability between the existing legacy communications systems utilized by the local government entities and the statewide radio system. It was never intended as a requirement that all local government entities must buy the same radio equipment in order to communicate with users on the statewide radio system.

Interoperability, specifically radio communications with federal and local government entities, took on a dramatically different definition after the events of September 11th. Even before this tragic event, the Commonwealth’s new radio system was designed to provide an interface between the various communications systems that were utilized by local government entities and this system. This interface, which is designed to communicate with systems manufactured by a variety of companies, facilitates interoperability communications between designated talk groups on the statewide system and these local systems. This allows for state agencies, which are on the statewide radio system, to communicate with local government entities through this interoperability interface.

In order to further assist local government entities achieve interoperability with the statewide system, the Commonwealth has recently embarked on the creation of a Public Safety Communications Interoperability Plan, whose goal is to provide a roadmap to achieve interoperability through standards that allow users of different radio systems to communicate with each other without buying the same equipment. This document is being released by the Pennsylvania Emergency Management Agency (PEMA).

As a result of the project’s current status, the Commonwealth has engaged iXP Corporation to review, develop findings, identify issues requiring attention, and develop resolution options for

consideration in four specific areas of the statewide radio system project. These four specific areas include:

1. The overall technical solution, including system coverage;
2. The project's communications interoperability capability, based on the current regional interoperability plan and approach;
3. The transition strategy and concerns associated with both state agency users and County users; and
4. The overall project's program management capability going forward.

Within these four areas, the following concerns are addressed:

1. Will the system work?
2. Is the system "Public Safety" ready?
3. Issues related to radio coverage.
4. Perceptions of the users and their ability to transition to the new system.
5. Perceptions regarding non-state agency (local government) participation?
6. Major resolution options the Commonwealth should consider to complete the project.

This report does not address issues regarding the cost of the project; i.e. a financial audit was not conducted, nor does it review the Commonwealth's procurement process and rationale for contract award of the project. Cost projections on the proposed resolution options that should be considered by the Commonwealth are also not included in this report. Cost projections would be developed after all the options are reviewed and the proposed course of action is determined.

The methodology followed in the development of this report focused on the validation of the findings through multiple methods and views. Initially, documentation was reviewed and analyzed to form the baseline of facts. These facts were then verified and expanded upon through both interactive discussions with several different stakeholders of the system including the Radio Project Office, the vendors and the end users and direct observation of the system.

Some of the information received was contradictory, as perceptions differed depending on the stakeholder. This in and of itself is an important finding and underscores a need for stronger communication among and between the different stakeholders of the system. In addition, the project has massive amounts of documentation, which was not stored in a manner conducive to reviewing the complete set in this timeframe. This report is based upon the documentation that was reviewed.

The result is a report which provides an introduction of each major area, a review and discussion of our findings and observations, and proposed resolution options for consideration.

It is important to note that some of the initial findings have begun to be addressed prior to the completion of this report. Those actions are also identified in the appropriate section of this report.

1.1 Major Findings

1.1.1 Structure and Approach to Project Implementation

In order to answer the questions, and address the above-mentioned concerns, the Commonwealth must first look back at the initial structure and approach taken to implement this project. The approach taken by the Commonwealth had two major risks:

1. The Commonwealth being its own integrator; and
2. Deploying a statewide system that did not have the implementation history in other venues of similar size, scope and complexity.

The Commonwealth's decision to assume responsibility for integration of the system was based on advice from the management consultant, Florian Mikulski who was hired by the previous Administration before the project was bid in 1996. The management consultant suggested that the Commonwealth could save more than \$70 million by not hiring an integrator.¹ Also, Mr. Mikulski projected a 20-month timeframe for completion of the project. This projection was based on 2 key assumptions that proved to be incorrect:

1. A Pre-existing site plan was accurate; and
2. The solution being implemented utilized traditional radio communications technology.

Rather than hiring an integrator, the Commonwealth established the Radio Project Office (RPO) and entered into a consulting services contract with RCC Consultants to provide system engineering, technical support and project management assistance. Given RCC's experience with the implementation of large radio systems, it was believed that the Commonwealth could mitigate the risks of assuming responsibility for integration.

However, the Radio Project Office (RPO) was not structured to support the implementation and management of a newly developed technology - this was less a decision of the RPO than a collective decision of the Commonwealth. This is the overriding issue hindering successful completion of this project. All other observations and findings in this report regarding issues impeding successful implementation, both real and perceived, have as their root the structure and charter of the RPO. It should be noted that purchasing and implementing a newly developed technology is neither a good or bad decision. It is simply the fact that if the decision is to go with a newly developed, state-of-the-art solution, then you must structure and manage the implementation and risks accordingly.

1.1.2 Will the Technology Work?

At a high level of technology development, the selection of an IP based, packet switched, software based communications infrastructure is a well-founded choice. This technology is the coming, future, or current state-of-the-art depending on the application and industry to which it is being applied. In future years, this investment will pay dividends compared to investing an

¹ June 16, 2004 interview with RPO

equivalent amount of money in an older, traditional radio communications technology. The best evidence of this view is the massive success of the Internet in providing communications on a worldwide basis. Its success is largely based on the viability of its technology infrastructure; emulated by the M/A-COM system.

Between this high-level view and the ground-level view of implementing this technology throughout the Commonwealth's agencies, a significant gap exists. History suggests this process will require diligence, dedication, and an unwavering focus on the project goals. Rough spots in development and problems requiring resolution are inevitable. In iXP's view, the long term interests of the Commonwealth will be best served by making this commitment.

Prior performance-based experience suggests that M/A-COM has, and will continue to work diligently with the Commonwealth to complete and resolve any development issues. To date, although slow moving in some areas, their performance has been technically thorough and committed to the directed process of completion. From a business perspective, M/A-COM must make this project a success as they see the future of communications systems being this IP packet-based approach.

1.1.3 Is Pennsylvania's System Public Safety Ready?

Although described in the RFQC as a requirement, the Commonwealth and the user agencies do not currently agree on the formal definition of a public safety grade system. This definition, when agreed to, should be applied to all aspects of the system design, including the system and features from M/A-COM, as well as the microwave system provided by Alcatel, and all sites - including their "hardening" for each of the infrastructure locations. The ultimate answer to the question of "Is the System Public Safety Ready?" will be answered *yes* only when the State Police and other public safety agencies agree to accept and fully use the system. This is currently not the case. Specific issues include:

1. System Software. The RPO has determined that release 4.0 of the M/A-COM software and its acceptance by them on October 15, 2003, satisfies M/A-COM's contractual obligation to deliver specified features and functions. Release 5.0 is currently completing testing and provides enhancements to this previous release. iXP has found the user agencies, specifically and most importantly PSP, do not have confidence that the current software release, accepted by the RPO, satisfies the requirements for a public safety system. Outstanding issues inhibit the ability of users to fully deploy on the new system. The Commonwealth needs to eliminate this gap in order that there is clear and concise understanding of how the system will operate before it is accepted and deployed for the PSP and other public safety users.
2. Current Coverage Percentages. The result of the most recent RF coverage test conducted on August 11, 2004, found that the cumulative coverage statewide is estimated to be 77.5 percent. Specific areas of 95 percent coverage exist, as do areas that are significantly below 77.5 percent.

1.1.4 Issues Related to Radio Coverage

There are three primary concerns related to achieving the contractually required 95 percent coverage by County level. The first is site construction and acquisition delays; the second is an increased reliance on micro-cell (cell) sites; and the third is coverage testing methods.

1. Site Construction and Acquisition Delays. Under current conditions, the process required to complete the system infrastructure, with both tower sites and cell sites to achieve the 95 percent coverage by County level could still be years away. At the present time there are 18 tower sites (towers) remaining in various states of completion. Completion of these 18 sites will provide the full compliment of 213 tower sites per the current system design. This figure does not include cell sites, however. There are still hundreds of sites (current estimate is 374) that have yet to be selected, designed and deployed.

Construction has not yet begun at 50% of these remaining 18 designed tower sites. Fully half of these tower sites are to be located on the property of one state agency, and as will be described later in this report, remains a cause of significant delays. Currently the procurement document for eight of these sites is awaiting Comptroller approval. Without any acceleration, it has been estimated that this procurement will not be completed until November of this year, at the earliest. This timeline does not include the additional estimated 374 sites that have not yet been designed.

2. Reliance on Cell Sites. Due to the various issues of permissions and site denials of other state agencies, local government entities and private enterprises the RPO has been forced to use many more cell sites to fill the coverage gaps left in areas that were slated for tower sites. The completion of the system design with an increased reliance on cell sites decreases the overall public safety grade of the system. Cell sites are not meant as a replacement to tower sites, as their use does not carry with it the same levels of reliability, capacity or security of a full tower site.
3. Coverage Testing Methods. The basis for RF coverage testing is outlined in section 20.0 of the original RFQC document issued by the Commonwealth. In short, it defines specific requirements for automated signal strength testing, as well as “Talk out/Talk back” or Circuit Merit testing. The interpretation of each Circuit Merit level and its associated voice sample is widely interpretive. This subjective nature of non-automated Circuit Merit testing plays a key role in the usefulness and repeatability of the measurements. Specifically:
 - a. Even properly trained and experienced communications professionals can often disagree on the rating of the same audio sample; and
 - b. The advantages and advanced capabilities of automated testing equipment are not utilized.

Subjective testing of the network introduces further complications in the future when major engineering changes are made to the operational system. In order to compare the effects of the design changes, significant personnel, time, and resources are required to duplicate the acceptance testing methods. These methods may be impractical or difficult to justify.

This inherent high variability in subjective tests due to the nature of different individuals evaluating audio quality, as well as the insignificant statistical sampling rate being conducted in each location, suggest that an automated approach, along with Circuit Merit level testing would be more reliable.

1.1.5 The Perceptions of the State Agency Users and Their Ability to Transition to the New System

Many agencies believe the RPO is not staffed to adequately address their concerns. The same resources have the responsibility of both operations site development and implementation. The agencies interviewed cited concerns in the following areas:

1. Software Features and Functionality;
2. Training;
3. Flow of Information;
4. Assistance with Fleet Mapping;
5. An Understanding of the Product and Technology;
6. Coverage;
7. Interoperability; and
8. Lack of Ongoing and Accessible Support.

The RPO does not have the primary responsibility for the transition activities of the state agencies. Traditionally the role of the RPO would include establishing and maintaining the master plan, coordinating with the users, providing training and direction of staff, integrating user-staff into the transition activities for each specific agency, and ensuring that transition support is provided to the end users. Unless users are supported for a period of time after the transition; inexperience, confusion, and a plethora of problems will result.

While it was wise for the Commonwealth to establish the RPO to oversee the implementation of the system, the early policy decision by the Commonwealth to shift responsibility for transition and rollout of the system, from the RPO to the user agencies, has contributed to the current difficulties in securing user agency acceptance. The Commonwealth should have ensured that the user agencies were partnered with the RPO, with shared responsibility for the successful rollout of the system, from the initial phases of the project through final transition of the system to the users. More extensive efforts on both acquainting key agency users with the operation of the new radio technology, and definition of key user agency functional requirements would have mitigated some of the current user resistance and subsequent delays encountered in developing critical functions at this late stage of the project.

In addition, the transition of users onto the system prior to completion and acceptance of the system development, although mutually agreed upon, was a source of risk, significant distraction, and allocation of resources away from the primary goals and objectives of the project. The same resources are being used to both operate the current system and complete the implementation. Increases in site utilization were tremendous and user feedback in the form of problems, unanswered questions, and the need for additional information and management while developing a live system, created a difficult and different environment, one not contemplated in any contract documents or change orders.

1.1.6 The Perceptions Regarding Non-State Agency (Local Government) Participation

The statewide radio system was originally designed to be utilized by 25,000 state agency users. The ability of local government entities to “piggyback” (become a user) onto the statewide system as their primary radio communications system was not intended nor mandated, but would be looked at on a case by case basis. The primary ability of local government entities to communicate with users of the statewide radio system was envisioned to be accomplished via interoperability between the existing legacy communications systems utilized by the local government entities users and the statewide radio system. It was never intended as a requirement that all local government entities must buy the same radio equipment in order to communicate with users on the statewide radio system.

In order to achieve interoperability, the Commonwealth has recently embarked on the creation of a Public Safety Communications Interoperability Plan, whose goal is to provide a roadmap to achieve interoperability through standards that allow users of different radio systems to communicate with each other without buying the same equipment. The policies and procedures, as well as the technology features and requirements are essential components in the development of the plan. While technologically detailed, the plan and approach should also incorporate the policy and procedures – i.e. how these communications are set up and broken down and under what conditions, should be the basis for justifying why any interoperability communications structure is being proposed and technology procured. One component without the other leads to a costly implementation with ineffective results.

1.1.7 What Are the Major Resolution Options the Commonwealth Should Consider to Complete the Project?

There are nine major options the Commonwealth should consider in order to effectively complete this project.

1. Restructure the RPO’s charter to include the responsibility for overall development and implementation. No organization has a central authority for success. This must be changed, and by definition, must reside with the RPO with joint performance objectives with the user agencies;
2. Finalize system requirements and gain stakeholder sign-off;
3. Establish a Site development team, composed of the RPO, Department of General Services, OIT and the Comptroller;
4. Review legislation changes similar to those implemented in Michigan, which expedited the site acquisition process;
5. Revisit system site design and identify weaknesses – gain stakeholder sign-off;
6. Review current system coverage testing procedures – consider the use of automated tools;
7. Develop a comprehensive Transition, Training and System Support Plan;

8. Implement a consolidated problem resolution identification procedure; and
9. Release the Public Safety Communications Interoperability Plan to the state agencies and local government entities as a “Roadmap.” This roadmap must provide answers not only to the technical questions, but also the procedural ones as well.

1.2 Conclusion

The Pennsylvania system, while currently not yet “Public Safety” ready (particularly from the PSP perspective) should be continued as many agencies would benefit from the system in its current state. Those agencies whose requirements are currently being met should, in an orderly and structured process, continue to be transitioned onto the system. The obstacles mentioned above are not insurmountable to overcome but are instead a product of how the project was set up to be managed.

There are four areas that need immediate focus. The first is the structure and charter of the RPO; the second is the resolution of site construction and acquisition issues; the third is opening the lines of communication among and between all stakeholders; and the fourth is re-involving the stakeholders, gaining their buy-in and sign-off. These actions, upon being implemented, will enable the Commonwealth to develop a realistic timeline for completion, have a single point of contact and project authority to identify and resolve issues and reduce fear, uncertainty and doubt among the user agencies.