

# Table of Contents

- Vision of Action..... 2
- Projects ..... 5
- Short-range Plans..... 5
- Long-range Plans ..... 8
- The Future ..... 8
- Metrics and Measures..... 9



## Vision of Action

The State of Michigan works diligently to provide access to a statewide public safety communications system for all Michigan public safety agencies. We strive to provide the ultimate in both inter-agency and intra-agency interoperability and facilitate cost-effective implementation and utilization of new communications technologies for those agencies.

The Michigan Public Safety Communication System (MPSCS) provides state-of-the-art communications using advanced technology based on nationally-recognized standards contained in the Association of Police Communications Officers (APCO) Project 25 specifications. As a leader in standards-based public safety interoperability, it is essential that the MPSCS stay current with new and important life-saving technologies. The ability to share information on demand and in real time, whether it is voice or data, is critical to the first responder.

The function of any public safety communications system is to assure rapid response and cooperation of emergency personnel. The MPSCS achieves this through statewide coverage and advanced technology, while remaining reliable and easy to use. System operation is monitored 24 hours a day to ensure that the system remains ready to assist Michigan's first responders deal with any situation. The MPSCS is the primary communications interoperability solution for Michigan's public safety first responders.

## Background

The MPSCS is a statewide radio communications system that:

- Serves over 1203 federal, state and local public safety agencies
- Is comprised of 231 tower sites, over 20 integrated state and local public safety dispatch centers and a network communications center serving over 40,012 radios
- Provides 97% mobile coverage across Michigan
- Provides enhanced portable coverage within the counties of Monroe, Genesee and Macomb as well as within the city of Detroit

Starting in the mid-1990's, the state made a significant investment to provide statewide radio communication for first responders. While the MPSCS was originally implemented to serve the Michigan State Police, in recent years the Michigan Department of Natural Resources and the Michigan Department of Transportation have become reliant on the system. More importantly, over 900 local public safety agencies have now joined the MPSCS, accounting for 84% of the system's "Push-to-Talks" (PTTs).

Today nearly 75% of the radios on the MPSCS are local public safety agencies units. The MPSCS is robust enough to serve the needs of many more federal, state and local agencies. Local agencies find the MPSCS financially attractive and benefit by leveraging the state's investment. The MPSCS provides the interoperable communications essential to today's emergency responder. Smaller agencies many times only need to acquire radios to join the MPSCS. Larger agencies frequently add additional towers and devices to provide in-building portable coverage within their jurisdiction or to meet other special local needs.

# Michigan Public Safety Communication System

## Goal 1: Interoperability

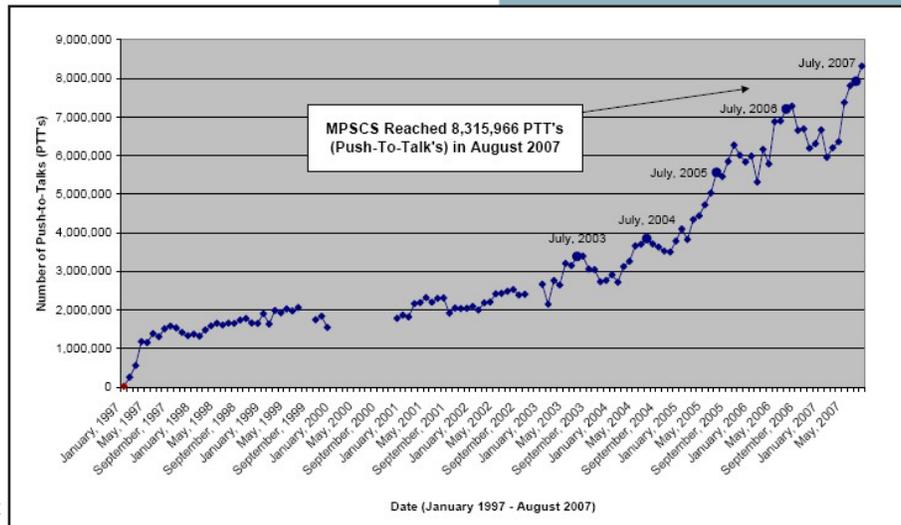
The MPSCS provides local, county and statewide interoperability without the implementation of cumbersome interconnections between radio systems called patches.

Because it is a standards-based shared system, any member of the MPSCS can speak with another member with the simple touch of a button, a feature that is already proven as a life-saving, safety-enhancing tool for the citizens and public safety officials of Michigan.

The system's ability to expand and adapt to unique requirements permits it to accommodate the current and future interoperability needs of Michigan's public safety community.

### Objectives:

- Continue to provide the highest level of interoperability for all first responders in Michigan
- Facilitate the addition of several thousand new radios by agencies awarded grant money
- Support initiatives for improving interoperability in southeast Michigan
- Support 911 dispatch center consolidation projects
- Support other forms of interoperability between the MPSCS users and public safety agencies still utilizing radio systems on analog mode or other frequency bands (Ongoing)



Monthly Push-to-Talks (PTTs) since system inception

## Goal 2: Outstanding Radio Coverage

The MPSCS provides 97% mobile radio coverage statewide. While there is no guarantee of portable radio coverage, many local agencies have enhanced the MPSCS by building and integrating additional radio infrastructure such as tower sites. This has significantly increased the MPSCS' portable radio coverage in southeast Michigan. The system's flexibility allows an agency wishing to achieve a specific level of portable radio coverage in its jurisdiction to add additional sites or other coverage-enhancing facilities. The system's adaptability allows various approaches to coverage enhancement.

### Objectives:

- Continue system enhancements to expand and improve mobile radio coverage statewide
- Add new members
- Integration of the Washtenaw County radio system
- Improve coverage in the city of East Lansing by addition of radio infrastructure at the East Lansing tower site
- Integration of several new towers provided by local public safety agencies funded through Public Safety Interoperable Communications (PSIC) grant projects
- Expansion of the St. Clair County radio system integration project
- Work with various other counties to facilitate integration of their radio systems

### Goal 3: Cutting-Edge Technology

The MPSCS has been recognized as being one of the nation's premier public safety radio communications systems. That recognition is based in part on the system's adoption of state-of-the-art technology.

The MPSCS utilizes the latest "digital trunked" technology. The system is also compliant with the Association of Police Communications Officers (APCO) Project 25 standards. These standards establish a common baseline of equipment specifications allowing various manufacturers to design and supply compatible radio equipment. The standards are continuously evolving to better meet the needs of public safety agencies.

Future MPSCS upgrades will include High Performance Data (HPD) capability. This will significantly increase the rate at which digital data can be transmitted over the system. It will also allow additional data features, including automated access to centralized databases.

#### Objectives:

- Replace aging equipment
- Offer the latest, proven technologies while maintaining compliance with established, recognized standards to ensure that the system never becomes technologically obsolete
- Maintain Project 25 compliance through the incorporation of new tested standards
- Expand data transmission and sharing capabilities
- Upgrade the MPSCS to add "high performance" data capabilities and integrate more advanced simulcast systems
- Pilot 700 MHz radio sites to provide access to additional interoperable spectrum
- Implement 700MHz voice channels and/or Project 25 TDMA standard

### Goal 4: System Upgrades at No Cost to Customer

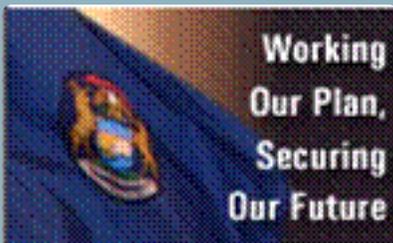
The state of Michigan is dedicated to keeping the MPSCS technology current. The system currently utilizes the Motorola ASTRO 25, Version 6.5 IP voice platform, a stepping-stone for future upgrades and enhancements. The system will adopt new technologies as new standards are developed.

For local public safety agencies, constructing a stand-alone system means the agency is responsible for upgrades – a process that can be costly and disruptive. By contrast, upgrades to the MPSCS infrastructure are currently installed free of charge to members; thus, users are provided the latest technology without the necessity of securing additional funds.

The MPSCS administrative and engineering staff remains dedicated to maintaining the system at the proven, forward edge of technology.

#### Objectives:

- Continue to provide upgrades of the infrastructure free of charge to members
- Upgrade of the MPSCS to Motorola's ASTRO 6.9 version software platform
- Expand the Interoperability Gateway Network to support both a strategic technology reserve and enhance system monitoring
- Develop and secure a funding strategy for future upgrades and "lifecycle" maintenance



## Goal 5: Rebanding the MPSCS to New 800 MHz Spectrum

Several years ago, the Federal Communications Commission (FCC) responded to significant interference to public safety communications created by the introduction of cellular architecture systems into the commercial 800 MHz spectrum. After much public debate, the FCC issued an order for public safety agencies on the 800 MHz band, including the MPSCS, to relocate within the band. This relocation is separating the frequencies used by public safety and cellular-type systems to eliminate the interference.

This rebanding process includes the retuning of every radio on the MPSCS and its entire 800 MHz infrastructure. Sprint Nextel, whose 800 MHz cellular telephone system is a principle source of the interference, agreed to fund the cost of the reconfiguration. This will eliminate the interference.

To successfully complete the rebanding and minimize disruption to the working public safety communications system, MPSCS staff developed a strategy for the rebanding implementation. At present, plans are largely complete and awaiting only final resolutions of certain international border area agreements to proceed.

### Objectives:

- Complete the development and facilitate approval of a comprehensive rebanding plan for the MPSCS
- Improve ongoing inventory and administrative processes for the MPSCS
- Eliminate interference to all public safety radios on the MPSCS through rebanding
- Ensure comparable operational characteristics after completion of the rebanding process

## Projects

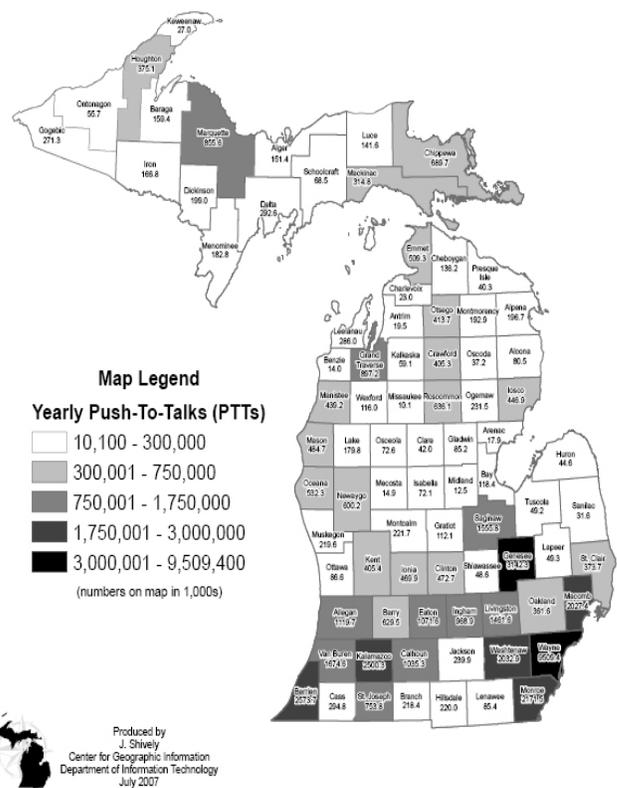
Provided below are examples of some of the short and long-range plans that the MPSCS staff has established to assist with carrying out the vision of facilitating the distribution and sharing of information; providing ease of use and accessibility; ensuring security and protection of information and promoting the use of central/shared systems.

## Short-range Plans

### Add New Members

There are several significant additions to the MPSCS membership in progress. These include St. Clair and Washtenaw Counties. Both counties are adding additional sites and infrastructure to the system to provide enhanced countywide coverage. Other counties are in the early stages of committing to join the MPSCS.

- In Washtenaw County, a new simulcast system consisting of 7 or 8 towers and over 2,000 radios will be completed in 2009.



## Provide Interoperability Options for Users and Non-Users

Interoperability is a widespread priority in the United States—due in large part to acts of terrorism and natural disasters in this country—and it is a primary function of Michigan’s communications system. At present, several interoperability options are available and in use with the MPSCS.

The system provides all current users with access to FCC-designated mutual aid and tactical channels. These channels use analog modulation and are available to all user radios operating in the 800 MHz NPSPAC band, regardless of home system type. With the 800 MHz rebanding presently underway, one challenge is maintaining interoperability with Canadian public safety agencies. Under the current system, U.S. and Canadian agencies using 800 MHz frequencies have access to a number of common channels. These common channels may be lost depending on the final border area frequency agreements established between the U.S. and Canada.

Non-MPSCS users on compatible 800 MHz digital trunking systems may have their radios programmed to operate on selected talk groups on the MPSCS system. Likewise, certain MPSCS users may have their radios programmed to operate on other compatible systems.

Non-MPSCS users on incompatible 800 MHz analog or digital home systems, such as Oakland County’s M/A-COM system, have access to the five common 800MHz mutual aid and tactical channels.

A cache of MPSCS radios is also maintained. These radios may be used in situations where other agencies do not use radios compatible with either of the previous options.

Finally, the MPSCS allows patches (interconnection via an appropriate interface circuit) to other radio systems in specific situations. This is not an optimal solution as it creates an additional load on the MPSCS resources and only operates effectively within the coverage area of the other agency’s system. However, it is a popular option used by many small to middle-sized agencies operating on other frequency bands to provide interoperability with the MPSCS system.

## Complete Upgrades and Plan for Future Improvements

Upgrades to the MPSCS take many forms. System-wide changes usually involve system software upgrades. Other upgrades tend to be localized infrastructure equipment changes necessitated by the addition of channels or sites or conversion of sites to simulcasting or a combination of these. Other equipment changes are necessitated by equipment obsolescence or failure. An overview of planned upgrades is provided below:

- **Dispatching:** The MPSCS currently uses Motorola’s ASTRO Version 6.5 software. This version includes capability for Integrated Voice and Data (IV&D). At present, IV&D capability is only being tested by Van Buren County. Data capability is limited to 9.6 Kbps. The next anticipated major system software upgrade is to ASTRO Version 6.9 software. This version software will allow the use of IP (Internet protocol) dispatch consoles and will create more dispatching capacity. This is critical because the system has reached a limit in adding additional dispatch consoles in southeast Michigan. This upgrade will eliminate the need for legacy Console Electronics Banks (CEB’s), and Ambassador Electronics Banks (AEB’s)—the audio switch that currently directs dispatcher audio.
- **High Performance Data Capability:** The ASTRO version 6.9 software also includes High Performance Data (HPD) capability on 700 MHz channels. This allows 96 Kbps data in a wider bandwidth channel. However, the channels at 800 MHz are normally 12.5 KHz bandwidth. High speed data will be limited to channels which have adequate clearance on each adjacent channel to allow the wider bandwidth.

- **Data Routing Flexibility:** Once the conversion to software version 6.9 has been made, the system can be prepared for the next stage upgrade, conversion to Version 7.0 software. This will include a new core network design utilizing MPLS (MultiProtocol Label Switching), allowing greater data routing flexibility and eliminating the Nortel wide area network (WAN) switch currently required in each radio zone.
- **Monitoring & Alarm:** The MPSCS infrastructure monitoring and alarm function is handled by the MOSCAD system. MOSCAD is rapidly becoming outdated, and support is becoming problematic. A new system will be needed to provide a suitable path for upgrade and expansion going forward. At present that path has not been determined.
- **System Diagnostics & Performance Metrics:** Another desirable upgrade is the ability to conduct system diagnostics and performance metrics based on the Air Traffic Interface Application (ATIA) "port trunking" data stream. There is presently only limited user traffic data collection and analysis capability available in the system. Software for performing analysis of this user data is available from a third party vendor (Genesis Software). Some investigation of its capabilities has been completed. However, consideration of this upgrade is still in very early stages, and no commitment has been made for the addition of this software.

An important aspect of the upgrade process is the fact that installed equipment has a finite lifecycle. It is necessary to replace aging equipment to maintain a continued level of performance and to obtain new capabilities and features implemented in the later design versions of the equipment.

### Monitor and Build System Capacity

As more and more public safety users join the MPSCS, system capacity must be closely monitored. When additional capacity is needed in certain areas, additional frequencies must be acquired. The MPSCS currently operates in the 800 MHz NPSPAC band which is quickly becoming full in high population areas. The 700 MHz band will be available for use by public safety in the future. Both 800 MHz and 700 MHz may be used in a single radio by purchasing equipment capable of operating in both. The 700 MHz band can thus be used to increase system capacity in areas where the 800 MHz band is congested.

Future improvements in technology will also help address system capacity concerns. Currently the Project 25 Phase 2 standards for time division multiple access (TDMA) systems are in the development stages. Once implemented, the new TDMA standards would facilitate the manufacturing of equipment that would allow twice the capacity on each transmitter. This would in turn provide more than twice the capacity at each site using the same amount of frequency spectrum and equipment.

### Dispatch Consolidation

The trend is to consolidate 9-1-1 call-taking and dispatch operations into centralized facilities handling multiple agencies. This provides improved cooperation and coordination, a significant manpower and facility cost savings, and reduced requirements on the system infrastructure. The MPSCS members currently have consolidated dispatch facilities in a number of districts.

The MPSCS dispatch systems currently operate on a platform that is limited by its dated synchronous architecture. Due to the extraordinary growth of the MPSCS, certain areas of the state are close to the maximum number of dispatch consoles that can be supported. The MPSCS is addressing these issues through dispatch consolidation and proposed system upgrades. As part of a MPSCS dispatch consolidation, new IP-based equipment will be utilized. This equipment has greater capacity and is far more efficient, allowing the MPSCS to accommodate its rapid system growth and dispatch needs.

Current P25 standards now include IP-based dispatch consoles as part of the CSSI console sub-system interface standard. This will allow the MPSCS to have greater flexibility in purchasing from multiple vendors, eventually resulting in greater savings through the competitive bid process.



## Long-range Plans

### 700 MHz spectrum availability

The FCC has allocated 24 megahertz of spectrum to public safety in the 700 MHz band. There are two issues preventing the MPSCS use of this spectrum at present. The first is the existence of several television stations on the spectrum in the southern portion of the Lower Peninsula. Those stations must vacate the spectrum by February 2009.

The other issue is the FCC acceptance of the Michigan 700 MHz band plan. This plan details how the Michigan Regional Frequency Advisory Committee intends to allocate the frequencies in the 700 MHz public safety spectrum. The plan has been submitted to the FCC and, once the plan is accepted, the Regional Planning Committee will be authorized to review and approve license applications.

The 700 MHz spectrum will provide additional narrowband voice channels. It will also allow aggregation of channels in a designated portion of the available 700 MHz spectrum into wideband channels. This portion of the spectrum is the subject of much current debate and could be affected by FCC rules covering the auction of commercial 700 MHz spectrum.

A proposal to create a private carrier-public safety partnership to build a broadband, nationwide system was created by the FCC and incorporated into the recent auction of the 700 MHz spectrum. The network would provide commercial service with public safety users having priority access. However, the spectrum allocated for that partnership did not receive the FCC's required minimum bid and so was not sold. The FCC is re-evaluating the rules it created for that partnership and will revise those rules and attempt another auction of that spectrum later this year. The auction of the commercial spectrum is congressionally mandated to occur by 2008.

### 4.9 GHz

4.9 GHz spectrum is useful for short distance, point-to-point microwave links as it is similar to microwave. It is relatively short range with moderate gain antenna systems and is useful in creating data "hot-spots" similar to the Worldwide Interoperability for Microwave Access (WiMAX) systems used with personal computers. The relatively low cost of equipment for this purpose makes implementation attractive. However, the use of uncoordinated frequencies in this band may limit its usefulness due to interference from systems in adjacent areas using essentially the same frequencies. Some effort has been made to establish the Michigan Regional Planning Committee as a frequency coordinating body for this spectrum, but there is no official authority currently in place to take on this responsibility.

## The Future

### New Technologies

Some new techniques and technologies which might be employed in the MPSCS in the future are still in development.

Mesh technology is already used in some limited, data network applications. Its use in wide-area applications could reduce the requirements for additional base station sites, while still providing improved coverage, especially in rural locations.

The technology depends on each user radio becoming a data repeater which passes received data packets on to all other user radios within range. These radios in turn pass the data on to all radios within their range, and so on. Coverage is thus enhanced as each radio needs to communicate only with another nearby user radio instead of a fixed-location station, which may be considerably farther away.

Another technology now reaching maturity is the software-defined radio. This is essentially a computing platform married to broadband radio frequency components. The operating characteristics of the resulting radio are determined by the software running in the computing platform. Generation of various frequencies and waveforms is only a matter of programming the computing platform to produce the appropriate output waveforms or to process the received signals.

The radio can span significant portions of spectrum and operate in a variety of modes, and in analog or digital configurations. This flexibility will enable the radio to interface to a wide variety of services and provide a wide range of capabilities. These will all be easily and instantaneously selectable. Multi-band, multi-mode radios will be easily configured and, if necessary, reconfigured to add additional bands, modes, power outputs, etc.

The integration of a multifunction computing platform into the radio will also allow the radio to become 'smart' and cognizant of its environment. It will be able to search out and use unused available spectrum, avoiding interfering signals, and utilizing appropriate modes to insure seamless communications in a rapidly changing radio frequency environment.

There is little doubt that public safety communications systems will soon carry image data. This may be relatively simple, fixed images such as driver's license images at first, but once the gate is opened, advanced high-resolution imaging and real-time video will surely follow. This will place additional bandwidth requirements on public safety systems.

## Metrics and Measures

### Goal 1: Interoperability

- Facilitate the addition of several thousand new radios by agencies that were awarded Public Safety Interoperable Communications (PSIC) grant money beginning in the spring of 2008, with all projects completed by 2010
- Support completion of the MPSCS Urban Area Security Initiatives (UASI) for improving interoperability in southeast Michigan by 2010; the date grants must be completed
- Support completion of 9-1-1 dispatch center consolidation projects for the Michigan State Police and local public safety agencies, including St. Clair County in 2008 and Chippewa County by 2010
- Implement the MPSCS IP consoles in Washtenaw County by 2009
- Support other forms of interoperability between the MPSCS users and public safety agencies still utilizing radio systems on analog mode or other frequency bands (Ongoing)

### Goal 2: Outstanding Radio Coverage

- Integration of the Washtenaw County radio system by 2009
- Improve coverage in the city of East Lansing by addition of radio infrastructure at the East Lansing tower site by 2008
- Integrate new towers provided by local public safety agencies funded through PSIC grant projects by 2010
- Expand the St Clair County radio system integration project by 2009
- Facilitate integration of the Saginaw County radio system by 2010

### Goal 3: Cutting-Edge Technology

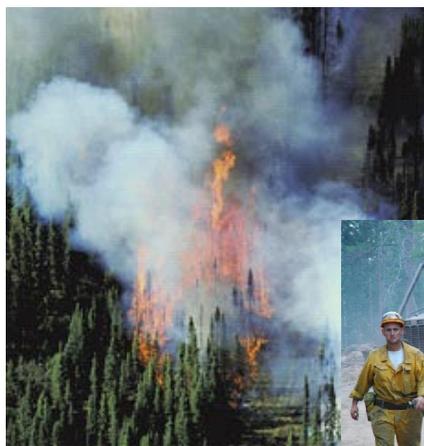
- Maintain Project 25 compliance through the incorporation of new, tested standards such as the Inter Sub-System Interface (ISSI) component and upgrading the MPSCS system software to Version 7.X by 2010
- Expand of data transmission and sharing capabilities (High Performance Data) by early in 2010
- Upgrade the MPSCS to add high-performance data capabilities and integrate more advanced simulcast systems by the end of 2008
- Pilot 700 MHz radio sites to provide access to additional interoperable spectrum by 2010
- Implement 700MHz voice channels and/or Project 25 TDMA standard if available by 2010

### Goal 4: System Upgrades at No Cost to Customer

- Upgrade the MPSCS to Motorola's ASTRO 6.9 version software platform in 2008
- Expand the Interoperability Gateway Network to support both a strategic technology reserve and enhance system monitoring by 2009
- Develop and secure a funding strategy for future upgrades and lifecycle maintenance in 2008

### Goal 5: Rebanding the MPSCS to New 800 MHz Spectrum

- Complete the development and facilitate approval of a comprehensive rebanding plan for the MPSCS by the end of 2008
- Eliminate interference to all public safety radios on the MPSCS through rebanding in 2009
- Ensure comparable operational characteristics after completion of the rebanding process in 2009



During the wildfires in the UP last year, MPSCS enabled interoperability between the Michigan DNR and first responders from Minnesota and Canada



Photo by Gina Harman  
www.superiorink.com