



International Wireless and Communications Expo IWCE
Las Vegas, Nevada
September 27, 2021

P25 for the Future

New Standards, Applications, Interoperability, Products, and Security

Presented by:
PTIG - The Project 25 Technology Interest Group
www.project25.org Booth 272



Introductions/ Agenda

PTIG P25 Resources Available

Stephen Nichols

Director Project 25 Technology Interest Group (PTIG)

P25 for the Future Agenda (1 of 2)



Steve Nichols, PTIG	Introductions, Agenda
	P25 Basics Video
Steve Nichols, PTIG	PTIG Members, Education Resources, P25 Benefits and ECO system
Jim Downes, DHS CISA	P25 Steering Committee Priorities and Future Roadmap, Importance of continued P25 LMR funding and evolution. CISA links: Video, SPUN, COMSEC; User Group update ISSI, COMSEC.
Andy Davis, Motorola Solutions	P25 Standards Update with focus on User Applications and Benefits. JLMRLTE update
Jeremy Elder, L3Harris	Practical applications of P25 ISSI: Common TG, Coverage Extensions, Multi system Roaming. P25 Location Applications and Benefits. Link Layer Encryption Overview
Michael Schafer, Compliance Testing	Role of the Independent Testing lab. Services to Industry and P25 User Agencies
Break	

P25 for the Future Agenda (2 of 2)



Sridhar Kowdley DHS P25 CAP	DHS CAP P25 Testing Program Update
Alan Massie, FBI	FBI System Snapshot. Encryption Interoperability: Federal with State & Local, NLECC
Scott Wright , State of Connecticut	P25 Connecticut Snapshot. P25 Sharing = Cost Savings Multi Agency Talk group planning, P25 Encryption Planning
Brad Stoddard , State of Michigan	P25 Michigan Snapshot. P25 Best Practices for System Governance and Growth. P25 Benefits to user agencies, paging.
Justin Evans , Montgomery County TX	P25 Montgomery County snapshot, P25 Benefits, ISSI Interoperability, Operations, Events, COVID 19 telehealth
Cheryl Giggetts , CTA Consultants	New P25 Products and Services for 2021
Steve Nichols , PTIG	Q & A session

P25 Basics Video



<..\..\..\..\P25 VIDEOS\Basics of P25 10Nov2020.mp4>



Project 25: Overview



Designed for public safety by public safety

Developed in partnership between Public Safety Users and The Telecommunications Industry Association (TIA) manufacturer members under guidance from the Project 25 Steering Committee.

- Project 25 formed in 1989
- Partnership with TIA established 1992
- Initial standards released in 1995
- Original goals have been met
- Ongoing development and evolution of the standards continue with broad industry support





Benefits of Project 25



- **A Public Safety Grade Technology** with High Availability through Redundant and Resilient Configurations
- **Direct Mode Communications** when Infrastructure is not available
- **Enabling Interoperability** for Multi Agency Sharing of Voice/Data/Location
- **Secure AES 256 bit Encrypted Communications**
- **Large Nationwide Installed Base of P25 Systems** including 42 State-wide.
- **P25 Sharing = Cost Savings & Improved Coverage for Users**
- **Multi-Vendor Sourcing** from 38 P25 Product and Service providers

***P25 is a Well Established Suite of Standards
with a User Driven, Evolving Technology***

The P25 ECO System Today



Established Base of over 2900+ Project 25 Systems on the air today

Including 42 Statewide Project 25 Systems in the US.

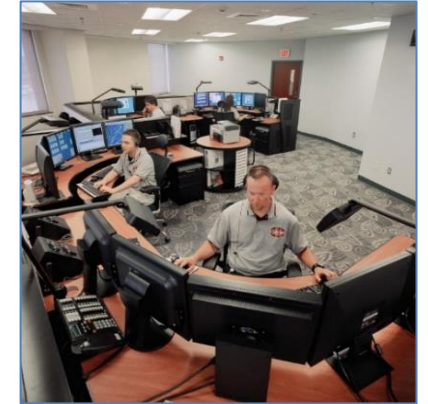
And, numerous Region-wide , County-wide, municipality, campus, and individual facility P25 systems.

Examples:

Michigan 110,000 users 1,665 Agencies 12 Million PTT /mo.

Miami/Dade 30,000 users, 110 Agencies, 7 million PTT/mo.

P25 is Operating in over **80 other nations World-wide.**



A Competitive Market-place with 38+ Project 25 Product and Service providers

offering a diverse range of P25 solutions at multiple price points

Independent Testing through the DHS CAP Program and a number of certified Independent Testing Labs.

An Active, Evolving Technology that continues to develop with new capabilities, upgrades, and test standards.



Founding Members



Sustaining Members



Project 25 Technology Interest Group



Corporate and Professional Members





Project 25

Technology Interest Group

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Tuesday, September 29, 2020

NEWS & EVENTS | PURPOSE | TECHNOLOGY | PRODUCTS | COMPLIANCE ASSESSMENT | MEMBERSHIP | DOCUMENTS



The Latest News

PTIG Publishes latest CSSI Non CAP Interoperability Test Results from Bosch Telex and Motorola Solutions

P25 Latest New Products and Services for 2020 from IWCE

P25 Priorities, Education, and Outreach Update from the Steering Committee

PTIG Welcomes STI-CO Antenna Solutions as a New Corporate Member

New P25 ISSI/CSSI Interoperability Document: Best Practices Vol II Now Available

Upcoming Events

No events

PTIG Website Login



Welcome to the Project 25 Technology Interest Group

The Project 25 Technology Interest Group (PTIG) brings you this web site to provide information on all topics concerning Project 25.

Please register on the site for access to additional information. If you previously registered prior to June 2010, a new registration is required. This is to assure we have current and accurate information.

Registration is required to maintain a spam free site for you. No Fees are required for website registration.

PTIG MEMBERS NOTE: When your individual registration is validated for affiliation to a paid membership or a commercial member company, your registration will provide member access privileges.

Use the dialog box titled **"Contact Us"** on the home page for any inquiries about registration and membership.

This site is the official home of PTIG and our P25 community. Your suggestions and comments are always welcome. Use the dialog box titled **"Contact Us"** on the home page to make your suggestions, offer comments, or seek more information.

List of P25 Trunking Systems

P25 ISSI/CSSI Interoperability

P25 Frequently Asked Questions

List of P25 Conventional Systems

P25 Standards latest Update

P25 Feature Translator

P25 Capabilities Guide

P25 Steering Committee Approved List of Standards

Why Choose P25?

New P25 Products and Services

P25 Resources available on the www.project25.org Website



- P25 System Lists: Trunking and Conventional
- P25 Video Links: P25 Basics and Encryption from DHS CISA
 - Basics of P25: <https://www.youtube.com/watch?v=2GTApTVOpkE>
 - Encryption in 3 Minutes: <https://www.youtube.com/watch?v=P1sKPEaHWUc>
- P25 Latest Standards Update & List of Standards Documents
- P25 New Products and Services
- PTIG Commercial Member listing Primary P25 Contact information and company Website link

P25 Resources available on the www.project25.org Website



- P25 Security and Encryption Links to DHS Library
- ISSI/CSSI Interoperability Links to DHS Library and Informal Testing Data
- P25 CAP Testing Program: Links to DHS CAP Program Library and approved equipment Lists.
- P25 Case Studies and System of the Month Articles
- PTIG Conference Panel Presentations PPT Slides
- P25 Frequently Asked Questions
- Benefits of P25



Thank You

Stephen Nichols

Director Project 25 Technology Interest Group (PTIG)

www.project25.org



P25 Steering Committee Priorities & Future Roadmap

Inter System Roaming and Communications Security

Jim Downes

Chief of the Federal and International Emergency
Communications Branch, Cybersecurity and
Infrastructure Security Agency (CISA)



P25 Steering Committee Priorities for the Future

- Mission: *Maintain and enhance resilient public safety communications operability and interoperability*
- Meet and exceed the demands of more complex regional response operations with new features and functionalities
- Improve the ability of the Inter-RF Subsystem Interface (ISSI) and the Console Subsystem Interface (CSSI) to connect radio systems and provide seamless roaming



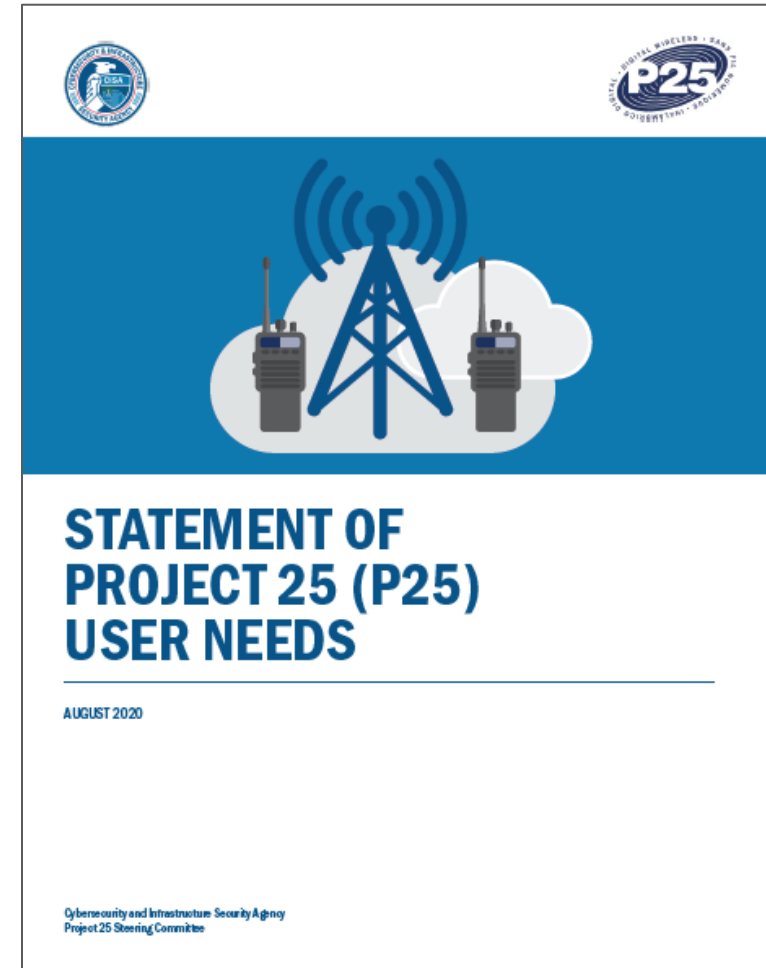
P25 Steering Committee Priorities for the Future

- Implement increased cyber protections against hackers and ransomware
- Enhance communications security to protect:
 - Sensitive information
 - Voice communications
 - Data traffic
- Explore advanced methods for interconnecting today's radio and long-term evolution (LTE) systems



Statement of Project 25 User Needs (SPUN)

- Framework to better understand P25 technologies and define communications needs
- High-level explanations of
 - P25 systems architecture
 - Features
 - Functions
- Developed by the P25 Steering Committee
- cisa.gov/sites/default/files/publications/10-06-2020_P25-SPUN_FINAL-r1_508c.pdf



P25 Steering Committee Efforts



EMERGENCY COMMUNICATIONS
ARE THE BACKBONE OF
PUBLIC SAFETY.

MAKE THE BEST
BUYING DECISIONS.

GET THE FACTS.

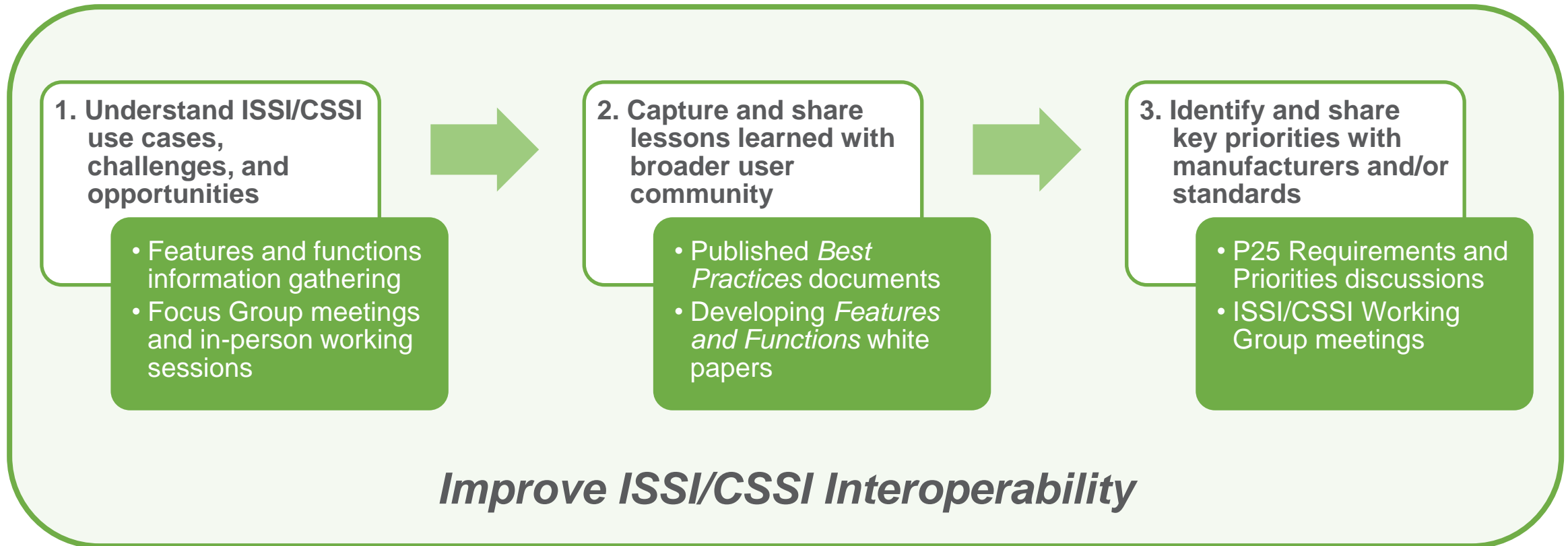
WATCH THE FUNDING &
THE FUTURE OF P25



- The [Basics of P25](#) Video
- [Encryption in Three Minutes](#) Video
- P25 101 and webinar
- ISSI 101 and webinar
- Funding and Future of P25 video
- P25 Steering Committee Handbook



ISSI/CSSI Focus Group Activities



ISSI/CSSI Best Practices Documents

- Volume I addresses:



Pre-Planning



Partnerships



Governance

- Volume II addresses:



Stakeholder Engagement



Policies



Technology



Thinking Ahead



FPIC Security Subcommittee Activities

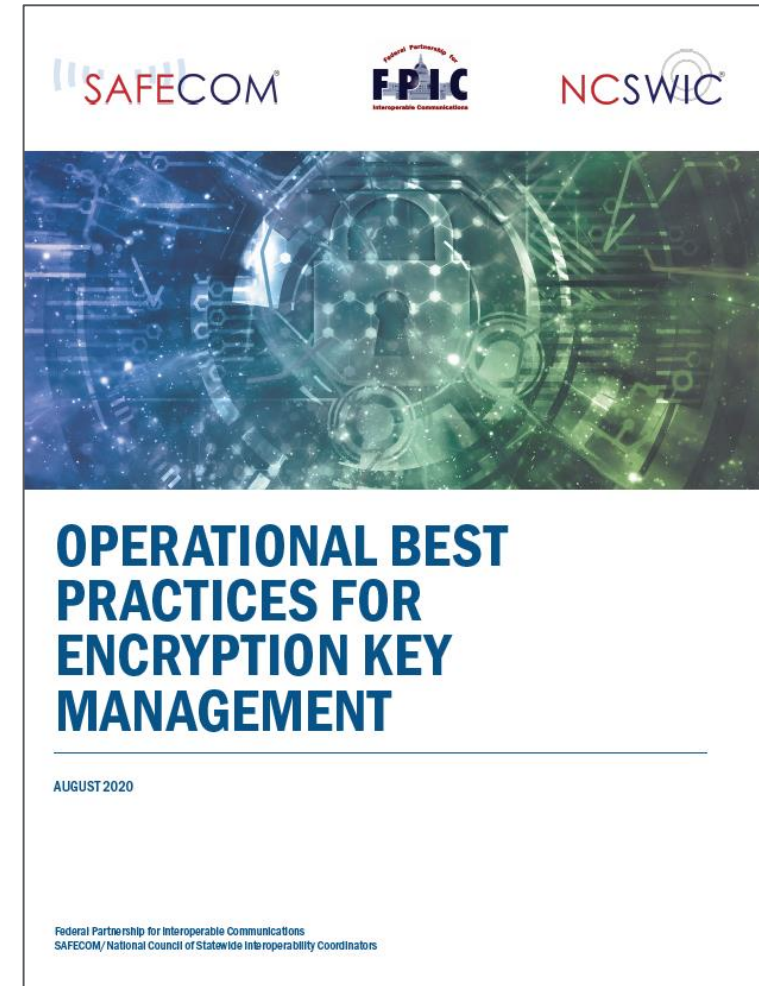


- Coordination amongst National Law Enforcement Communications Center (NLECC) and users on:
 - Sunsetting Data Encryption Standard (DES)
 - Addressing insufficient management of encryption key change schedules
- Revision of the published encryption documents



FPIC Encryption Operational Best Practices

- Best practices for key management, distribution, and governance among partner agencies based on lessons learned
- Vulnerabilities with continued use of DES and other proprietary algorithms
- Risks associated with inconsistent key change periods



FPIC Encryption Fact Sheet



Encryption Key Management Fact Sheet

What is encryption key management?

Encryption key management is the administration of policies and procedures for protecting, storing, organizing, and distributing encryption keys. Encryption keys (also called cryptographic keys) are the algorithm-generated strings of bits used to encode and decode data and voice transmissions. Effective encryption key management is crucial to the security of land mobile radio (LMR) communications and the sensitive information those communications contain. In addition to ensuring security, key management also ensures that encryption does not impede the interoperability of LMR systems and radios within and among agencies.

Why should I encrypt radio transmissions?

There are several reasons to encrypt LMR transmissions. First and foremost is operational integrity. Scanners and smartphone applications enable almost anyone to monitor public safety radio traffic and eavesdrop on everything from tactical law enforcement communications (potentially endangering law enforcement personnel and compromising mission integrity) to emergency medical communications containing sensitive patient information (violating citizen privacy). Encryption can keep such transmissions private within the public safety sphere. This does not mean all channels need to be encrypted; each agency should determine what information and channels require encryption.

How are encryption keys managed?

Encryption keys are managed using key management facilities (KMF) and key fill devices (KFD). KMFs are secure PCs, laptops, or other authorized devices that generate encryption keys and maintain secure databases of keys. They also securely transfer keys to KFDs, which distribute the keys to subscriber units (individual LMRs) either by direct connection or over-the-air-rekeying (OTAR).

Why is key management important?

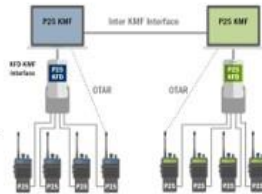
The privacy and security of encryption keys are the foundation of effective encryption. Key management maintains protection and security by controlling the distribution of keys and reacting immediately if an encrypted radio is lost or stolen. A lost or stolen radio that falls into the hands of an unauthorized user can compromise the security of the entire public safety communications system. Key management requires that such a radio be shut off remotely and new encryption keys be issued to all subscriber units.

Does key management affect interoperability?

Key management enhances the interoperability of LMR systems and radios by helping to ensure that all radios within the system have the same encryption keys, enabling them to talk to one another. Good key management policies ensure that encryption keys are shared with authorized agencies to maintain fully interoperable communications in mutual aid situations. Balancing security and interoperability is one of the core objectives of key management.

What encryption algorithm should I use?

Several encryption algorithms are available; however, they are not equal and do not offer the same level of security. The suggested best practice is to use an encryption algorithm validated by the U.S. Department of



- Intended for interested public safety agencies
- Provides a high-level overview of encryption
- Introduces the importance of proper key management
- Addresses the impacts of interoperability



Additional Topics for Consideration

- Continuing P25 Steering Committee Education and Outreach Activities
- Providing better understanding of P25 Features and Functions and interactions between different manufacturers systems and interfaces
 - Focusing user understanding on technical and operational capabilities of the technology
 - Educating and collaborating with the manufacturers on the operational needs and requirements of the users
- Developing educational webinars with TIA partners





Thank You!

Jim Downes

Chief of the Federal and International Emergency Communications
Branch, Cybersecurity and Infrastructure Security Agency (CISA)



P25 Standards Update and Future Projects JLMRLTE (LMR-LTE) Interworking Update.

Andy Davis

Chair of the TIA TR-8 Mobile and Personal Private Radio Engineering
Committee, Motorola Solutions P25 Support Manager

Project 25 Standards TR-8 Update



Completed in 2020:

Air Interfaces

- **A revision to the TIA-102 Documentation Suite Overview Telecommunications Systems Bulletin** was approved for publication.

This revision updates the documentation suite and feature information to align with new publications that have occurred over the last 3 years.

- **A revision of ANSI/TIA-4950-B “Requirements for Battery-Powered, Portable Land Mobile Radio Applications in Class I, II, and III, Division 1, Hazardous (Classified) Locations” Standard** was approved for publication.

This revision contains UL recommended improvements/clarifications to the document regarding electrical protection parameters updates

Project 25 Standards TR-8 Update



Completed in 2020 (Continued):

Security

- **An addendum to the Over The Air Rekeying Messages and Procedures Standard** was approved for publication.

This will allow single key radios to use any Encryption Key ID and will allow multi-key radios to use any Encryption Key ID in order to ensure interoperability between single key and multi-key equipment.

Completed in 2021:

Air Interfaces

- **A revision to the TSB-88.2 Wireless Communications Systems Performance in Noise and Interference-Limited Situations Part 2: Propagation and Noise** was approved for publication.

This revision includes various technical clarifications and propagation and noise associated with the 800 MHz Interstitial 12.5 kHz channels.

- **An addendum to the Trunking Interoperability Test Standard** was approved for publication.

This addendum clarifies the testing procedures for System Wide Call.

Project 25 Standards TR-8 Update



Completed in 2021 (Continued):

Wireline Interfaces

- **An addendum to the Trunking ISSI/CSSI Messages and Procedures Standard** was approved for publication.
This addendum describes how the ISSI/CSSI interface may be used to connect a Trunking RF Sub System to an Inter Working Function (IWF) to enable interoperable services between P25 Systems and LTE Mission Critical Systems.
- **An addendum to the Trunking ISSI/CSSI Messages and Procedures for Supplementary Data Standard** was approved for publication.
This addendum describes how the ISSI/CSSI interface may be used to connect a Trunking RF Sub System to an Inter Working Function (IWF) to enable interoperable services between P25 Systems and LTE Mission Critical Systems.

Security

- **A revision to the OTAR Messages and Procedures Standard** was approved for publication.
This revision addresses errata that have been collected since the last publication.



Project 25 Standards TR-8 Update

Work in Progress (1 of 3):

Air Interfaces

- **Creation of a High Signal Strength Intermodulation Rejection Test** is in progress.

This test will measure the ability of a P25 or analog conventional FM receiver to reject an unwanted broadband base station signal, thereby preventing degradation to the reception of a desired signal. The performance recommendations establish minimum levels of performance. Manufacturer specifications are expected to identify actual performance of specific products.

Measurement Method and Performance Recommendations for FDMA have been approved for publication. A review of proposed modifications to TDMA Measurement Methods is now under review. TDMA Performance Recommendations will follow.

Analog FM Measurement Methods and Performance Recommendations will be addressed next.

- **A revision to the TSB-88.1-E Part 1: Recommended Methods for Technology-Independent Narrowband Performance Modeling Telecommunications Systems Bulletin** is in progress.

This work will look into possible near-far interference issues for radios with wide pre-selectors in proximity of short-tower cellular systems at 700/800 MHz.

Project 25 Standards TR-8 Update



Work in Progress (Continued 2 of 3):

Air Interfaces

- **A revision to the TSB-88.3-E Part 3: Recommended Methods for Technology-Independent Narrowband Performance Verification Telecommunications Systems Bulletin** is in progress.

This work will consider (a) attenuation to account for building penetration, antenna height, and other factors for Coverage Acceptance Plans (CATPs) and (b) near-far interference for radios with wide pre-selectors in proximity of short tower cellular systems at 700/800 MHz.

Wireline Interfaces

- **Group Regrouping for the Trunking ISSI/CSSI Standard** is in progress.

This work will enable dispatch equipment connected to Trunking Infrastructures via the ISSI/CSSI to control group regrouping services. Note the control channel messaging for these services has already been standardized.

- **A revision to the Trunking ISSI/CSSI Messages and Procedures Standard** is in progress.

This document will merge two previously published addendums (Addendum 1; Group Emergency Behaviors and Addendum 2; Errata to Fix Errors and Omissions) into the previously published parent document.

Project 25 Standards TR-8 Update



Work in Progress (Continued 3 of 3):

Security

- **Definition of a Link Layer Encryption Security Service** is in progress.
This technology upgrade is for improved Security for all air interfaces of P25. It protects control messages, and hides group and individual IDs.
The Overview of the new services is considered complete along with the TDMA Air Interface material. Material covering Trunking Control Channel Key Management is in progress. Material covering FDMA Common Air Interface modifications and Key Fill Interface modifications are pending review.
- **A revision to the Key Fill Device Interface Standard** is in progress.
This will enable Key Fill Device (KVL) interface to a KMF, an Authentication Facility and another Key Fill Device. The revision will merge the draft addendum provided by the Encryption Task group with the currently published document.



ATIS/TIA JLMRLTE Working Group Background

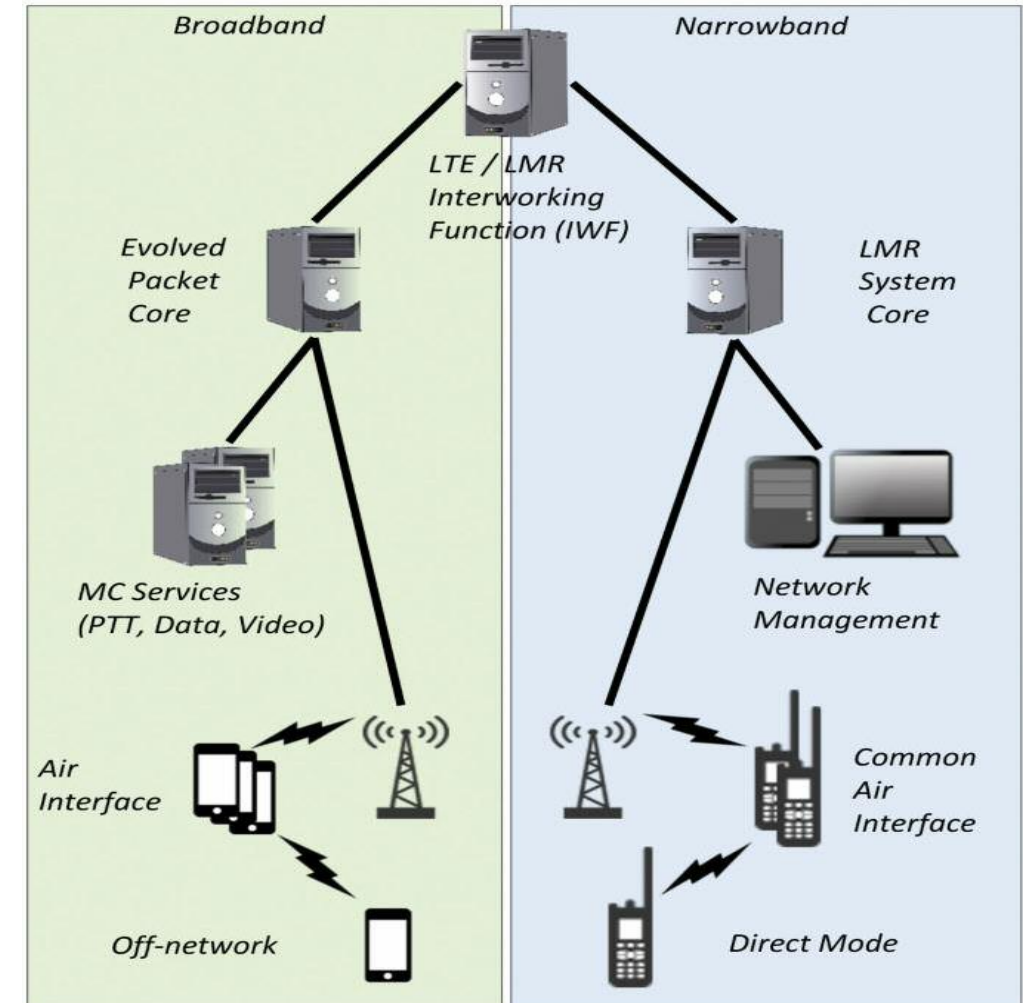
- The Telecommunications Industry Association (TIA) and the Alliance for Telecommunications Industry Solutions (ATIS) resumed work on standards for the interworking of mission-critical LTE and LMR services in late 2017, with a project committee known as Joint Land Mobile Radio Long Term Evolution (JLMRLTE).
- The current JLMRLTE work item is titled **the “Study of Interworking between P25 LMR and 3GPP (MCPTT) Mission Critical Services.”**

This document contains scenarios and considerations for the use of a 3GPP Release 15 interworking function (IWF) to enable interoperability of services between a mission-critical 3GPP system and a TIA-based LMR system. For the purposes of the document there are three distinct TIA-based LMR systems that are being examined: P25 trunking, P25 conventional, and TIA-603 analog conventional FM.

- 3GPP Release 15 and 16 documents define the interconnection of mission-critical 3GPP LTE systems and the interworking between LTE and non-LTE systems.

LTE/LMR Inter Working Function

- The 3GPP Interworking architecture defines an interworking functional entity (IWF). This IWF adapts LMR systems to LTE mission-critical systems via the 3GPP IWF interfaces and supports interworking between LMR systems and mission-critical LTE systems.
- From the 3GPP side, the IWF acts as another mission-critical system, and from the LMR side, the IWF acts as another LMR system.
- The IWF is the functional entity responsible for conversion of media, identities and control signaling between LTE and LMR technologies to enable interoperable services.





ATIS/TIA JLMRLTE Working Group Status

The JLMRLTE document is focused on describing how common services (features) may interwork (interoperate). The document does not prescribe a particular LMR interface to the IWF although P25 Inter-RF Subsystem Interface (ISSI) and Digital Fixed Station Interface (DFSI) have been chosen by TIA.

- The first phase of ATIS JLMRLTE work occurred in July 2019. Services tackled in this phase included registration, affiliation, group call (clear and encrypted), emergency group call, announcement group call, broadcast group call and manual key management. That work focused on LMR P25 trunking and conventional systems
- The second phase of ATIS JLMRLTE work completed in March 2020 and focused on multiple audio sources, LMR console takeovers, and emergency alarm and cancel.
- The third phase of ATIS JLMRLTE work completed in Dec. 2020 and included architecture of interworking of trunking individual call and group emergency cancel.



ATIS/TIA JLMRLTE Working Group Status

- On April 14, 2021, TIA Technology & Standards Secretariat published the following documents:
 - TIA-102.BACA-B-3 “ISSI Messages and Procedures for Voice Services, Mobility Management, and RFSS Capability Polling Services – Addendum 3 – Interworking with an IWF”
 - TIA-102.BACD-B-3 “ISSI Messages and Procedures for Supplementary Data – Addendum 3 – Interworking with an IWF”

These documents describe use of the Trunking ISSI for connection to an IWF for the purpose enabling the interoperability of a set of standard trunking services (features) common to the 3GPP MCPTT standards the P25 Trunking standards.

- The 2021 work on the JLMRLTE study is considered Phase 4. This work is expected to include cleanup of material on common P25 trunking standard services, consideration of common P25 conventional standard services, consideration of common Analog conventional FM standard services, consideration of IWF trans-encryption and consideration of additional key management methods.



LTE/LMR Interworking Summary

- The rollout of 3GPP LTE services is in progress and is expected to continue to progress in the coming years.
- There will likely be an extended period of time where both technologies exist in the market. This period of co-existing technologies creates a need for Interworking of these technologies during the period of co-existence. Interworking technology is also a beneficial enabler for migration from P25 technology to 3GPP LTE technology.
- The joint ATIS/TIA working group will continue to expand content of the study document to enable interworking of the technologies and migration to the LTE technology.
- Work will continue in TIA to maintain and update the P25 standard services.
- Work will continue in 3GPP to maintain and update the 3GPP LTE standard services.



Thank You!



Andy Davis

Chair of the TIA TR-8 Mobile and Personal Private Radio Engineering Committee,

Motorola Solutions P25 Support Manager

Andy.Davis@motorolasolutions.com



P25 Practical Applications of the P25 Inter System Interface (ISSI)

P25 Location Applications and Benefits

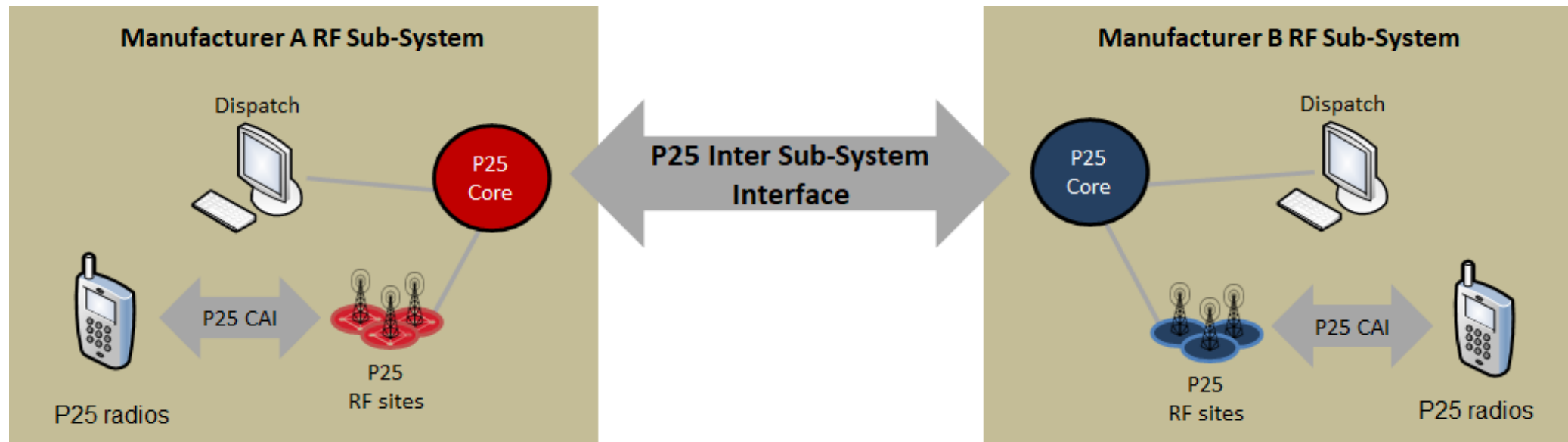
P25 Link Layer Encryption Overview

Jeremy Elder

Director of Product Management for Systems Infrastructure and
Subscriber Equipment for L3Harris Corporation

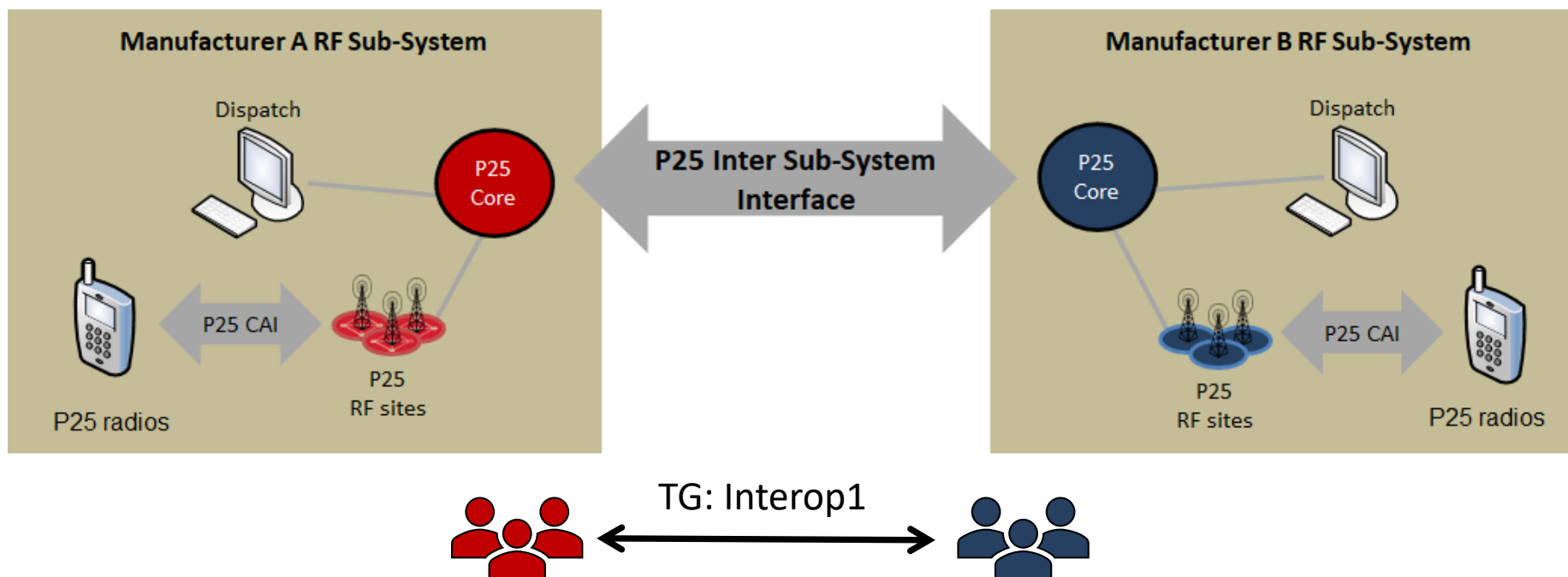
Practical Applications of the P25 Inter System Interface (ISSI)

- Inter-RF Subsystem Interface (ISSI) – G Interface
- The ISSI is a P25 Standard interface that can interconnect RF Sub-Systems (RFSSs), including those built by different manufacturers and with different software versions, into wide area networks such that users on disparate networks connected via ISSI can communicate with each other. These wide area networks are also known as “system-of- systems” architectures.



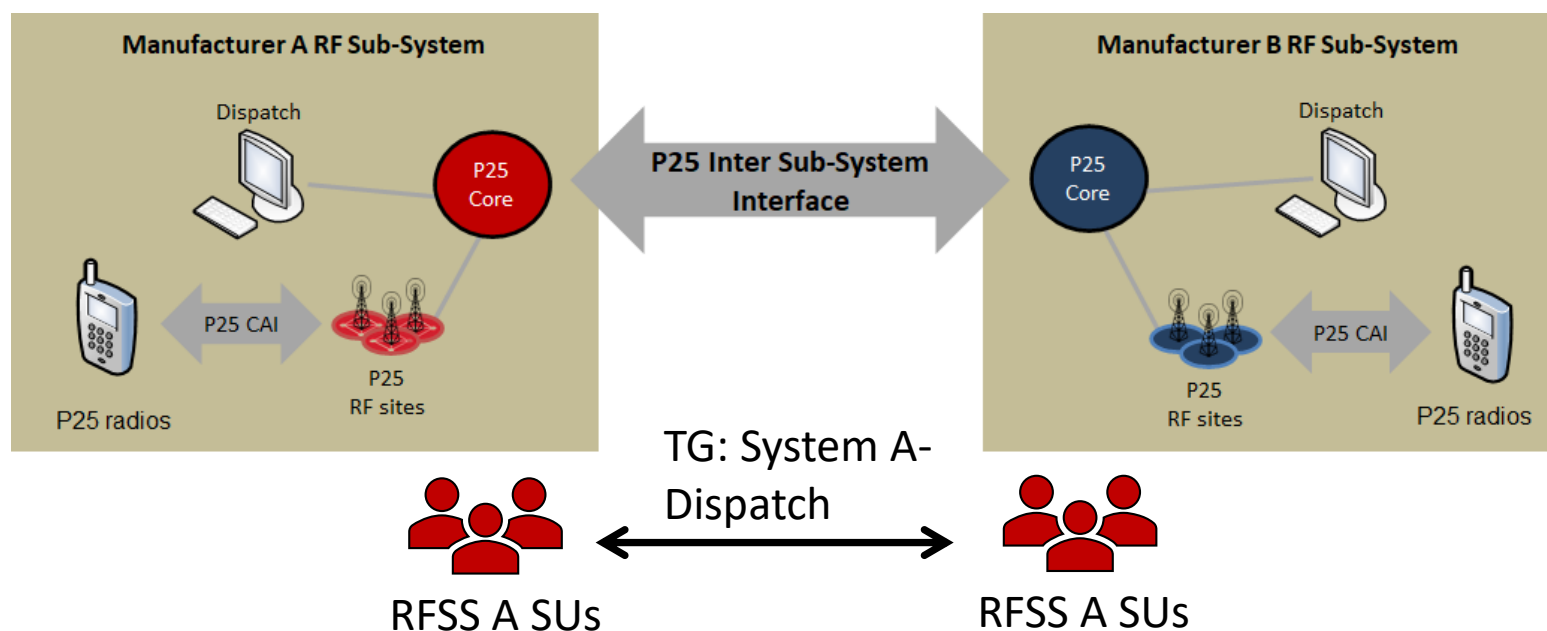
Constant Interoperability without roaming

- **Example situation:** Establish common Interoperability Group between disparate systems.
- **Solution:** Common ISSI Talk Group: Users from separate systems intercommunicate on the same group across the ISSI.
- **Key Customer Value:** Secure interoperable group communications between users on separate systems



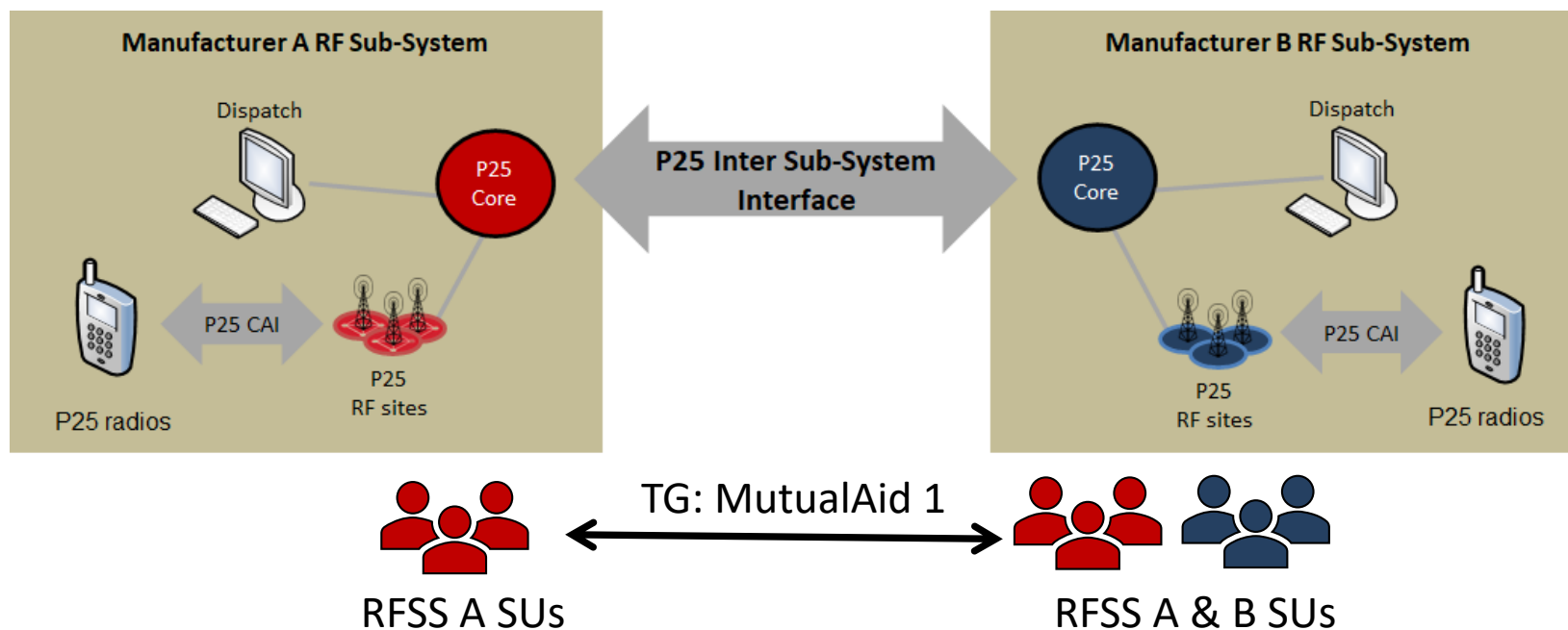
Extending RF Coverage

- **Example situation:** High-speed pursuit: During a pursuit, a law enforcement officer may leave the RF coverage of his/her network. The mobile radio roams onto the neighboring system allowing the officer to continue communications with their dispatcher and other nearby units.
- **Solution:** User roaming between RFSSs: Users register and affiliate on the foreign RFSS using their home credentials and are allowed to communicate back with SUs and dispatch on their home system.
- **Key Customer Value:** Extension of system coverage beyond the borders of the home system



Roaming with Interoperability

- **Example situation:** Mutual-Aid for incident response. First responders from one state travel to a neighboring state to support the overall response. While on scene, they communicate with users from their home state as well as with local users.
- **Solution:** User roaming between RFSSs AND Usage of a Common ISSI Talk Group at the same time
- **Key Customer Value:** Flexibility in coverage extension and group interoperability to support diverse situations



Customer Considerations with the P25 Inter Sub-System Interface



- Up-front planning is the key to a successful ISSI implementation. Best practices include: Specifying what capability is required from the beginning, establishing MOUs between affected parties early, and ensuring there is adequate time for establishing any fiber/network connections required.
- Understanding Supported P25 Capabilities Across the ISSI
 - The supported feature-set for the system of systems in an ISSI deployment is the overlap region of supported ISSI capabilities of each separate P25 RFSS or manufacturer implementation.
 - Commonly deployed ISSI features include unit registration, group affiliation, group call with caller ID, AES-256 encrypted calls, call preemption, and emergencies.
 - Some standardized features such as supplementary data or packet data capabilities may not be available in all implementations.
 - There are some advanced capabilities that are not yet standardized such as Group Regrouping
- During the implementation process, it is important to work closely with your chosen vendor to avoid known configuration pitfalls.

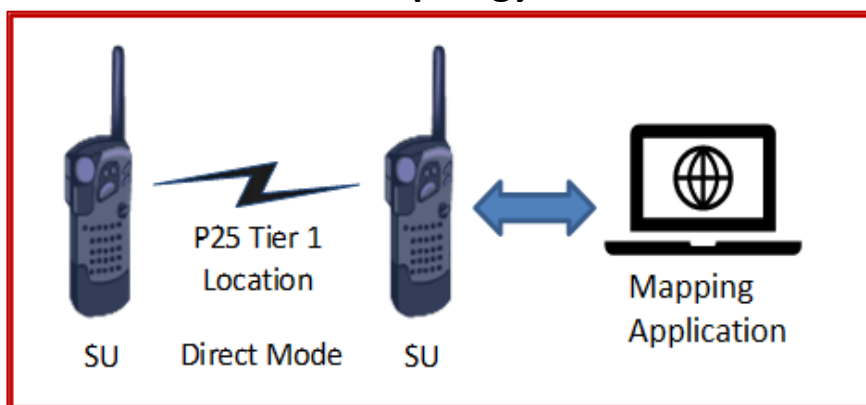
P25 Location Applications and Benefits

P25 location services allow location service host systems (LSHS) such as mapping software to receive location information from SUs within the P25 coverage area. Within the standards, location services are classified into two tiers (next slide). These services provide benefits for a variety of different critical communications applications.

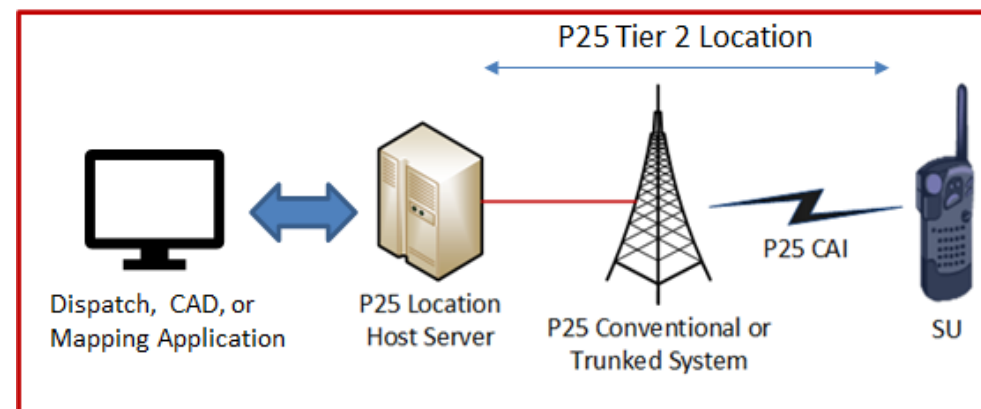


Comparison of P25 Tier 1 and Tier 2 Services

P25 Tier 1 Location Topology



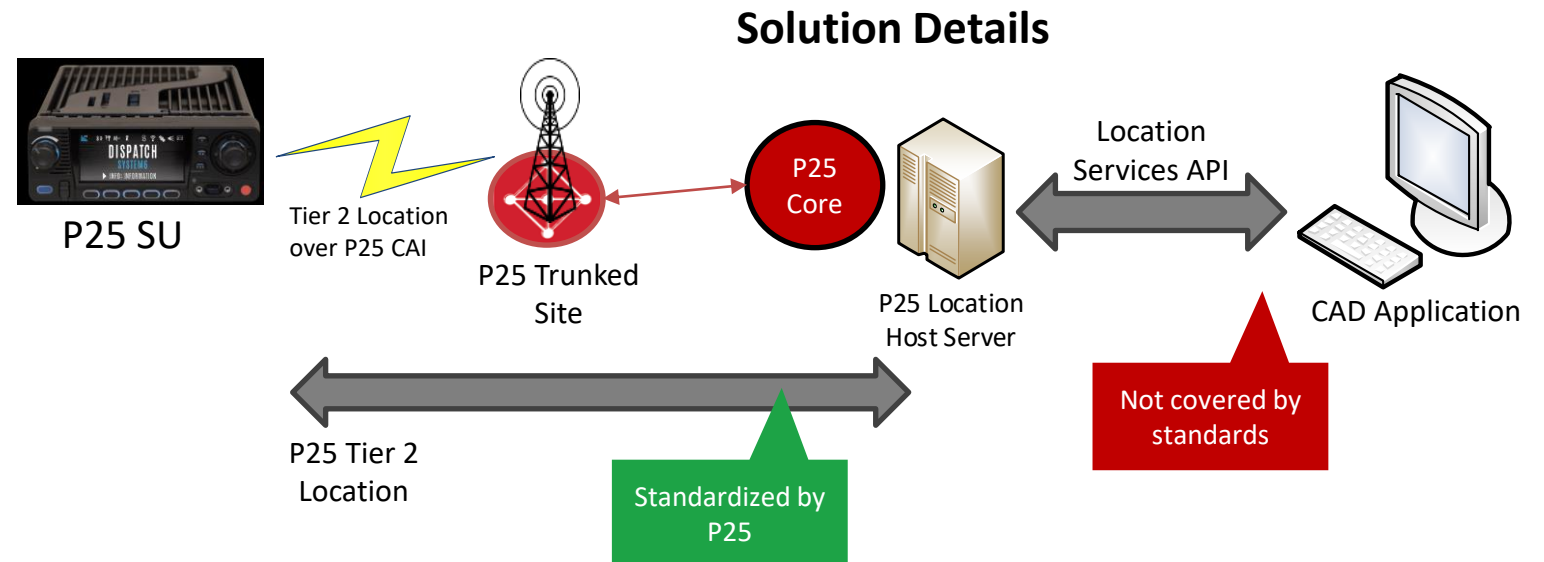
P25 Tier 2 Location Topology



Attribute	P25 Tier 1 Location	P25 Tier 2 Location
P25 Supported Networks	P25 Conventional Direct Mode Only	Any P25 Conventional or Trunked System
Supports external Location Host Server	No	Yes
Location Triggers Supported	Subscriber Unit Only: Based on local configuration	Location Host Server & Subscriber Unit: PTT, Periodic, Distance Change, Emergency, Power On/Off, Host Request, User Request
Typical Use Case	Sharing location between SUs in the field to improve situational awareness	Location Updates routed to a Dispatch, CAD, or Mapping application to provide vehicle tracking or personnel tracking during an incident or emergency

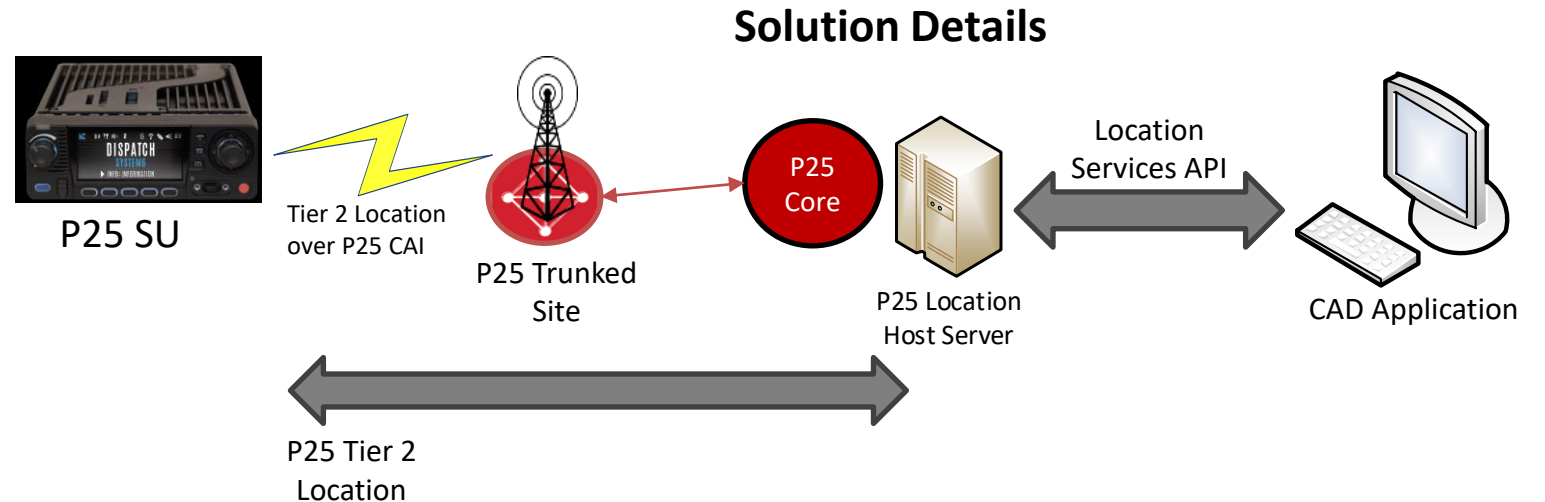
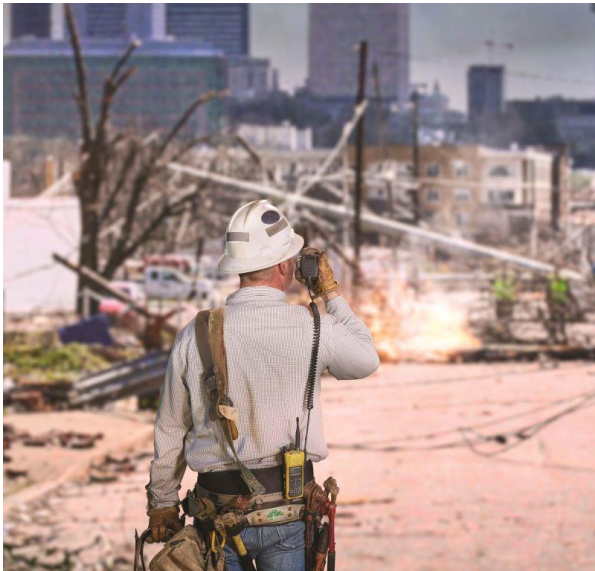
P25 Location Typical Real-World Examples

- **Customer Classification:** Public Safety: Local Police/Fire/EMS
- **Use Case:** Portable & Mobile location for reporting at Dispatch to track the response to incidents
- **Solution:** Tier 2 GPS exchanged across a P25 Network covering a locality. Location information is routed from the P25 LHS to CAD for the purposes of monitoring the response to an Incident
- **Key Customer Value:** Accurate picture of overall incident response and improved officer safety at dispatch



P25 Location Typical Real-World Examples

- **Customer Classification:** Major Investor-Owned Utility (IOU)
- **Use Case:** Mobile radio location for reporting at Dispatch to track restoration teams for repair and natural disasters
- **Solution:** Tier 2 Location exchanged across a P25 Network covering the service area of a major utility. Location of mobile radios vehicles is provided to the AVL application
- **Key Customer Value:** Improved worker safety and efficiency for dispatching work crews



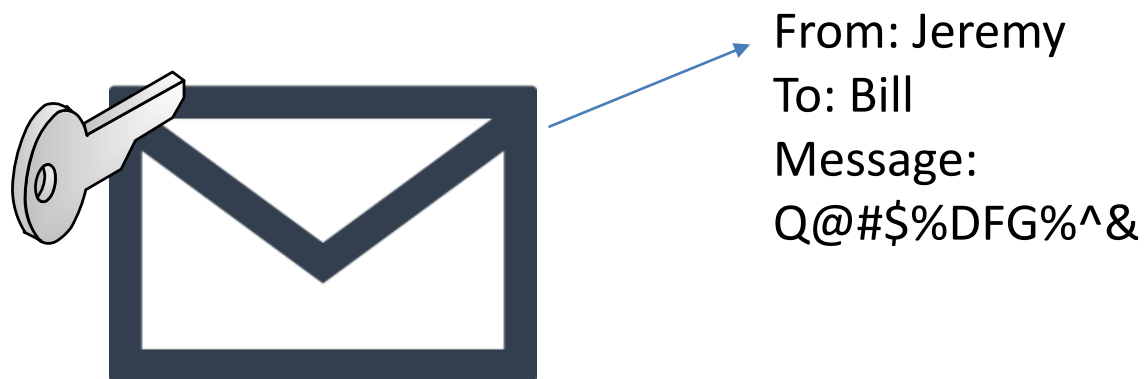


Customer Considerations with P25 Location Services

- GPS-enabled SUs are required. This capability is widely-available in the market for P25 radios.
- Tier 2 Location includes an extensive set of triggers. It's important to specify which triggers are required in procurements because trigger support may vary between manufacturers.
- P25 is a narrowband technology with limited data capacity. There are trade-offs to consider with (1) the amount of RF channel capacity reserved for data, (2) the number of SUs being tracked, and (3) the location update rate.
- The P25 standards don't address the interface between the LHS and external systems such as CAD or Mapping -- so that interface is manufacturer-specific. It's important to consider application integration with the LHS when deploying location services.
- In our experience, Tier 2 GPS is deployed more widely than Tier 1 GPS, so our examples focused on Tier 2 Location. Your experience may be different. We'd love to hear more about how Tier 1 GPS is being leveraged in the field.

LLE Problem Statement

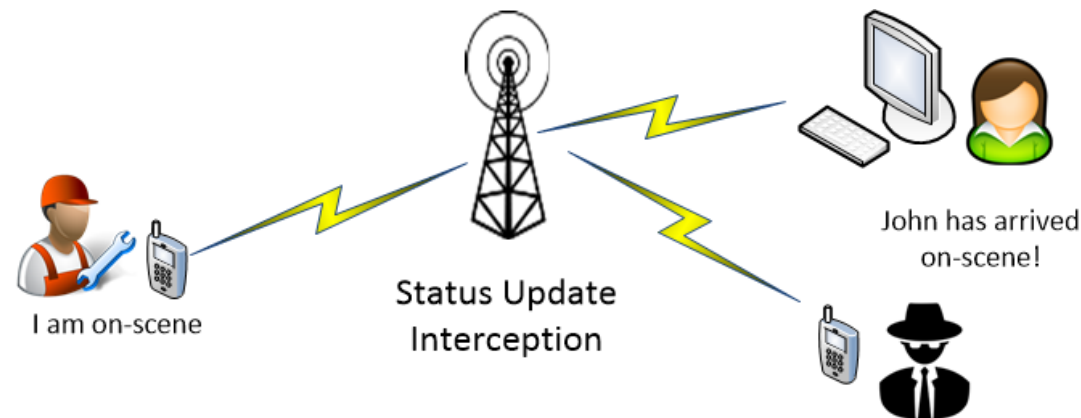
- P25 End-to-End Encryption for voice calls and packet data protects the contents of the transmission
- End-to-End Encryption by itself does NOT protect against intercepting the identities of the parties involved in a call
 - Initiator of a Call (Typically a User ID)
 - Target of a Call (Typically a Group ID but may be a Supergroup or another User ID)



LLE Problem Statement

Current state of P25 systems:

- Control signaling messages on traffic channels and conventional channels are not protected.
- P25 trunking control channel messages (inbound & outbound) are not protected.
- This includes:
 - User Registration/Group Affiliation, Service Requests & Channel Assignments
 - Supplementary Data Services such as Status Update, Short Message, Radio Unit Monitor, Unit Inhibit



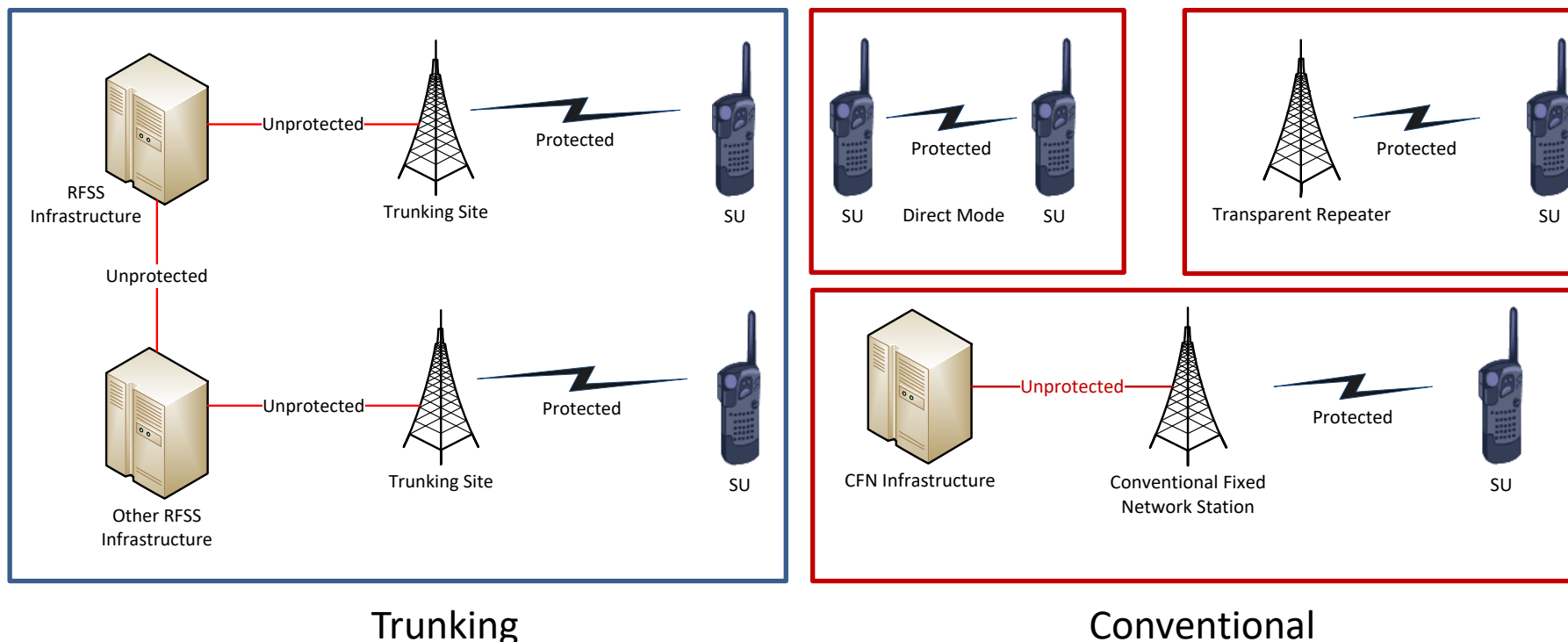


LLE Problem Statement

P25 Link Layer Encryption helps ensure:

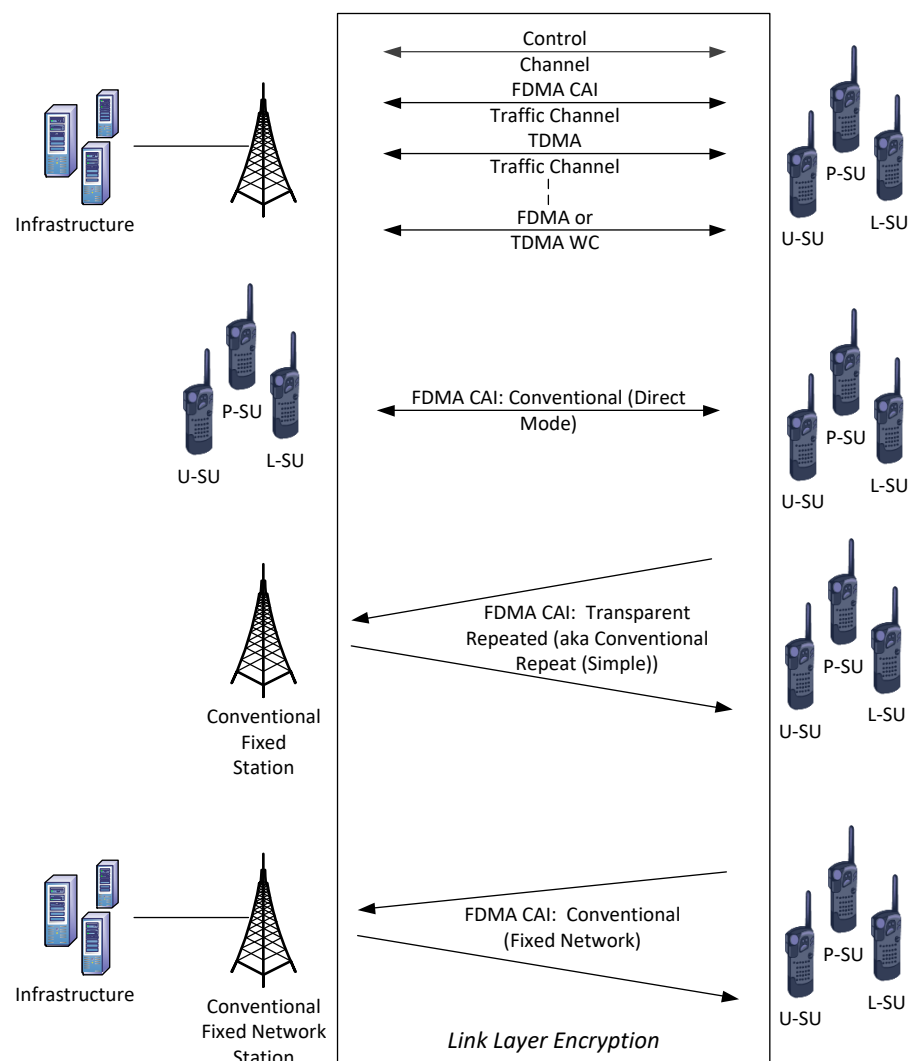
- **Integrity** – How can you know the message has not been altered?
 - Specifically Replay Protection ensures that a message cannot be resent later by an untrusted source
- **Confidentiality** – How can you be sure that the message is only received by the intended parties?
- **Key Distribution** – Do the initiating and receiving parties have the means to securely communicate?

LLE Solution Overview



- LLE only protects the air interfaces—nothing wired
- “Protected” means that identities and user data are encrypted

LLE Solution Overview

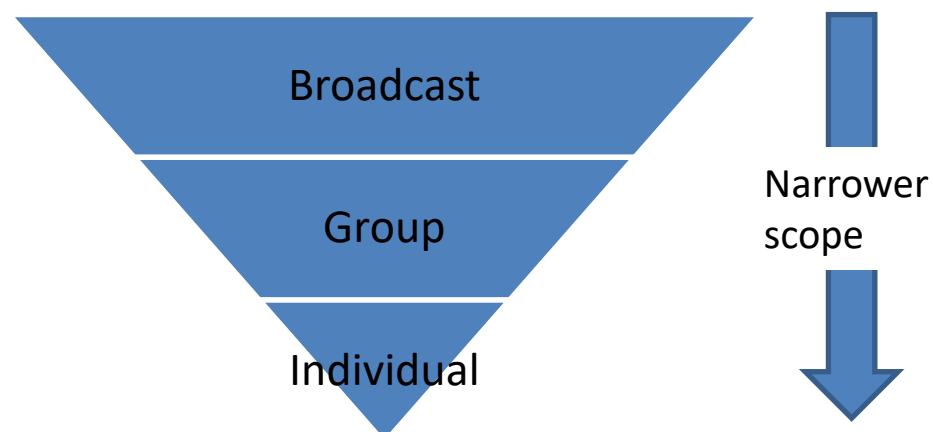


- Protected (P), Unprotected (U), and Legacy (L) SU can all co-exist on the same channel/site/system
 - Protected: Supports LLE and is operating with LLE
 - Unprotected: Supports LLE, but is running without LLE
 - Legacy: Doesn't support LLE
- All existing P25 channel types are supported—including TDMA CC

Key Management for LLE Overview

Important Concepts:

- The Link Encryption Facility (LEF) securely stores & distributes LLE Crypto material
- LLE Key Management provides for a hierarchy of keys and multiple key distribution methods. There are 3 types of LLE key distribution in the standard:
 - Broadcast key distribution: provides an efficient method for SUs to be efficiently key managed
 - Group Key Distribution: provides a method for groups of SU to be efficiently key managed
 - Individual key distribution: provides a method to provision keys to an individual SU





LLE Important User Considerations

- Updates to P25 standards for LLE will have no impact on users that don't require LLE
- LLE will support interoperability with legacy subscriber units that don't support LLE and subscriber units that support LLE on the same network
 - For example in P25T, the standards will support a mix of protected & unprotected groups operating on the same site
- Key management is designed to be as seamless as possible – supporting distribution of future keys before they take affect
- Protection of the Root Link Encryption Key and the derived Common Link Encryption Key is very important
- There is still some time until the standard is published—equipment conforming new standards are typically available 12-18 months after publication



L3HARRIS™



Thank You!

Jeremy Elder

Jeremy.Elder@L3Harris.com

Director of Product Management for Systems Infrastructure
and Subscriber Equipment for L3Harris Corporation



Project 25 Testing

Role of the Independent Testing Lab

Michael Schafer

President, Compliance Testing LLC

- Testing LMR since 1963 for FCC regs
- Independent P25 Accredited Test Lab
- Review Role of the Independent Testing lab. Services to Industry and P25 Users & Agencies

CT

COMPLIANCE TESTING

SINCE 1963



Compliance Testing LLC Background

- Operating since 1963
- Testing areas include;
 - LMR and wide array of electronic devices to FCC, CE for EMC requirements and
 - LMR (Radios) to P25 standards
 - CAI Performance, Interoperability, Conventional & Trunked
 - ISSI –CSSI Interoperability ,
 - ISSI – CSSI Conformance (pending)
 - Infrastructure Verifications – ISSI-pending, Traffic Radars



ISO 17025:2017 Accreditation



- **Accreditation requires Annual Certification of:**
 - Equipment
 - Staff
 - Competency
 - Impartiality (Risk analysis- Could Lab results be influenced?)
 - Field Testing (can perform accredited testing anywhere infrastructure is located)
- **To ensure:**
 - Accurate results
 - No Bias
 - FCC testing authority
 - DHS CAP TIA testing authority
 - Confidence in a Certification, DTR > SDOC – Statement of Declaration “*our device has passed the applicable standards of testing*” meets the requirements

Industry First:

P25 CAP ISSI Interoperability Testing

- **Three (3) Test Scenarios**
- **(self-test as an example) All Test Scenarios defined by DHS CAP Program CAB and STR**
- 1. **RFSS to RFSS:** Two RFSS's connected by ISSI. Mobile SU's initiate tests and indicate test results. FDMA and TDMA tests, No consoles.
- 2. **RFSS to Console:** RFSS w/no console against RFSS w/embedded console or a CSS. FDMA and TDMA tests.
- 3. **Console to RFSS:** RFSS w/embedded console or a CSS against RFSS w/ no embedded console. FDMA and TDMA tests
- **Test Event Set Up**
- 1. RUT/RST in two separate Motorola lab locations connected by VPN
- 2. Test Engineer in a third location (remote)
- 3. All connected via a normal Microsoft Teams meeting (no special connections, cyber security exposures, impact on IT systems, etc.)
- 4. Observations of tests initiated on SU's and test results on SU's observed and recorded by lap top cameras with web cams and smart phones connected via Teams.
- 5. Test Engineer directed and observed each test to record the test results



This Photo by Unknown Author is licensed under [CC BY-SA](#)

Role and Responsibility of Test Lab per ISO 17025

- Test device to applicable standards and report the results.
- In some cases, the results must be defined by the manufacturer
 - A beep will be heard
 - Screen will flash
 - Red light will blink
- Results in CAP are generally pass / fail vs measurements

New Standards Maturation Process



- ***Scheme Holders*** = Owners, Drivers; FCC, DHS, CE
- R1 of a released standard is generated over time and approved generally by a committee of stake holders
- Testing can reveal issues, inconsistencies, changes and adjustments needed in standard
- New features cause changes, adjustments or additions to standards
- Over time the standard “matures” and changes
- Goal is to Start with something and have a mechanism to improve it over time
- Users, Manufacturer’s, Lab’s feedback and perspectives will be different, but important to standards development

Upcoming Objectives



- Planning to add **Conformance Testing** to CT's accreditation, while we await the green light from DHS
- A “**dry run**” of ISSI-CSSI Interop test event on a **live system** is in planning on a State multi-manufacture Infrastructure. (Possibility to include Conformance at the event)
- Assessing **Periodic Live ISSI-CSSI System Verifications** to P25 CAP Standards to verify “readiness”



Thank You

Michael Schafer

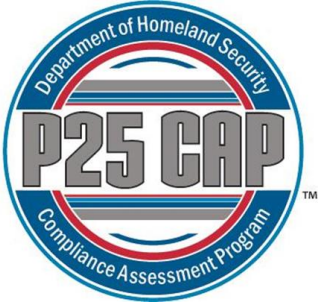
President, Compliance Testing LLC

International Wireless and Communications Expo IWCE
Las Vegas, Nevada
September 27, 2021



P25 for the Future

Break Time



DHS CAP P25 Testing Program Update

Sridhar Kowdley

Program Manager, CAP Program, DHS Science and
Technology Directorate.



P25 CAP Status Update

For IWCE 2021

Contact us: P25CAP@hq.dhs.gov with any questions, feedback, comments or if you would like copies of any documents referenced.

P25 CAP Testing – Common Air Interface (CAI)

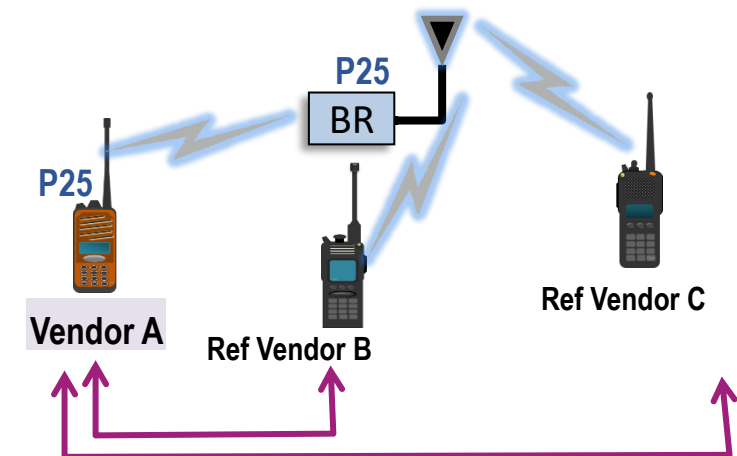
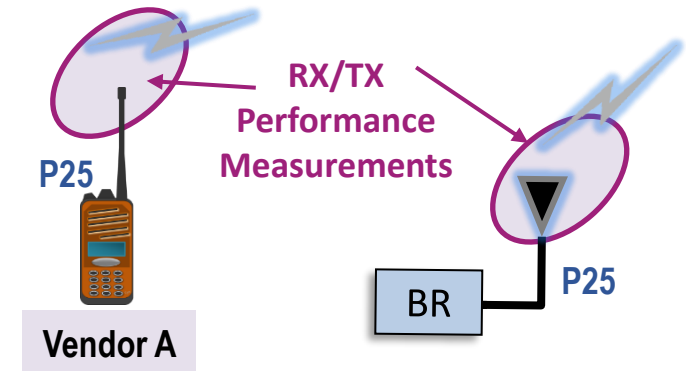


P25 CAP **CAI Performance** Testing – Verifies performance for both P25 Conventional and Trunking over-the-air *waveforms*

- Performed on P25 Subscribers and P25 Base Repeaters

P25 CAP **CAI Interoperability** Testing – Performed on three types of Conventional and on Trunking in both FDMA and TDMA modes.

- This suite of tests verifies the end-to-end operation between different vendors' equipment waveforms and P25 Feature over the air implementations



P25 System and Services Behaviors are Tested
“End to End” Across Multiple Vendors

P25 CAP ISSI Interoperability Testing



P25 CAP ISSI Interoperability Testing is Underway

P25 CAP Released ISSI/CSSI Interop STR

- First configuration of ISSI data is being entered
- New template being tested with real data

New ISSI STR Incorporate New Improvements



P25 CAP Near Term Plans

Continue P25 Gap Analysis – Focus on antiquated features

- Synthesize reports into draft summary recommendations, short term and strategic priorities, decision-making opportunities

Continue Supported vs Unsupported Feature Analysis

- Focus on Supplementary Data over ISSI, ISSI/CSSI Features Supported

Summary Test Report (STR) and Suppliers' Declaration of Compliance (SDoC) Optimization Implementation (Part 1)



STR/SDoC Optimization – Objectives

Mission Statement – Continuation of effort to build upon dramatic efficiency enhancements achieved in last STR revision which implemented change to an Excel-based template. This continuous improvement phase also includes revisions to the P25 CAP SDOC template to reduce the burden on P25 manufacturers and to improve usefulness of these primary, customer-facing documents.

- Reduce effort, cycle times and improve usability of P25 CAP reporting documents
- These are ALL Administrative changes in this initiative. Any changes to test cases, P25 Content or Feature Scope will be captured elsewhere.
- Implement optimized P25 CAP reporting tools, specifically the current “STR” and “SDOC” templates
- Create a manageable “step-by-step” plan to get from the current versions to a fully optimized version that will be available to our P25 Vendor customers
 - Review with stakeholders to obtain feedback and refinements using iterative reviews

STR/SDoC Checklist Released




Interactive, high-level checklist to reduce CAP review cycle times.

Sent to P25 equipment CAP and CAP lab Points of Contacts on 8/17

Feel free to request via P25CAP@hq.dhs.gov

Project 25 Compliance Assessment Program



STR/SDoC Submission Checklist

The following checklist has been compiled to provide P25 equipment Supplier submitters with a clear checklist of data verification steps we are asking be performed PRIOR to submitting to P25 CAP. This will enable the P25 CAP engineering Reviewer(s) to verify the data much more efficiently, enabling to dramatically reduce or approval cycle times. Thank You!

Complete? Yes/No <small>[Select Check Box to Activate]</small>	Description of Verifications to Perform <u>Prior</u> to Submission to P25CAP
<input checked="" type="checkbox"/>	1. Verify Submission Uses Correct and Most Current STR & SDoC Templates – Please verify submitted data is using correct and most current P25CAP STR and SDoC templates. Note underlying template content may not be edited without permission.
<input type="checkbox"/>	2. Verify Accuracy of DTR to STR Data Transfer – Please check accuracy of STR by verifying results of each P25 CAP Test Case results cell has been accurately reflected from a valid* and applicable DTR.
<input type="checkbox"/>	3. Compile and Prepare to Send ALL Referenced DTRs are Provided – All items below must be verified (not listed in any particular order).
<input type="checkbox"/>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Verified by Submitter <input type="checkbox"/> </div> <div style="width: 50%;"> 3a. Verify All DTRs required to verify submitted STR data are available to be sent upon request by P25CAP Reviewer. Do not include out of date or non-applicable DTR files. We prefer all DTRs in a single, zipped folder labeled with applicable submitted Model. OR to not send duplicates if applicable to multiple or previous, but please indicate this in DTR submission memo. </div> </div>
<input type="checkbox"/>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Verified by Submitter <input type="checkbox"/> </div> <div style="width: 50%;"> 3b. Verify referenced DTRs have the same and accurate DTR filenames, titles and page headers/footers. Provide notations to indicate any errors to P25CAP Reviewer in submission email. </div> </div>
<input type="checkbox"/>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Verified by Submitter <input type="checkbox"/> </div> <div style="width: 50%;"> 3c. *Verify all data submitted is still valid for P25 CAP references including, but not limited to referenced Test Equipment being in current DHS Grant Eligibility good standing. </div> </div>
<input type="checkbox"/>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Verified by Submitter <input type="checkbox"/> </div> <div style="width: 50%;"> 3d. Provide all necessary DTR passwords. </div> </div>
<input type="checkbox"/>	4. Statements of Performance Model Series Commonality – Per existing policy, all Test Data reused from a previously submitted Performance data as indicated must be accompanied by a statement of commonality attesting to the formal engineering assessment which assures the end user changes between models tested used in previous Performance Testing (1) do not affect resulting STR results reflected in submitted and reused DTR results data.
<input type="checkbox"/>	5. Statements of Interoperability Models', Software Version Commonality – Per existing policy, all Test Data reused from a previously submitted Interoperability STR test case results(2) as indicated must be accompanied by a statement of commonality attesting to the formal engineering assessment which assures changes between software versions do not affect Interoperability test case.
<input type="checkbox"/>	6. Verify Completion and Accuracy of all PoC Information – Provide all contact information for CAP PoCs including submitter, email submissions to P25CAP@hq.dhs.gov must include full signature line with title, company name and mobile or desk phone number.
<input type="checkbox"/>	7. Once Verified, Submit via Email to P25CAP@hq.dhs.gov! – Our current turn-around is 10-15 days; note the review clock is reset for each revision because a detailed review of the revised submission must be performed and we cannot be assured all requested verification and documents have been made available as referenced and/or requested.
<input type="checkbox"/>	(FYI) P25 CAP will Note Conflicts in Submitted STR Results against Current Test Equipment Vendor STR Data – Note P25CAP will be checking that no "STR-Level" changes in feature test case support have been implemented by Test Eqt vendors since referenced DTR Submission.

P25CAP Acronyms

DTR Detailed Test Report

SDoC Suppliers Declaration of Compliance

STR Summary Test Report

☐ Not complete

☒ Complete

Notes

(1) Refers to all P25 CAP Test Cases appearing in STR Tables labelled as "Performance"

(2) Refers to all P25 CAP Test Cases appearing in STR Tables labelled as "Interoperability"

Note the list above is only a partial list of verifications performed provided as part of the compliance assessment process.

DRAFT V4 - AUGUST 2021 - C01E

P25CAP STR-SDoC Checklist DRAFTV4 (8-9-21)



STR/SDoC Reminders

Please review new *STR/SDoC Submission Checklist*

New Subscriber STR Submissions

- Plan for 14-45 day turnaround
- Be ready to send DTRs promptly upon request

August 2021



THANK YOU!

We'd love to hear your feedback and perspectives!

Feel free to contact us a: P25CAP@hq.dhs.gov

For more information visit our website at

<https://www.dhs.gov/science-and-technology/p25-cap>



Thank You

Sridhar Kowdley

Program Manager, CAP Program, DHS Science and
Technology Directorate.



FBI P25 System Overview

Interoperability for Federal Agencies with State & Local P25 Systems

Alan Massie

Electronics Engineer, Federal Bureau of Investigation (FBI),
Operational Technology Division, Field Operations Section,
Radio Engineering Unit

P25 and FBI



FBI Shared Land Mobile Radio System (SLMRS)

- A nationwide P25 VHF Conventional system
- CONUS, Hawaii, Guam, Puerto Rico, USVI
- Cores located in Denver and Quantico
- Shared resources – ATF, DEA, FBI, USMS
- Each agency has own Dispatch and KMF's
- FBI alone approximately 47,000 SLMRS subscribers
- FBI P25 system includes two VHF Trunking Zones – NCR, PNW



P25 Feds and Encryption



FBI Shared Land Mobile Radio System (SLMRS)

- Federal Information Security Management Act
- SLMRS received ATO Oct 2016.
- Federal Information Processing Standards
- FIPS 140-2, AES Standard FIPS – 197, Nov 2001
 - FIPS 140-2 precludes the use of unvalidated cryptography *for the cryptographic protection* of sensitive or valuable data within Federal systems. Unvalidated cryptography is viewed by NIST as providing *no protection* to the information or data—in effect the data would be considered unprotected plaintext. *If the agency specifies that the information or data be cryptographically protected*, then FIPS 140-2 is applicable. In essence, if cryptography is required, then it must be validated.
 - With the passage of the Federal Information Security Management Act ([FISMA](#)) of 2002, there is no longer a statutory provision to allow for agencies to waive mandatory FIPS.
 - FIPS 46-3, DES was withdrawn May 2005.



P25 Feds and Encrypted Interop



FBI and other federal agencies/departments

- Are obligated to seek FISMA compliance
- FISMA compliance includes use of FIPS – AES is a FIPS
- Compliance cannot be achieved with DES, or RC4 variants
- Whether Federal, State, Local, or Tribal, for encrypted interop...
- Please use AES
- Note recent CAP AP/DHS rules on non-standard encryption
- Ponder how long DES may remain in P25 Standard?
- Is encrypted interop with Feds the justification you need?
- DHS/CBP/NLECC, Orlando, FL distributes interop key material



National SLN Assignments

SLN	Algorithm	Use	SLN Name	Crypto Period (Annual key changes are completed on the first working Monday of October)
1	DES	Public Safety Interoperable	ALL IO D	Annual
2	DES	Federal Interoperable	FED IO D	Annual
3	AES	Public Safety Interoperable	ALL IO A	Annual
4	AES	Federal Interoperable	FED IO A	Annual
5	DES	National Law Enforcement State and Local Interoperable DES	NLE IO D	Static
6	AES	National Law Enforcement State and Local Interoperable AES	NLE IO A	Static
7	AES	US – Canadian Fed Law Enforcement Interoperability	FED CAN	Static
8	AES	US – Canadian PS Interoperability	USCAN PS	Static
9	DES	National Tactical Event	NTAC D	Single Event Use – Not to exceed 30 Days
10	AES	National Tactical Event	NTAC A	Single Event Use – Not to exceed 30 Days
11	DES	Multiple Public Safety Disciplines	PS IO D	Static
12	AES	Multiple Public Safety Disciplines	PS IO A	Static
13	DES	National Fire/EMS/Rescue	NFER D	Static
14	AES	National Fire/EMS/Rescue	NFER A	Static
15	DES	National Task Force Operations	FED TF D	One time use as needed for Special OPS
16	AES	National Task Force Operations	FED TF A	One time use as needed for Special OPS
17	DES	National Law Enforcement Task Force (one time only operation)	NLE TF D	One time use as needed for Special OPS
18	AES	National Law Enforcement Task Force (one time only operation)	NLE TF A	One time use as needed for Special OPS
19	AES	Federal – International Law Enforcement Interoperability	FED INTL	When needed by operational requirement
20	AES	Public Safety – International Law Enforcement Interoperability	PS INTL	When needed by operational requirement

P25 Feds and Encrypted Interop



The best for last - SLN/CKR's

- SLN's are only required for comms between KMF and subscriber radio during OTAR
- SLN's have nothing to do with radios ability to decrypt a message (Key, Key ID, ALGID do matter)
- SLN de-confliction is only relevant within the context of your KMF/OTAR environment.
- If you want to interoperate with a subscriber that gets key from another KMF as long as you have the same Key, Key ID and ALGID, you will communicate.





Thank You

Alan Massie

Electronics Engineer, Federal Bureau of Investigation (FBI),
Operational Technology Division, Field Operations Section,
Radio Engineering Unit



State of Connecticut P25 System Overview

P25 Sharing = Cost Savings, Successful P25
Encryption deployment and management

Scott Wright

Sr. Telecommunications Engineer II,

Connecticut Department of Emergency Services and Public Protection

Connecticut Land Mobile Radio Network



Scott Wright
Sr. Telecommunications Engineer II

IWCE September 30, 2021

State of Connecticut - Demographics



Land area: 5543 sq miles (48th)

Population: 3,608,298 (29th)

Median Income: \$72,889 (4th)

Rail Transportation:

- Metro North - #3 commuter railroad

- Amtrak – NEC

Air Transportation

- Bradley International Airport

- Multiple regional airports

Bus Transportation

- CT Transit

Home to: 2nd and 3rd largest casino's in the US

- by gaming square footage

- Many tourism destinations



State of Connecticut – P25 System Statistics



Sites: 131, Sub-systems: 24

2 Zones – each with both on site and geo redundant servers

(14 simulcast systems/5 single site systems/5 deployable single site systems)

Frequencies: 150+

IP Consoles: 175

Subscriber units: approximately 20,000

2020 Statistics:

PTT's: 59,163,117

Seconds: 376,385,715

Connectivity:

Private/Shared Microwave

State Fiber Optic

Leased circuits



State of Connecticut – CTS System

Contractor Support:



Adesta/G4S

Microwave/Network

Network Control Center

Motorola

P25 system maintenance

Subscriber maintenance

Development of additional sites

State of Connecticut – CTS System

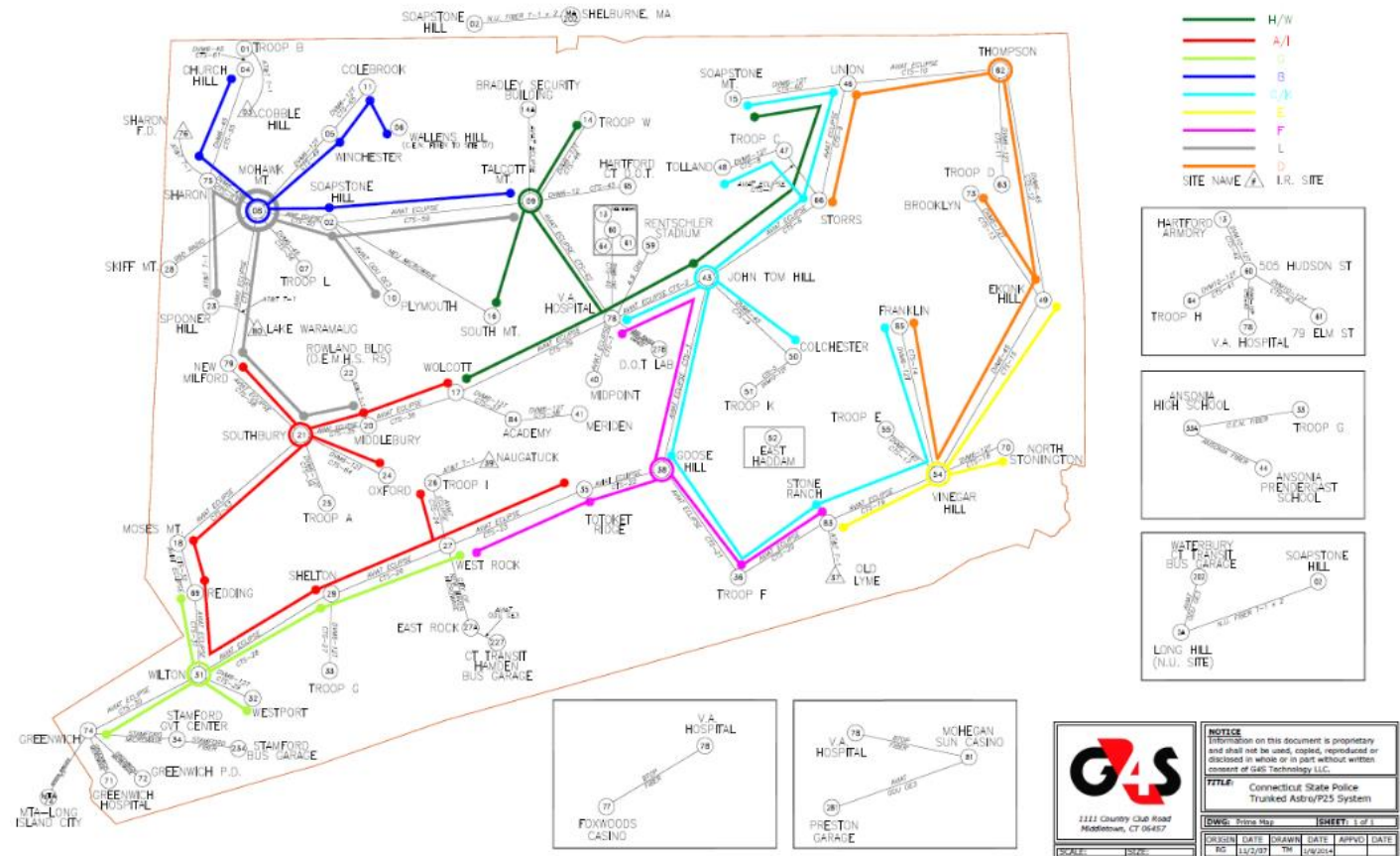


Microwave

IP MPLS Microwave

EXTREMELY stable and reliable

4 ring design



State of Connecticut – CTS System

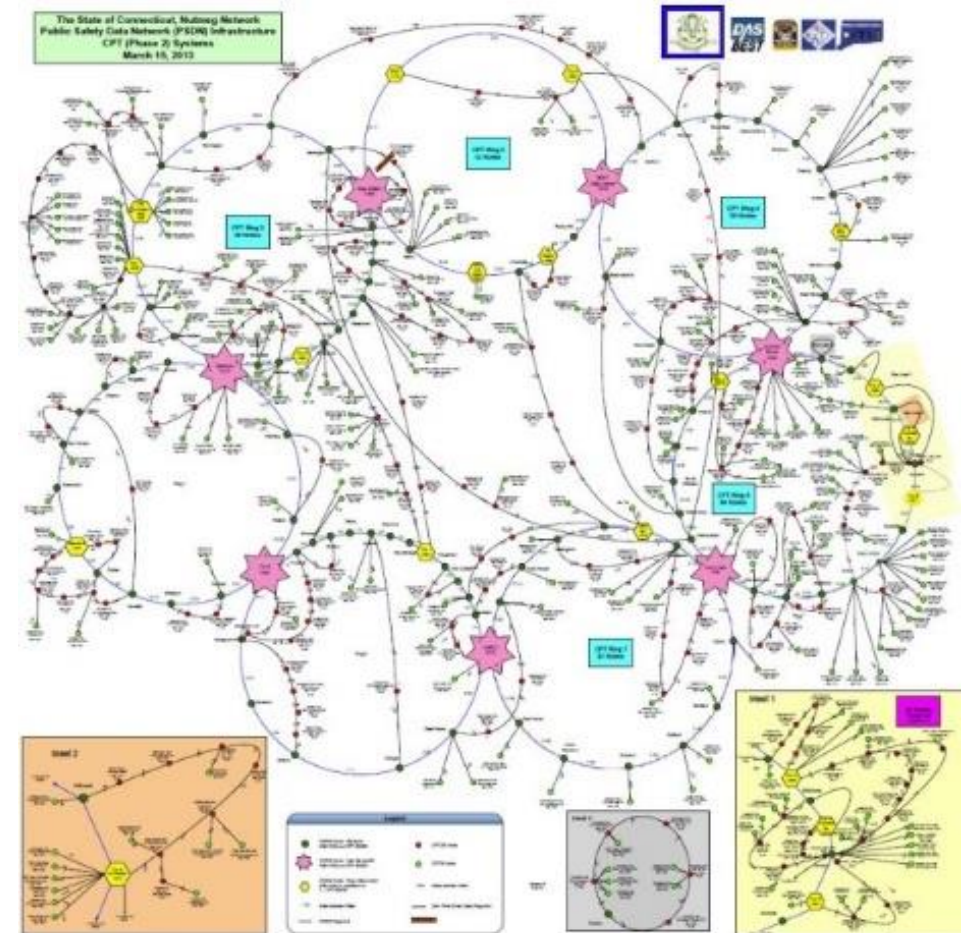


Fiber Optic

P25 allows us to use the State fiber network (Public Safety Data Network)

Serves primarily as redundancy to microwave for radio network

Provides connectivity to PSAPs



State of Connecticut – CTS System



DEPLOYABLE EQUIPMENT

Emergency Restoration Vehicle (ERV) – Site on Wheels

- P25 6 channel site-“deployable trunked”

- Conventional Base/Repeaters (33-862)

Deployable Standalone Trunked Systems (5)

Mobile Communications Vehicle

Command Post

Tactical Console System

- 14 Laptop based consoles – either on or off network

- 6 RF cases

- 3 Dual band (V/7-800, U1/7-800, U2/7-800)

CACHE portables (single and tri-band)

All can be connected via microwave, state fiber, or public network



State of Connecticut – CLMRN



Cost Savings:

Shared Core

- Maintenance costs don't change with the number of connections
- Leverage availability of State fiber (PSDN)
- Cost avoidance
- Use of ISSI/CSSI
- Discounts
- Multiple subscriber vendors



State of Connecticut – CLMRN

Cost Savings: Shared Core Example

One of our municipalities had their own stand-alone system, but were faced with significant upgrade costs (had purchased the software but NOT the hardware).

Leveraging using the State Core:

- Fixed network was updated for less than \$140k

- Future Core updates are eliminated

- Gained:

 - Statewide coverage

 - Redundancy

 - Significantly improved interoperability

- Network Control Center

State of Connecticut – CLMRN



Cost Savings: Shared Core

Models for coverage/capacity:

- Add sites to existing sub-systems

Typically lower utilization users

Avoids the costs of a prime site

- Add a new subsystem

Higher utilization users (cities, etc)

Improved coverage for all users

State of Connecticut – CLMRN



Cost Savings: Use of ISSI/CSSI

Currently using 3 ISSI / 5 CSSI connections with more planned

ISSI allows users to roam from their standalone system to the State

- Improved operability

- Improved Interoperability

- Redundancy

CSSI allows users to leverage investments in recently procured console systems

State of Connecticut – CLMRN



Cost Savings: Leveraging Availability of State Fiber (PSDN)

State Fiber is available at every PSAP and several tower sites in the state

Provides network backhaul connectivity at no additional cost to the users

Next generation hardware refresh currently underway

Building in additional redundancies

State of Connecticut – CLMRN



Cost Savings: Cost Avoidance/Discounts

Users have access to a much larger network than they could ever afford on their own

Additional discounting available based on quantities

Availability of common OTAP/OTAR facilities

Access to common spare parts

Multiple vendor subscriber units supported

State of Connecticut – CLMRN



P25 Encryption

Common Key Management Facility

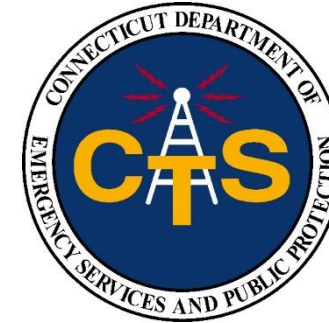
Coordinated encryption plan

Access to NLECC/FPIC interoperable encryption

Interoperable encryption IS possible



Thank You



Scott Wright

Sr. Telecommunications Engineer II

CONNECTICUT

DEPARTMENT OF EMERGENCY SERVICE AND PUBLIC PROTECTION

scott.wright@ct.gov

860-462-9899



State of Michigan P25 System Overview

Best Practices for System Governance and Growth, P25 Paging

Brad Stoddard

Director, Michigan's Public Safety Communications System (MPSCS)
Statewide Interoperability Coordinator (SWIC)



IWCE 2021
P25 for the Future
Monday, September 27, 2021



MICHIGAN

P25: Best Practices, System Governance,
Management and Benefits

Brad Stoddard, Director
Michigan's Public Safety
Communications System (MPSCS)
Statewide Interoperability
Coordinator (SWIC) Coordinator





MPSCS SNAPSHOT

Brad Stoddard, Director
Michigan's Public Safety
Communications System &
Statewide Interoperability
Coordinator (SWIC)





OUR TIMELINE OUR STORY



- Executive Branch and Legislative Fiscal agency committee evaluated the 1940s era system for replacement to support all state agencies.
- Governor Engler's Telecommunications Task Force supported the Steering Committee's recommendation; MPSCS was first authorized as the Michigan State Police (MSP) Statewide Two-Way Radio and Microwave Backbone System in Public Act 253



- MPSCS constructed in 5 geographically based phases; First P25 system in the nation revised cost \$215 million
- "Blackout" of entire east coast highlights MPSCS capabilities in a large-scale disaster
- Local, tribal, and private public safety invested additional \$150 million



- Kicking butt and taking names

1984

1994

2004

2014

Today



Before the mid-1990s, emergency responders across MI communicated using equipment maintained by their own law enforcement, fire and EMS.

- Michigan Legislature approved the funding for the new system and a contract was awarded to construct the 180 site MPSCS at a cost of \$187 million – will be the first statewide system in the country; provides 97% statewide all-weather mobile radio coverage



- 36,000+ radios added to MPSCS from federal grant dollars to locals
- No additional radio IDs available
- Integrated solution from dispatch operations to vehicle developed; CAD, AVL, and integrated dispatch consoles for end-to end communications solutions.
- System software upgraded to double amount of radio IDs
- Lifecycle Remediation



From unplanned emergencies...
to planned events

THE IMPORTANCE OF MPSCS

The ability to communicate across agencies is a widespread priority in the United States, largely so that we are prepared for potential acts of terrorism or rescue efforts in natural disasters. That ability for agencies to communicate – interoperability – is the primary function of MPSCS.



Sustainment - Governance and Funding

- Single State agency leadership that morphed to a statewide governance approach of local, state, and private collaboration.
- Inclusion and trust coupled with cost savings and avoidance have shifted the mindset and evolved a system.
- State and local partnership aided legislator understanding of the breadth of the system capability and impact.
- Technology evolution based on the use case needs of the user community.

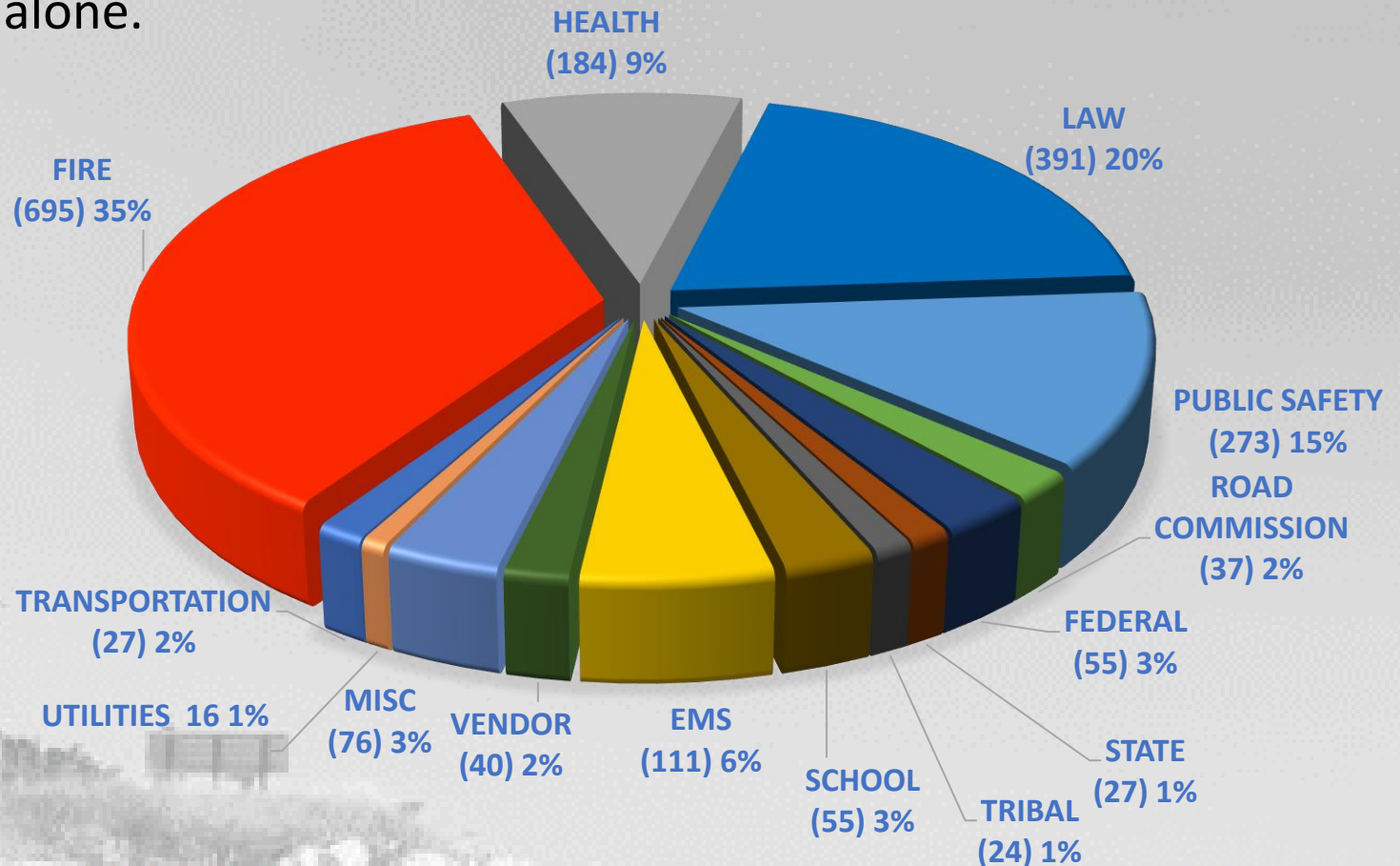


From just one agency...
to a mature model leading the way

MI'S STATEWIDE SYSTEM PROFILE & USERS



No single emergency communications system – no matter how large or how powerful – can meet its communications challenges alone. Today's systems demand new partnerships with local, state, federal, tribal and private first responders, achieving together what no one organization can accomplish alone.



SYSTEM EVOLUTION



- **123,816** Total Radios - 8.6% increase of 9,854 radios since Aug. 2020
- **2,114** Agencies – 3% increase of 58 new agencies since Aug. 2020
- **277** Total Mission Critical Push-to Talk, formally WAVE (MCPTT) Users
- **39** Agencies utilizing Mission Critical Push-to Talk, formally WAVE (MCPTT) Users

2002	2014	2018	Today
8,000 mobile and portable radios	68,575 mobile and portable radios (757% increase)	89,177 mobile and portable radios (1,015% increase)	123,816 mobile and portable radios (1,448% increase)
180 sites	244 RF Sites	253 RF Sites	298 RF Sites
6 Dispatch Centers 38 console positions	55 Dispatch Centers 248 console positions	72 Dispatch Centers (1083% increase) 343 console positions (803% increase)	86 Dispatch Centers (1333% increase) 456 console positions (1097% increase)
2 million/month Push-To-Talks	11 million/month Push-To-Talks (PTT) (450% increase)	12 million/month Push-To-Talks (500% increase)	12,119,938 Push-To-Talks (506% increase)
152 agencies with interoperable voice and data communications	1,468 agencies with interoperable voice and data communications (866% increase)	1,665 agencies with interoperable voice and data communications (995% increase)	1,995 agencies with interoperable voice and data communications (1213% increase)
596 Multi-Jurisdictional events recorded in 2003.	1200 Multi-Jurisdictional events recorded in 2014	1,446 Multi-Jurisdictional Events in 2017 (142% increase)	1,660 Multi-Jurisdictional in 2019.

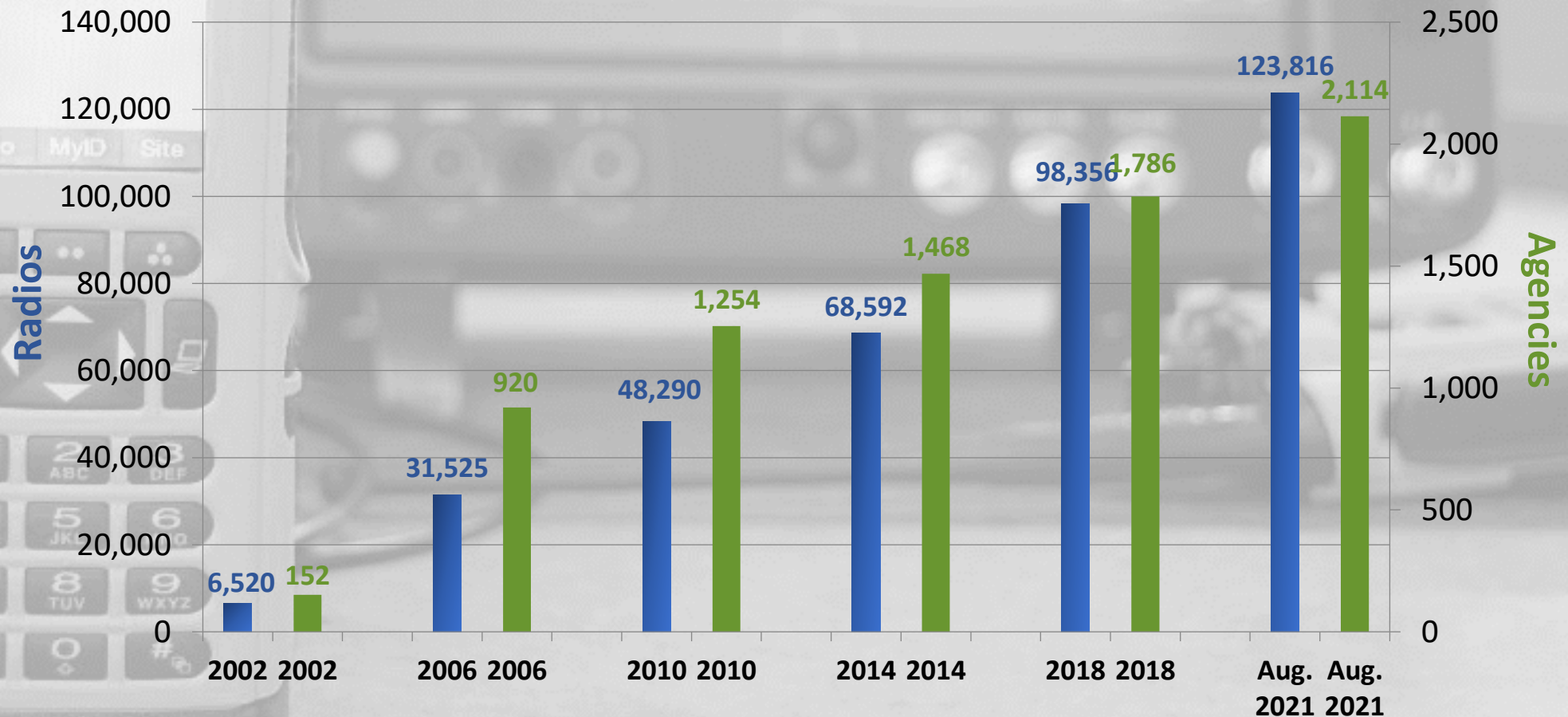


MICHIGAN'S FORWARD - THINKING STRATEGY

MPSCS + Partnerships = Interoperability

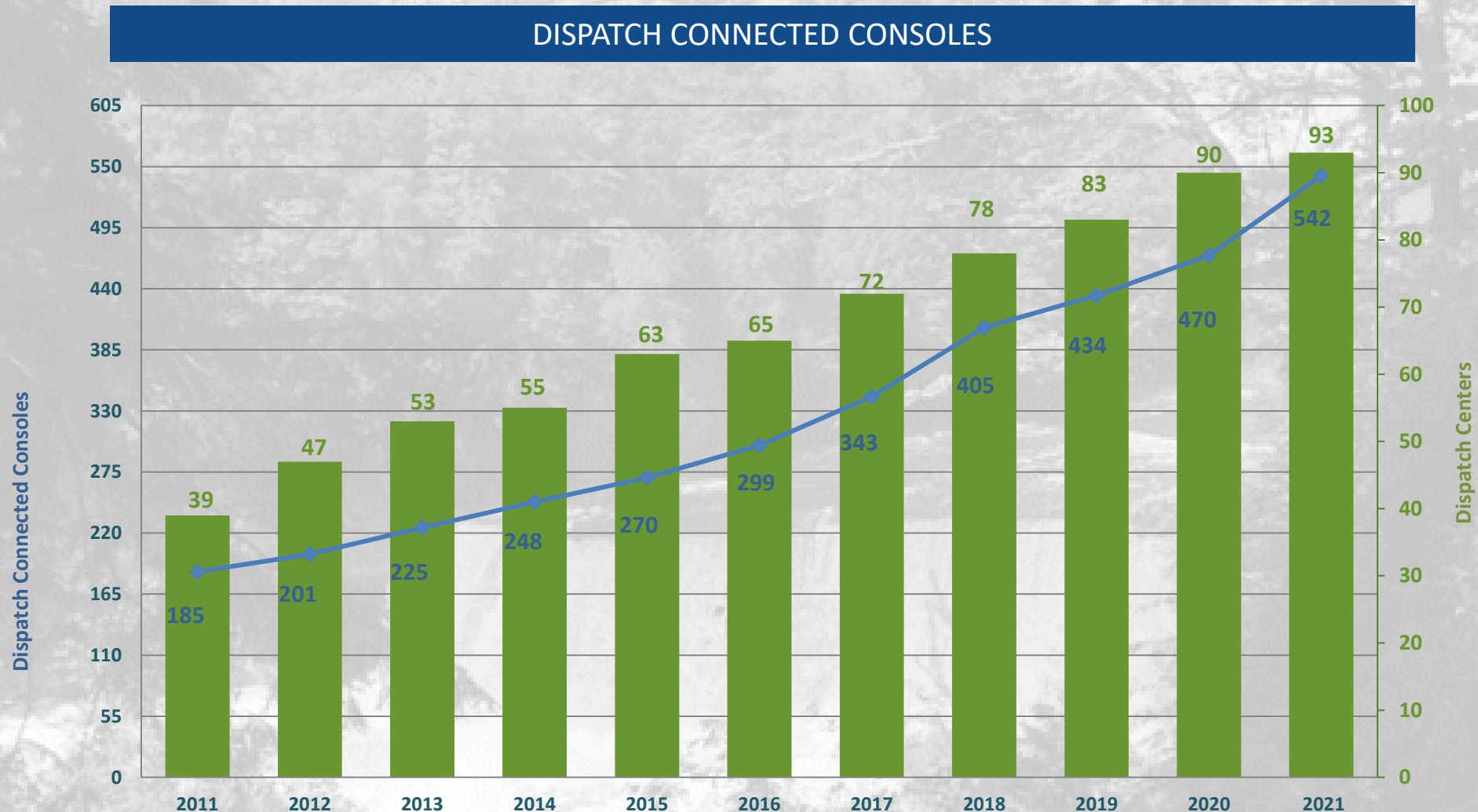


RADIO AND AGENCIES ON SYSTEM 2002-2021



MICHIGAN'S FORWARD - THINKING STRATEGY

Voice + Data = Interoperability



TECHNOLOGY EVOLUTION-TODAY

MPSCS Paging Solution

- **8,344** Pagers LIVE on the system, and an additional **3,695** are pending
- Digital P25 audio is much clearer than narrow band analog fire paging audio
- Allows agencies to end maintenance responsibility and cost of a separate system
- Simplifies dispatcher process and reduces time needed to send critical messages

TECHNOLOGY EVOLUTION-TOMMOROW

- P25 AVL





Brad Stoddard, Director

Michigan's Public Safety Communications System
& Statewide Interoperability Coordinator (SWIC),
7150 Harris Drive, Dimondale, MI 48821

StoddardB@michigan.gov

Office: (517) 284-4101



Thank You

Brad Stoddard

Director, Michigan's Public Safety Communications System (MPSCS)
Statewide Interoperability Coordinator (SWIC)



Project 25 from the System Manager's Perspective.

Benefits, Interoperability, Operations, Events, COVID 19

Justin Evans

**Radio System Manager Montgomery County (Texas)
Hospital District**

Proper Planning and Implementation

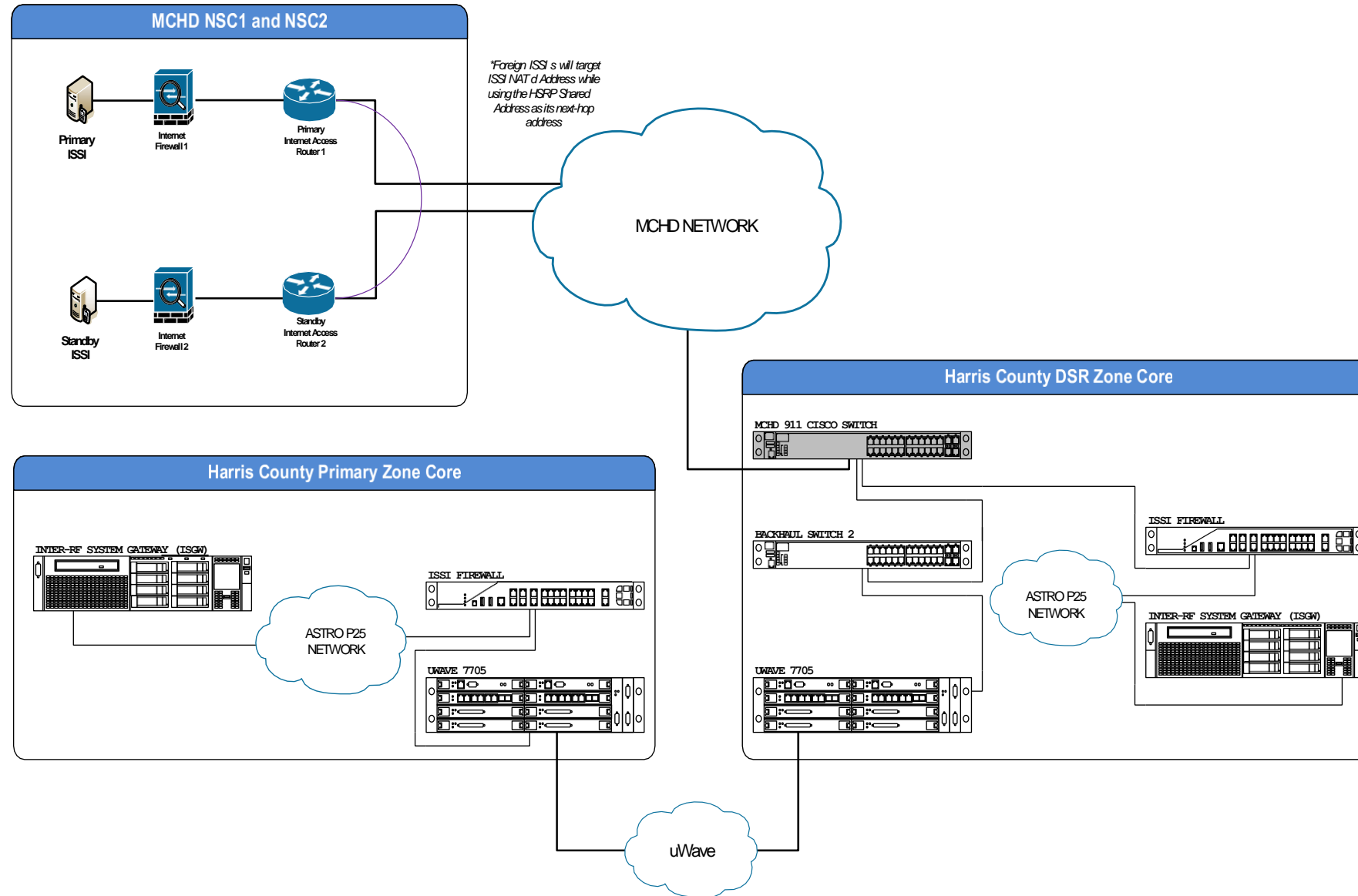


- Statewide ID plan
- Encryption Key Management
- Inter-local Agreements (ILA)/MOU



MCHD/HC ISSI Network Layout

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	ORIGINAL	17-OCT-18	

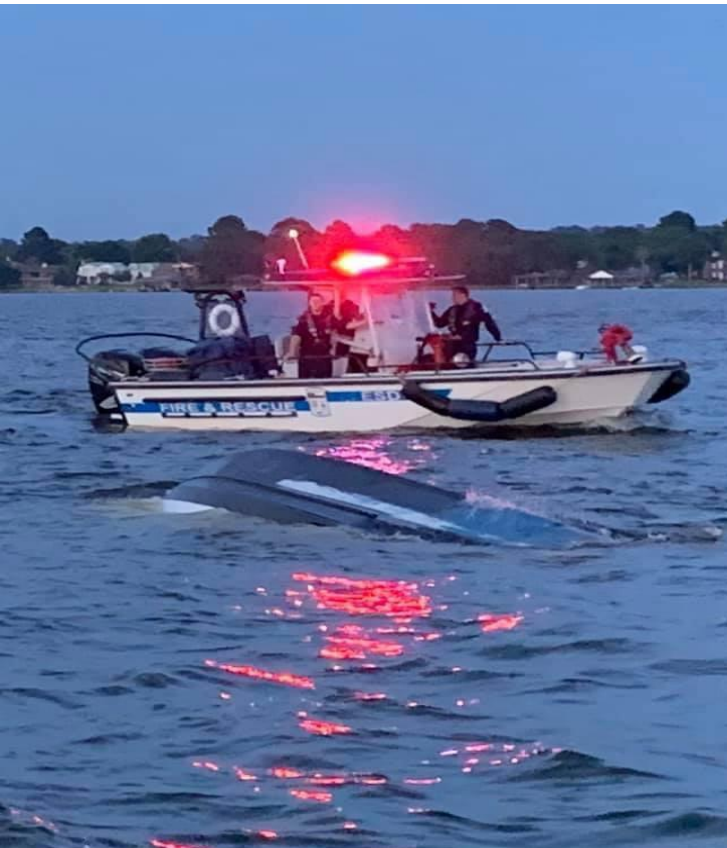


Marine Operations

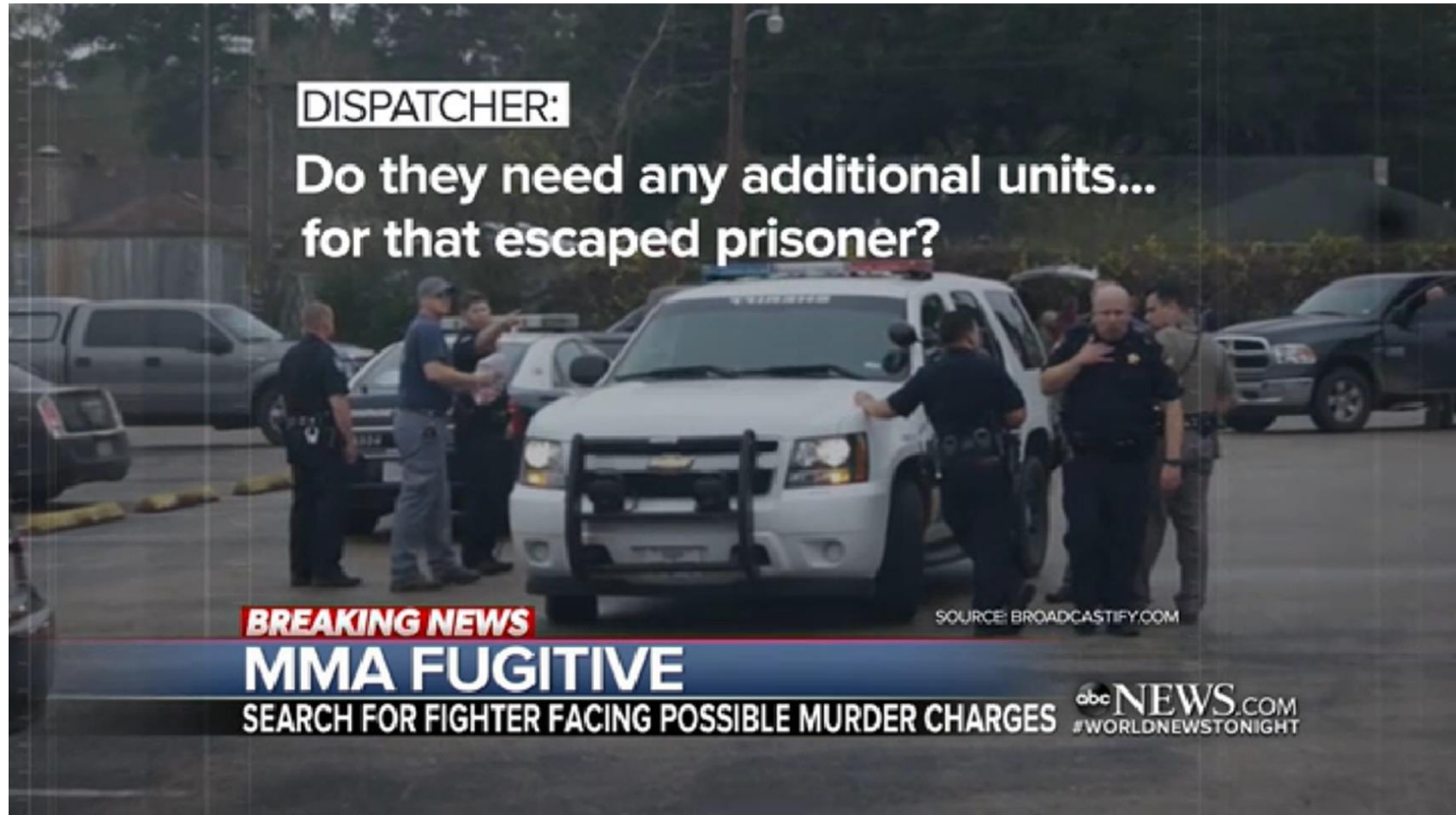
Public Safety Agencies (Local, State, Federal)



- P25 Inter System Interface ISSI
- AES 256-bit Encryption



Unplanned Events



Disaster Deployments



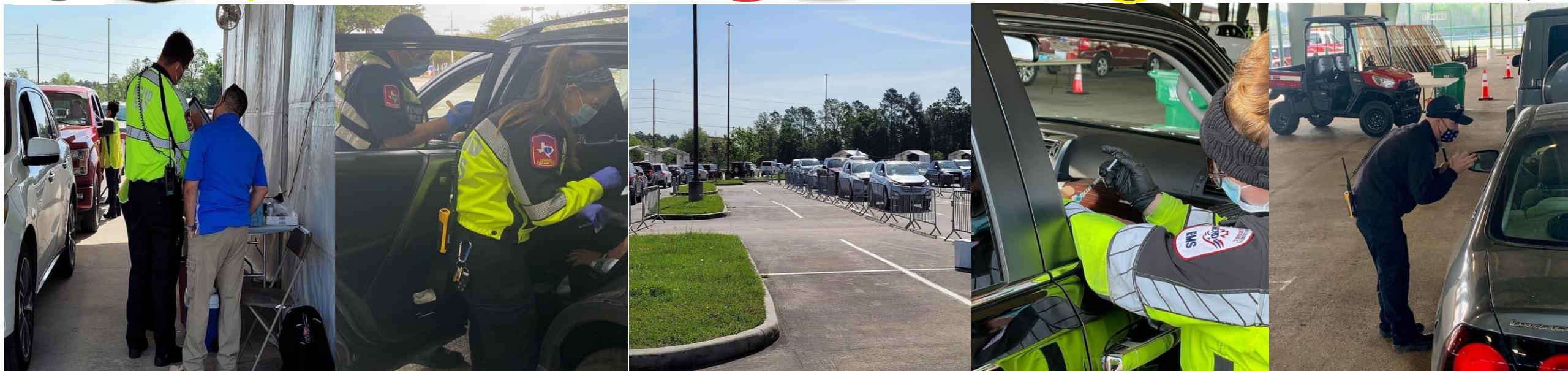
COVID 19 Telehealth Deployment



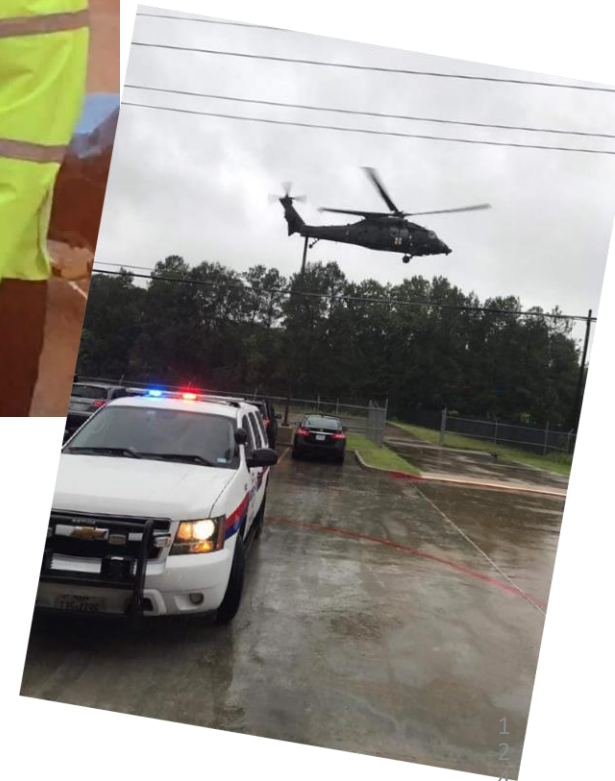
- P25/LTE Radio
- Our paramedics now have a communications hub as soon as they make patient contact. This gives them the ability to connect all of our patient care devices to the wireless access point located in the radio
- Our physicians to do a telehealth patient assessment real-time (transmit and review electrocardiograms (EKGs) and pulse/oxygen readings, and triage without having to transport patients)



P25 Communication During COVID-19 Vaccine Distribution



P25 location services GPS



August 2021

Project 25 Technology Interest Group



Montgomery County Special Threat Response Plan Communications

Implementation

- Adding new “COMMON” talk group to all PS radios in knob position #16
- Adding new “COM D” P25 conventional to all PS radios in knob position #15
- Adding 14 MIR (Major Incident Response) talk groups to all PS radios
- Using same AES 256 Encryption key on all new talk groups/channel except MIR 1-3

New Talk Groups/Channels in PS Radios



<u>ZONE 73(MCHD)</u>	<u>Encryption</u>	<u>ZONE 74(TxWARN)</u>	<u>Encryption</u>
MIR_01	CLEAR	MIR_01	CLEAR
MIR_02	CLEAR	MIR_02	CLEAR
MIR_03	CLEAR	MIR_03	CLEAR
MIR_04	AES 256 Encryption	MIR_04	AES 256 Encryption
MIR_05	AES 256 Encryption	MIR_05	AES 256 Encryption
MIR_06	AES 256 Encryption	MIR_06	AES 256 Encryption
MIR_07	AES 256 Encryption	MIR_07	AES 256 Encryption
MIR_08	AES 256 Encryption	MIR_08	AES 256 Encryption
MIR_09	AES 256 Encryption	MIR_09	AES 256 Encryption
MIR_10	AES 256 Encryption	MIR_10	AES 256 Encryption
MIR_11	AES 256 Encryption	MIR_11	AES 256 Encryption
MIR_12	AES 256 Encryption	MIR_12	AES 256 Encryption
MIR_13	AES 256 Encryption	MIR_13	AES 256 Encryption
MIR_14	AES 256 Encryption	MIR_14	AES 256 Encryption
COM D	AES 256 Encryption	COM D	AES 256 Encryption
COMMON	AES 256 Encryption	COMMON	AES 256 Encryption



Thank You!

Justin Evans

Radio Systems Manager

Montgomery County (Texas) Hospital District



New P25 Products and Services for IWCE 2021

Cheryl Giggetts

Principal, CTA Consultants

L3Harris XL EXTREME™ 400P Portable Radio

VHF, UHF, 7/800, GPS, Wi-Fi, LTE, Bluetooth



ENHANCED
CONNECTIVITY
BUILT IN



GPS



Wi-Fi



Bluetooth™



LTE



WHAT IS NEW

- Built to the toughest industry standards for operation in extreme environments
 - Heat resistant seals and display to withstand temperatures up to 500°
 - Ruggedized against damage from 3-meter drops, salt water and humidity corrosion
- Provides advanced ergonomics for fireground operation
 - Larger emergency button and optional in-building location capability
 - Top display with unique visual zone coding
 - Color tagging and audio playback for the last 5 calls

P25 INTEROPERABILITY SOLUTION

- Multiband P25 operation in VHF, UHF, 7/800
- CAP certified, field-proven P25 interoperability
- Converged P25, Wi-Fi and LTE technologies

BENEFITS TO PUBLIC SAFETY

- Keep everyone connected in extreme fireground conditions
- Enhance PTT coverage & simple device management over LTE networks like AT&T® and Verizon®
- Loud and clear audio with industry-leading noise cancellation



L3HARRIS™
FAST. FORWARD.

www.L3Harris.com

APX NEXT

All-Band P25 Smart Radio

VHF, UHF, 7/800, LTE, WiFi, Bluetooth, NFC



What is New

- Updated ergonomics and a large, rugged touchscreen
- A new platform for public safety applications, including ViQi, your new virtual partner
- Improved device management software and remote management capability over LTE
- Automatically switch PTT functionality between P25 and LTE based on coverage level and transmit GPS location data via LTE

P25 Interoperability solution

- FDMA and TDMA P25 Air Interface interoperability as well as LTE

Benefits to Public Safety

- Keep eyes up and focus forward with intuitive ergonomic design, voice control, and voice database queries
- Always stay connected by automatically switching between LTE and LMR based on coverage and continuously transmit location data over LTE
- Keep devices in the field longer by implementing updates over LTE





What is New

- Tier 1, 2 and Tier 3 Models
 - Tier 1 Top display only, no keypad
 - Tier 2 Top & front display, nav keypad only
 - Tier 3 Full alphanumeric keypad
- Longer Battery Life
 - High capacity Li Ion pack
 - AA Alkaline tray with >16hrs battery life
- Large Bright Color Display and Top display
 - Gorilla glass
- Integrated Bluetooth Operation

P25 Interoperability solution

- P25 CAP Performance Class A
 - Trunked & Conventional
- Interoperability with Motorola, L3Harris, Tait/Zetron

Benefits to Public Safety

- Large Controls for use with heavy gloves
- IP68 Ruggedized housing in Black or Optic Yellow
- Long popular BK Technologies cloning capability
- NIST FIPS140 2, Level 2 compliant
- NIFC/DOI approved



<https://www.bktechnologies.com/product/bkr-5000-portable-radio/>



New Multi-Mode TETRA-P25 Radios



What is New

- Dual-Mode TETRA-P25 selectable through the user menu.
- FCC certified 764-869 MHz (except NPSPAC 806-809/851-854 MHz).

P25 Interoperability solution

- P25 CAP certified for nationwide interoperability channels.
- Fully compliant with requirements set forth in Feb 12, 2018 FCC Report & Order governing 700 MHz band.

Benefits to Public Safety

- Cellphone-like speech quality, background noise cancellation, GPS data, Image App.



HTT-500-2



MDT-500-2



<http://www.powertrunk.com>



F7010/F7020/F7040 Portable F7510/F7520/F7540 Mobile



What is New

- Voice log archives with GPS metadata and mapped RSSI analysis with Radio Discovery Tool (RDT)
- Hardware based advanced system key (ASK)
- Enhanced talkgroup scanning (up to 32 talkgroups with user selectable priority modes)
- Receive only talkgroups prevent unauthorized transmissions

P25 Interoperability solution

- VHF, UHF and 700/800 MHz models
- Conventional Analog FM/P25/Mixed-Mode and P25 Phase 1 (FDMA) and Phase 2 (TDMA) trunking
- AES/DES Encryption with Over-the-Air Rekeying

Benefits to Public Safety

- Small lightweight and concealable for surveillance and tactical operations and smaller vehicle installs
- Recorded voice log archives with GPS metadata show when and where voice calls were made and can help identify interference issues
- Diagnostics with mapped RSSI analysis values can show lack of coverage where coverage was expected



<http://www.icomamerica.com/en/landmobile/>

Tait Unified Vehicle



What is New

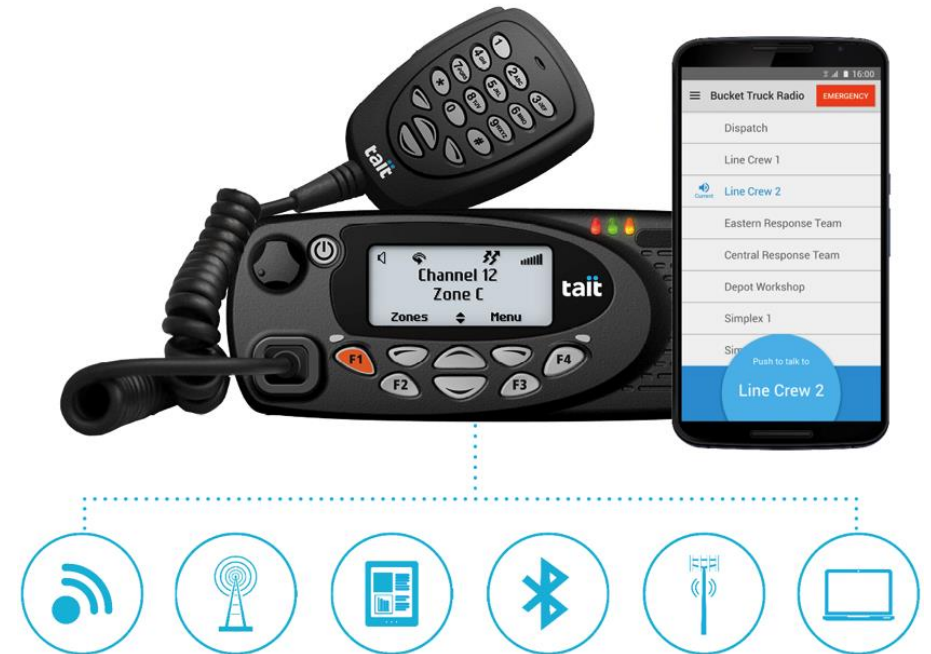
- IP Routing: WiFi-to-Cellular, Ethernet-to-Cellular, Ethernet-to-WiFi
- Voice Recording app: significant enhancements including metadata and user interface
- Remote Application now available for Apple iOS and Android devices
- More broadband frequencies supported:
 - 4G/LTE: B2, B4, B5, B12, B13, B14, B66, B71; 3G: B2, B5
 - WiFi: 2.4GHz, 5GHz

P25 Interoperability solution

- Based on CAP certified TM9400 with field proven P25 interoperability
- Open standards WiFi & LTE connectivity

Benefits to Public Safety

- Vehicle Area Network with choice of connectivity options
- Record ALL voice traffic including off-network simplex calls
- Make and receive radio calls from smartphones and tablets



New P25 Tactical Mixed Mode Repeater



What is New

- Tactical Mixed Mode repeater
- Rugged Extremely Compact Housing
- All P25 Network Interfaces available



P25 Interoperability solution

- Supports IP/H.F. & Satellite Backhauls
- Interfaces with FSI (BAHA)+CSSI+ISSI
(Phase One &Two)

Benefits to Public Safety

- Deployable P25 Repeater for
Emergency Communications



www.etherstack.com

Technisonic TDFM-9000 Series Airborne P25 Radios



Performance Driven

- * Tri-Band Modules support VHF /UHF/7-800
- * Analog Capabilities include VHF-AM 118-136MHz, UHF 225-400MHz, Low Band 30-50
- * Meets all Current P25 Analog, Digital and Trunking Standards, Phase I & II Compatible
- * Encryption Protocols –AES,DES, DES-XL, DVP, DVP-XL, DVI, ADP. Multiple Encryption Keys
- * US Narrow Band Mandate compliant in US
- * Front Panel Programming capable
- * Night Vision Google Compatible
- **New Multi-Communications Port (MCP)**
- Developed to address circumstances where additional temporary capabilities are needed such as handhelds, or where additional communication integrations are mission-critical such as Satellite



TDFM-9300

(4) All-Band P25 Transceivers
(1) Traditional Aviation analog transceiver

Contact Technisonic at (905) 890-2113

P25 New Product for IWCE 2021

RT-7000 Airborne Communications System



What makes it Unique

Flexible, Modular, Scalable –Panel Mount and Remote mount radios available- start with 3 and expand to 6 modules control via Remote Control display Unit or Panel display

- **Software-defined radio (SDR) with touchscreen display**

- Display is NVIS compliant to MIL STD 3009 with a best-in-class man machine interface – developed with public safety first responders and pilots
- Resistive touchscreen glass interface that works with flight gloves or PPE.
- No Recessed buttons to clean or clog, 1000 NIT display with 170° viewing angle
- Integrated code plug search function, integration with Augmented reality or glass cockpit

- **Modular design** - future proofs aviation assets with three available communications modules custom configurable to meet your mission needs - additional modules in development

1. **Wide Band Transceiver** – 29.7- 960 MHz P25 Compliant – Compact design, Continuous solution in ONE module. 118 -136 MHz ATC bands-TSO C169a Approval
2. **Motorola APX 8000 Module** – P25 Phase 1&2, Motorola feature sets, encryption, & all bands or a la carte.
3. **Search and Rescue** 121.5 MHz, 243.00 MHz 156.8 MHz(Marine 16) & 156.525 MHz FSK (DSC channel 70)

- Relay, simulcast, and relay/simulcast
- Built in connectivity for two (2) external handheld radios – no external interface required

P25 Interoperability solution

- All P25 Bands Common Air Interface (CAI), Phase I, II Trunking
- 29.7 – 960 MHz Common Air Interface (CAI) AES Encryption
- P25 VHF – 6W Min UHF – 5W Min 700/800 MHz – 3W Min

InterTalk Cloud Dispatch



What is New

- **Cloud Dispatch** is a first-to-market dispatch solution in North America
- Offers a public-safety-grade dispatch console, empowered by the cloud
- **Cloud Dispatch** provides P25 connectivity in the field via mobile-connected devices

P25 Interoperability solution

- Connect **Cloud Dispatch** console to P25 via DFSI or CSSI/ISSI
- Convergence of analog radio, P25, LTE, call-taking capabilities, and more
- Allows user to extend their P25 network over Wifi, LTE, or satellite connections

Benefits to Public Safety

- Empower your P25 system to create seamless communications across multiple devices
- Enhance situational awareness and operational intelligence
- Reduce hardware footprint and cost, making **Cloud Dispatch** affordable for virtually any agency



www.intertalksystems.com
Booth 457

New P25 PDR8000® Rackmount Repeater & DFSI Option



What is New

- New form factor for field proven PDR8000® Suitcase
- VHF, UHF & 800 MHz Bands
- Optional 50 Watt Amplifier

P25 Interoperability solution

- Wireline Ethernet IP connection to consoles supporting Digital Fixed Station Interface Protocol Version 1 (analog and digital)
- DFSI option available for both Rackmount & Suitcase models

Benefits to Public Safety

- Increased radio coverage range



Company Website
<http://www.futurecom.com>

P25 LMR LTE Interworking Solution



What is New

- **Demonstrating** IntelliLink™ Interworking Solution from Catalyst
- Standards Based Communications between P25 LMR and MCPTT on LTE Networks (FirstNet™, Verizon Push to Talk Responder, Southern Linc, etc.)
- Based on the MCPTT Standard, not “almost mission critical” as are existing LTE PTT solutions

P25 Interoperability solution

- Provides Interworking Communications between P25 subscribers on LMR Radios and SmartPhone users with MCPTT Application

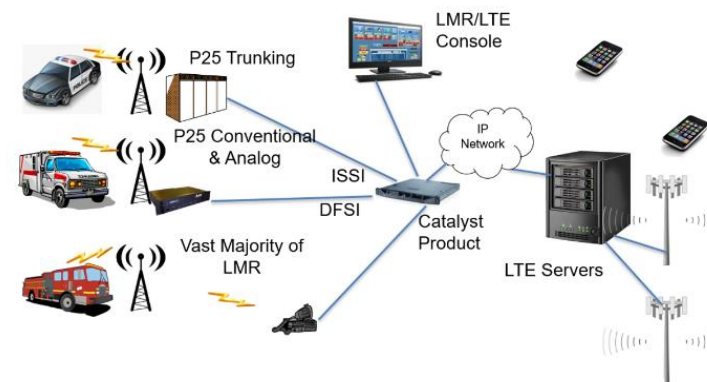
Benefits to Public Safety

- Standards based solution for Critical Communications
- Enables transition to MCPTT on LTE for current P25 Systems



www.catcomtec.com

Booth 942 at IWCE 2021



DFSI Gateway



What is New

General Features

- DFSI v1 and v2 compatibility
- Channel Change
- Repeat On/Off
- Monitor (Squelch Bypass)
- Voter receiver and transmitter selected/enabled/disabled status and control

Digital Features

- Full-Rate AMBE voice encode/decode
- Group Calling
- Individual Calling
- Emergency Calling and Alarming
- Radio Check, Stun, Revive, Remote Listen, Call Alert, Status Querying, Status Messaging
- NAC Control
- DES/AES Encryption
- RX/TX Level Settings
- RX EQ

Analog Features

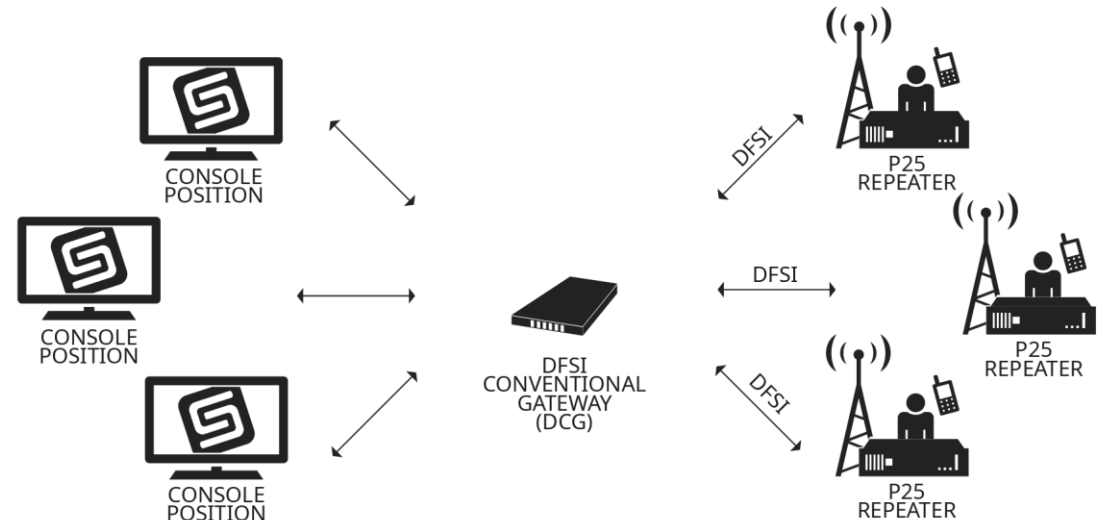
- MDC-1200 Emergency alarm decode
- MDC-1200 ID encode/decode
- CTCSS/CDCSS control
- RX/TX Level Settings
- RX EQ

P25 Interoperability solution

- Patch traffic between different base stations at talk-group level.
- Patch P25 base station with numerous other technologies when paired with the Mindshare Radio Interface (MRI)

Benefits to Public Safety

- Migrates legacy analog infrastructure to P25
- Single gateway supports multi-vendor stations via DFSI standard
- Lower cost with more features than previous offering



www.css-mindshare.com

IWCE Booth # 484

P25 Digital and Analog Mixed-Mode Public Safety Systems from Zetron a Codan Company



ZETRON®
a Codan Company

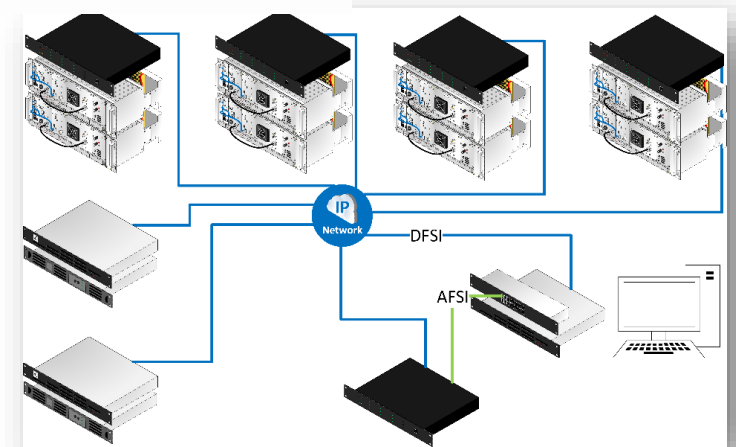
IWCE Booth #443 #449

What is New

- Share regional LMR systems across multiple agencies, all with different requirements, but within the same jurisdiction
- Support Fire, Police and EMS using the same infrastructure
- Add coverage on-the-go using transportable extensions

P25 Interoperability solution

- Each agency allowed use their preferred manufacturer's subscribers
- Support for P25 Standard interfaces to third-party applications and technology



Benefits to Public Safety

- Provides reliable, secure, always-on communications
- Built to support any agency's mission in any environment

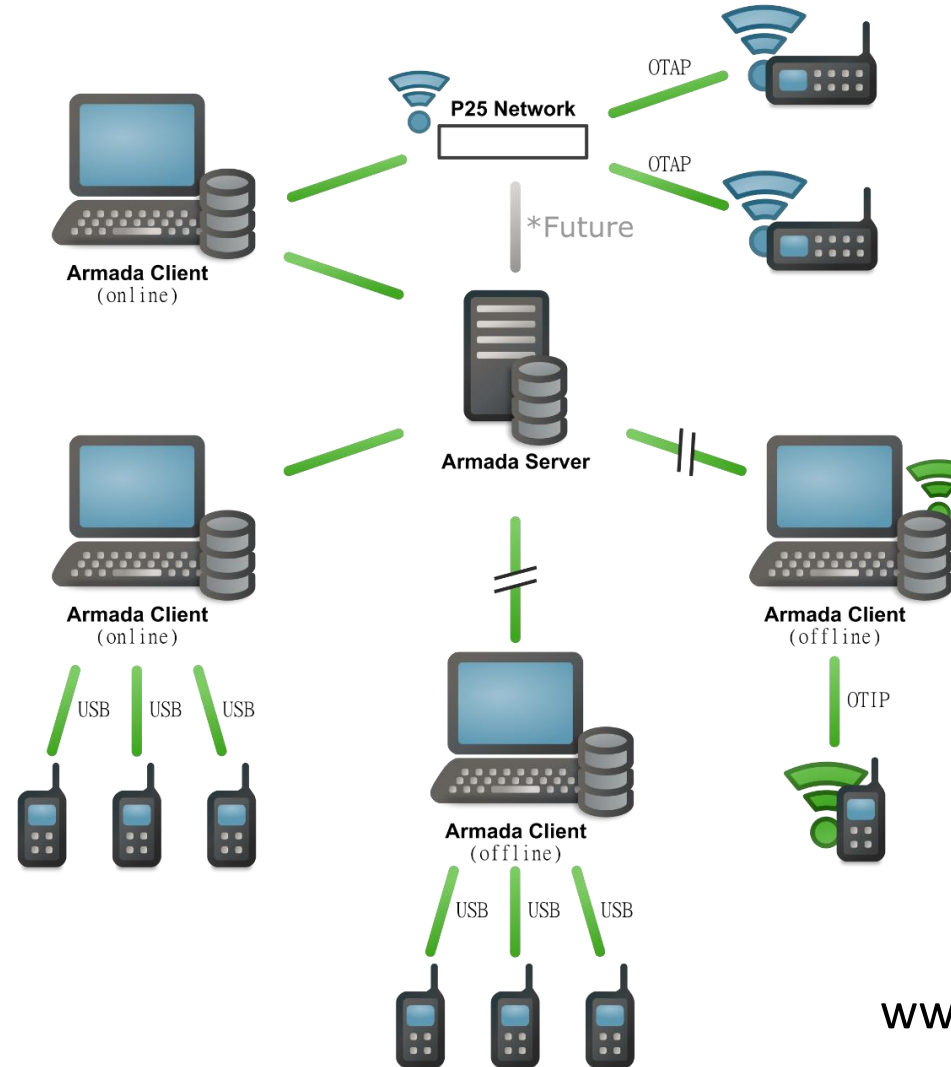
Viking Armada Server

Distributed Programming Capability for Fleet Management



NEW: Armada Server for Viking P25 public safety radios

- Allows multiple radio managers to share a common, central database.
- Offline mode allows radio managers to make updates that are synchronized when returning on-line.



KENWOOD
VIKING
Making Safe, Simple™

www.EFJohnson.com

STI-CO Industries IWCE Booth 1056



What is New

- Tri-band Flexi-Whip antenna available in NMO roof, magnet, and glass mount
- Covert fin-style single and triband available for stealth missions

P25 Interoperability solution

- Seamless antenna connectivity to your P25 LMR providing reliable interoperability

Benefits to Public Safety

- Durable flexi-whip material makes our antennas extremely robust
- Covert designs won't blow your cover



8800SX Radio Test Set



What is New

- Additional Auto-Test support for Harris and Motorola P25 radios
- Kenwood Viking and Tait P25 radios added to the Auto-Test family

P25 Interoperability solution

- Phase 2 support
- Infrastructure testing with Wideband RF Power Sensor

Benefits to Public Safety

- Ensure indoor and outdoor RF signal coverage with signal strength mapping solutions
- Portable RF testing of P25 subscribers and infrastructure



<https://www.viavisolutions.com/en-us/products/8800sx-digital-radio-test-set>

R8200 New LMR Service Monitor with VNA



What is New

- Single Port Vector Network Analyzer: The only LMR test set to include a VNA
- Includes multiple general use options
 - Remote Front Panel
 - Extended Gen Port Output
 - Process Automation Toolkit (“PAT”)

P25 Interoperability solution

- P25 Phase 1 Conventional Test Option
- P25 Phase 1 Trunking Test Option
- P25 Phase 2 Test Option

Benefits to Public Safety

- Perform comprehensive subscriber and network testing with a single instrument
- Save space by combining multiple instruments into one portable device

ASTRONICS
TEST SYSTEMS



FREEDOM

www.astronics.com/lmr

In-Building Critical Communications Network Testing Solutions



What is New

- Commissioning tests for in-building radio systems
- SeeHawk™ Central cloud reporting and automation platform streamlines testing and data sharing

P25 Interoperability solution

- P25: RSSI, SINR, Frame BER, OOS BER, Phase detection
- Multi-technology: LTE/FirstNet, DMR, TETRA, 5G, CBRS
- Fast and cost-effective radio tests to obtain building occupancy permit
- Grid test based on NFPA, IFC, and AHJ regulations
- Automatic report generation for submission

Benefits to Public Safety

- Ensure indoor communications for first responders
- Makes adopting and enforcing requirements realistic
- Track buildings in a centralized, secure online platform



▲ Public Safety Network Testing Solution includes SeeHawk® Touch software and IBflex® scanning receiver



<https://www.pctel.com/ptig>

Booth # 252

Valid8 P25 ISSI/CSSI Conformance Testing



What is New

- Multiple Form Factors
- Test Consoles or RFSS on CSSI and ISSI
- Multiple Test Options (Lab, VPN)



P25 Interoperability Solution

- Use Valid8's Pre-Canned Test Scenarios to Ensure Interoperability with Other Vendor Devices

Benefits to Public Safety

- Real World Testing with Multiple form factors
- Flexibility to Customize Test Scenarios
- Upgradable to MCX, NG911, P25 Cyber-Security Testing Suites



<https://www.valid8.com/datasheets/p25-issi-cssi-conformance>

PX-900 Portable Instrument

What is New

- PX-900 is a portable radio waveform analyzer that enables organizations to identify two-way radios in need of service in the field

P25 Interoperability Solution

- Conventional (Now) and Trunked (Early 2022)
- VHF, UHF and 700/800/900 MHz

Benefits to Public Safety

- It measures a radio's alignment and operating characteristics, Touch-Free, Over-the-Air in real-time, without user intervention
- Generates reports allowing the user to identify radios requiring service and validate the accuracy of the other radios
- A proactive radio maintenance tool that assures operational readiness



ISSI/CSSI Interoperability Testing

What is New

- P25CAP ISSI and CSSI Interoperability Field Testing by an ANAB, DHS & P25CAP recognized test lab
- The RFFS/ISSI under test, RFSS supporting the test and test Engineer all in separate locations
- CTL Test Engineer directs, observes and records all test results via VPN & Microsoft Teams
- Detailed test reports produced to complete SDOC & STR

P25 Interoperability solution

- P25CAP Compliant ISSI & CSSI equipment listed on DHS Grant Eligible list

Benefits to Public Safety

- Procurement - Assurance of ISSI/CSSI P25CAP compliance
- Field Testing – Compliance of Agency-owned ISSI/CSSI already installed



Chris Lougee
LMR Industry Business Development
Compliance Testing LLC
1724 S. Nevada Way
Mesa, AZ 85204

206-790-0790 Cell
ChrisL@compliance-testing.com
www.ComplianceTesting.com

P25 Enhanced Vocoder Software



What is New

- Licensing for standard and custom processors
- Optional SIMD Libraries available
- Available for various OS's



P25 Interoperability Solution

- Enhanced Dual-Rate Vocoder
- Rate conversion available for Full-Rate and Half-Rate


Benefits to Public Safety

- Meets latest P25 requirements for voice quality
- Universal standard for interoperability and assured quality




Project 25 Products and Services Available



P25 Products & Services 	www.Project25.org Member Web Address	Fixed Stations & Repeaters	Mobile & Portable Radios	Pagers	Antennas	Vehicle Repeaters	Consoles	Networks	Software	Test Equipment	Systems Integration	Consultant Services
Founding PTIG Members												
MOTOROLA SOLUTIONS	www.motorolasolutions.com/en_us/products/p25-story.html											
VIAVI SOLUTIONS	HTTP://www.viavisolutions.com/lmr											
Sustaining PTIG Members												
EF JOHNSON	http://www.efjohnson.com											
L3HARRIS CORP.	www.pspc.harris.com											
ETHERSTACK	www.etherstack.com											
ICOM AMERICA	http://www.icomamerica.com/en/landmobile/											
JVC KENWOOD	www.kenwood.com/usa/com/lmr											
TAIT	www.taitradio.com											
TECHNISONICS	www.til.ca											
ZETRON a Codan Company	www.zetron.com											
Corporate PTIG Members												
20dBSolutions Ltd.	mailto:dale@20dbsolutions.com											
FREEDOM an Astronics Company	www.freedomcte.com											
AVTEC	www.avtecinc.com											
BK TECHNOLOGIES	www.bktechnologies.com											
CATALYST	www.catcomtec.com											
CANYON AEROCONNECT (Wulfsburg)	http://www.canyonaeroconnect.com											
COMPLIANCE TESTING	www.compliancetesting.com											
CTA CONSULTANTS	giggetts@cta-c.com											

Project 25 Products and Services Available



P25 Products & Services	www.Project25.org	Fixed Stations & Repeaters	Mobile & Portable Radios	Pagers	Antennas	Vehicle Repeaters	Consoles	Networks	Software	Test Equipment	Systems Integration	Consultant Services
	Member Web Address											
Corporate PTIG Members												
DVSI	www.dvsinc.com											
FEDERAL ENGINEERING	www.fedeng.com											
FUTURECOM SYSTEMS	www.futurecom.com											
GME- (standard comm pty ltd)	www.gme.net.au											
INTER TALK SYSTEMS	www.intertalksystems.com											
LEONARDO	http://www.leonardocompany-us.com											
LOCUSUSA	www.locususa.com											
MINDSHARE by CSS	http://www.css-mindshare.com											
PCTEL	http://www.pctel.com											
POWERTRUNK	www.powertrunk.com											
RFI TECHNOLOGY SOLUTIONS	https://www.rfiamericas.com/											
RFTECHNOLOGY	www.rftechnologyamericas.com											
SIMOCO	www.simocogroup.com											
SPECTRA ENGINEERING	www.spectraeng.com.au											
STI-CO ANTENNA SYSTEMS	https://sti-co.com/											
TELEVATE	www.televate.com											
TELEX RADIO DISPATCH (BOSCH)	www.telex.com											
VALID8	http://www.valid8.com											
36		16	13		1	8	12	15	6	8	14	9

P25 New Product Trends at IWCE 2021



- **P25 LMR Interoperability with LTE Broadband Data**
 - Multi mode P25/LTE Portable radios
 - Mobile P25 radio with Wi-Fi and LTE connectivity
 - New P25 Consoles connect P25 and LTE technologies
- **Voice recording in radios**
- **Mobile radio with simultaneous P25 TX/RX (4 bands)**
- **New products are P25 Phase 1 and Phase 2 capable**

P25 New Product Trends at IWCE 2021



- **Deployable, mixed-mode, P25 repeaters for Emergency Ops**
- **Scalable, Configurable P25 Airborne Radios**
- **P25 Antenna Site Monitoring**
- **“Over the Air” radio maintenance for P25 Systems**
- **“Cloud based” Asset management for P25 Systems**
- **“Cloud based” Dispatch in the field**
- **New P25 Location Services**
- **P25 enhanced Vocoder Software**



Thank You

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Project 25 for the Future



www.project25.org