



# APCO 2019

August 11-14 | Baltimore, MD

## Project 25 What's New Today and What's Coming Next

Presented by the Project 25 Technology Interest Group (PTIG)



# Program Participants

- Moderator
  - **Steve Nichols**, Director, Project 25 Technology Interest Group (PTIG)
- Panelists
  - **Andy Davis**, Senior Resource Manager, Project 25, MOTOROLA SOLUTIONS Chairman: TIA TR-8, TIA TR-8.8
  - **Jeremy Elder**, Director of Integrated Platforms, L3HARRIS CORPORATION
  - **Jim Downes**, Project 25 (P25) Steering Committee Chair



# Agenda

<b>Steve Nichols</b>	<b>Who is PTIG?</b> <b>P25 Resources from PTIG</b>
<b>Andy Davis</b>	<b>P25 Standards Update</b> <b>LMR-LTE Interworking</b>
<b>Jeremy Elder</b>	<b>P25 Link Layer Encryption</b> <b>Key Management Improved Interoperability</b>
<b>Jim Downes</b>	<b>P25 System and Console Interoperability</b> <b>P25 Testing Update</b>



# Project 25 Technology Interest Group (PTIG)

## What do we do?

- Provide a forum for users and manufacturers
  - Manage education and training on Project 25
  - Create and distribute Project 25 information
  - Support the TIA standards process
  - Offer Users convenient access to the P25 standards process
  - Maintain a “neutral ground” among the competing manufacturers and providers
- And...
- Present Classroom Training and Panels such as THIS SESSION.



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# www.project25.org

- P25 Standards Update Summary
- List of P25 Systems (2500+)
- P25 Case Studies
- PTIG Conference Presentations
- P25 Testing (Links to DHS CAP Program)
- P25 Non CAP ISSI Testing Template and Reports
- New P25 White papers: P25 Authentication, What is P25 Compliance?
- P25 Frequently Asked Questions
- P25 Capability Guide



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# P25 On the APCO Show Floor

## PROJECT 25 TECHNOLOGY INTEREST GROUP

Visit **PTIG**  
**Booth # 1419**  
**APCO 2019**

OUR MEMBER ORGANIZATIONS

AS EXHIBITORS ALSO SAY

**THANK YOU**

Founding Members	Booth Number
*Viavi	1009
*BK Technologies	1121
*Motorola Solutions	611/NP2
Sustaining Members	
*Codan Radio Communications	402
*EF Johnson	737
*L3Harris Corporation	923
*ICOM America	1223
*JVCKenwood	737
*Tait	923

Corporate Members	Booth Number
*Avtec	819
*Bosch Security-Telex Dispatch	1311
*Catalyst	1113
*CSS-Mindshare	1205
*Futurecom Systems Group	704
*Inter-Talk	746
*Locus USA	1212
*PCTEL	524
*RF Technology	214
*Televate	1317
*Unication	705
*Zetron	731



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# P25 Standards Update & LMR-LTE Interworking

## Andy Davis

- Chairman, TIA TR-8 Mobile and Personal Private Radio Engineering Committee, TR-8.8 Broadband Sub Committee
- Sr. Resource Manager, P25 Standards - Motorola Solutions



# P25 Standards Update

***The P25 standard is a living standard that continues to be maintained and expanded as technology evolves and as the communication needs of the Public Safety Community evolve.***

## **Completed in 2019:**

- **Air Interfaces**
- **A revision to the Trunking Control Channel Messages standard was approved for publication.**

*This revision addresses errata that have been collected since the last publication. There are no required changes to existing P25 radios in the field.*



# P25 Standards Work in Progress

- **Air Interfaces**
- **Creation of a High Signal Strength Intermodulation Rejection Test** is in progress.  
**Measurement Method for FDMA receivers approved for ballot.**  
*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. Performance specifications are expected to follow completion of the measurement method.*
- **A revision of the “Requirements for Battery-Powered, Portable Land Mobile Radio Applications in Class I, II, and III, Division 1, Hazardous (Classified) Locations”** standard is in progress.  
*UL is proposing improvements/clarifications to the document regarding electrical protection parameters.*



# P25 Standards Work in Progress

## Air Interfaces

- **A revision of ANSI/TIA-102.AABA-C “Trunking Overview” standard was approved for ballot.**

*This revision addresses errata that have been collected since the last publication.*

- **A revision of the Project 25 TIA-102 “Documentation Suite Overview” is in progress.**

*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 the “Two-Slot TDMA MAC Layer Specification” standard, a revision of the “Two-Slot TDMA MAC Layer Messages” standard and a new standard TIA-102.BBAE “Two-Slot TDMA MAC Layer Procedures” were all approved for ballot.**

*This restructures the TDMA Air Interface Standards for voice and control channels to address errata that have been collected and in preparation for the addition of Link Layer Encryption.*



# P25 Standards Work in Progress

## 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 new Interoperability test standard for Trunked ISSI Supplementary Data Services** is in progress.  
*This document will provide a standard set of tests for validating interoperability of Supplementary Data Services (Emergency Alarm, Call Alert, etc) operating across a Trunked ISSI.*



# P25 Standards Work in Progress

## Security

- **Definition of a Link Layer Encryption Security Service** is in progress.

*This is the first big new technology upgrade for improved Security for all air interfaces of P25. It protects control channel control messages, and hides group and individual IDs.*

- **An addendum to the Key Fill Interface standard** is in progress.

*This will enable Key Fill Device (KVL) interface to a KMF, an Authentication Facility and another Key Fill Device*



# P25 Standards Work in Progress

## Data

- **A revision of ANSI/TIA-PN-102.BAJB-A “Tier 1 Location Services Specification”** was approved for ballot.

*This revision addresses errata that have been collected since the last publication.*

- **A revision of ANSI/TIA-PN-102.BAEB-B “IP Data Bearer Service Specification”** was approved for ballot.

*This revision addresses errata that have been collected since the last publication.*



# P25 Standards Work in Progress

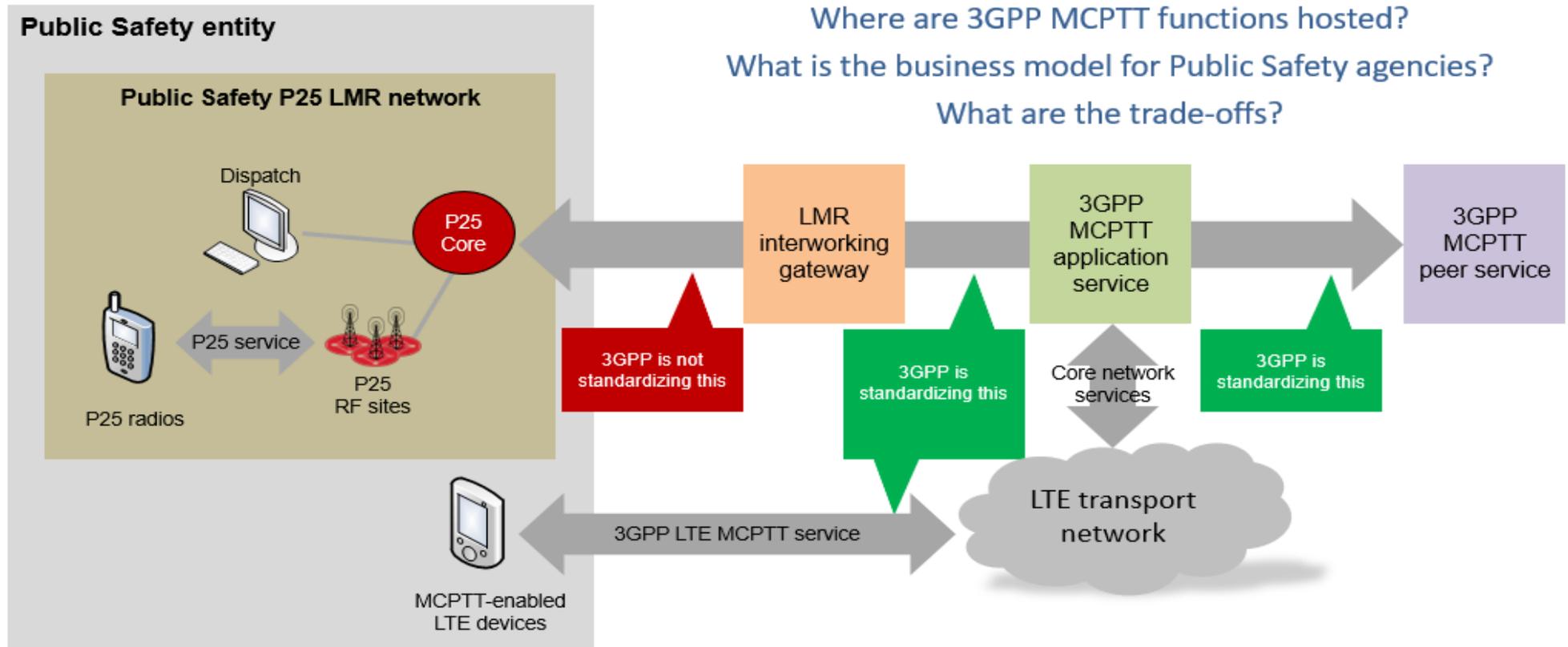
## Data

- **Broadband**
- **Definition of 3GPP Mission Critical standard services interworking with TIA Land Mobile Radio standard services is in progress.**

*This document will describe interworking of features (example; group and individual calls) that are common between 3GPP LTE standards and P25 Trunking, P25 Conventional and Analog Conventional FM LMR standards. **This document will be a basis for the modification of the ISSI, CSSI and DFSI P25 standards to enable interface with a Mission Critical LTE network via the 3GPP Inter Working Function (IWF).***



# LMR(P25) - LTE (First-Net) Update



Standardized interfaces between 3GPP MCPTT and LMR (P25) networks are enablers for interoperability of common standard services



# LMR(P25) - LTE (First-Net) Update

The ATIS (Alliance for Telecommunications Industry Solutions) TIA TR-8.8 (Broadband Data Solutions) Joint Project Committee (JLMRLTE)

*Creating a study document that contains scenarios and considerations for the use of a 3GPP Release 15 Interworking Function (IWF) to enable interoperability of common standard services between a 3GPP MC system (First Net) and a TIA-based LMR system (P25).*

*Note: Three distinct TIA-based LMR systems will be examined: P25 trunking, P25 conventional, and TIA-603 analog conventional FM.*



# LMR(P25) - LTE (First-Net) Update

## **TIA Recommendation:**

- The P25 Inter Sub System Interface (ISSI) is the primary interface to the Inter Working Function (IWF) for P25 Trunking
- The P25 ISSI and Digital Fixed Station Interface (DFSI) are the primary interfaces to the IWF for P25 and Analog Conventional

## **JLMRLTE Document Phase 1 Scope:**

- P25 Trunking, P25 Conventional (Analog will be in Phase 2)
- Registration, Affiliation, Group Call, Emergency Group Call, Announcement Group Call, Broadcast Group Call
- Encrypted and Clear Voice

*Document provided to TIA to enable start of TIA work*



# LMR(P25) - LTE (First-Net) Update

## Next Steps:

- TIA will begin modifying the P25 ISSI spec to interface with the 3GPP Interworking interface (IWF).
- JLMRLTE will continue Phase 2 work on the study document to address additional services and interworking with LMR Analog FM
- 3GPP will consider interworking details identified in the study document

Key contributors include but are not limited to: Firstnet, AT&T, Interworking equipment providers, Motorola, Harris, P25 equipment providers and users



# LMR-LTE User Expectations

## Government Users LTE Expectations\*

- Reliability, Capacity and Coverage Equal or better to LMR
- Cost Less money or more services
- Frequencies in Use Band 14 plus commercial bands
- Carrier Interoperability Local control & seamless transfer from any carrier to any carrier

## Government Users LMR/LTE Interworking Expectations\*

- LTE to operate between carriers for public safety mission critical broadband data
- LTE to operate between carriers & FirstNet for public safety mission critical broadband data
- LTE/FirstNet to develop interoperable capabilities with P25 systems

\*User information gathered by Cindy Cast as presented by PTIG at IWCE 2019



# P25 Standards Update & LMR-LTE Interworking

## Thank You

**Andy Davis**

- Chairman, TIA TR-8 Mobile and Personal Private Radio Engineering Committee, TR-8.8 Broadband Sub Committee
- Sr. Resource Manager, P25 Standards - Motorola Solutions



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# P25 Encryption Update: Link Layer Encryption and & Key Management Improved Interoperability

**Jeremy Elder**

- Director of Integrated Platforms, L3Harris



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# P25 Encryption Standards Update

- Link Layer Encryption (LLE)
  - Problem Statement
  - Solution Overview
  - Standards Update
  - Important User Considerations
- Key Fill Device Addendum



# LLE Problem Statement

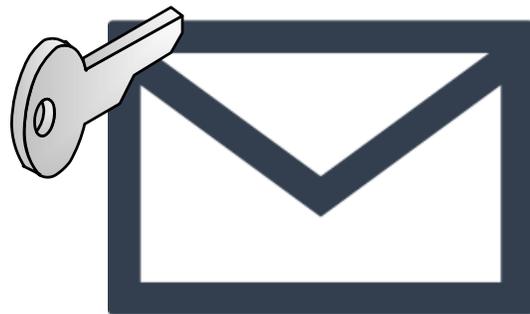
P25 Link Layer Encryption helps ensure:

- **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 Problem Statement

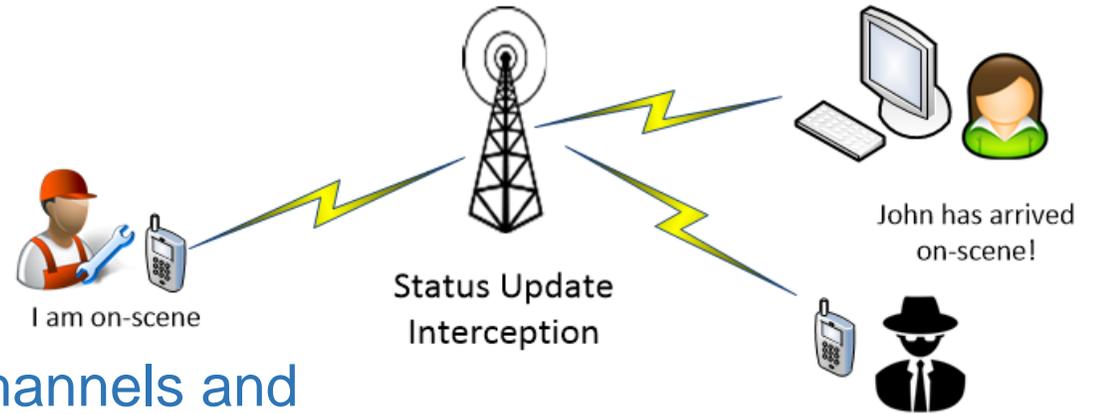
- P25 End-to-End Encryption for voice calls and packet data protects the contents of the transmission
- End-to-End Encryption by itself does NOT protect against intercepting the identities of the parties involved in a call
  - Initiator of a Call (Typically a User ID)
  - Target of a Call (Typically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



From: Jeremy  
To: Bill  
Message:  
Q@#\$%DFG%^&



# LLE Problem Statement

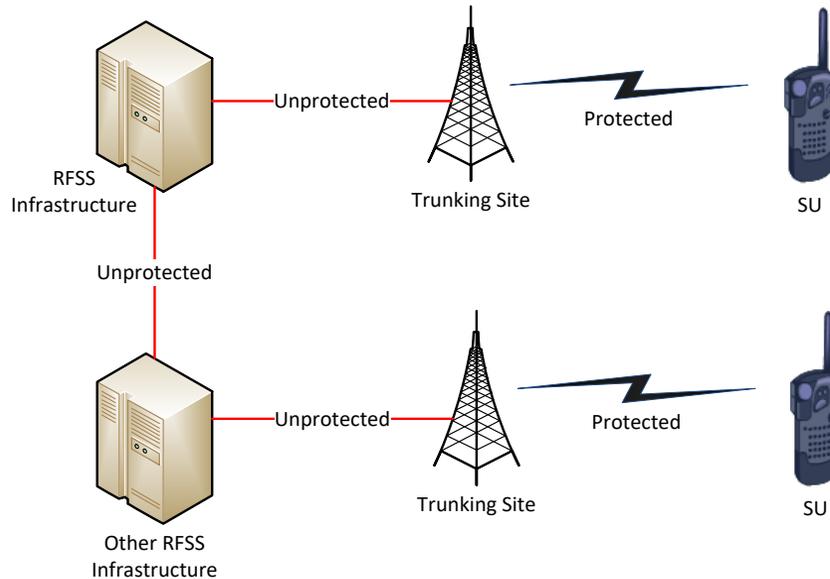


## Current state of P25 systems:

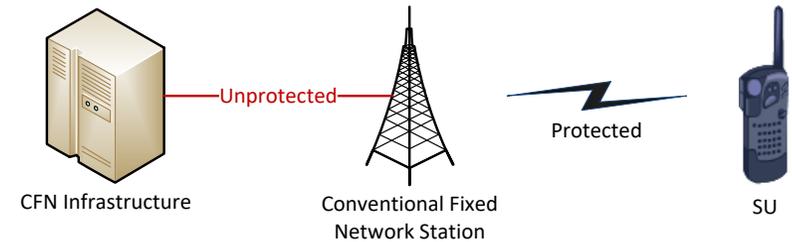
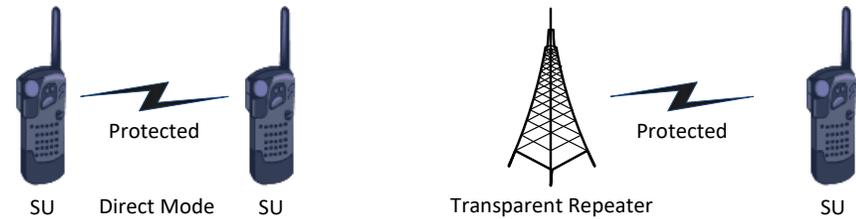
- Control signaling messages on traffic channels and conventional channels are not protected.
- P25 trunking control channel messages (inbound & outbound) are not protected.
- This includes:
  - User Registration/Group Affiliation, Service Requests & Channel Assignments
  - Supplementary Data Services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



# LLE Solution Overview



Trunking



Conventional

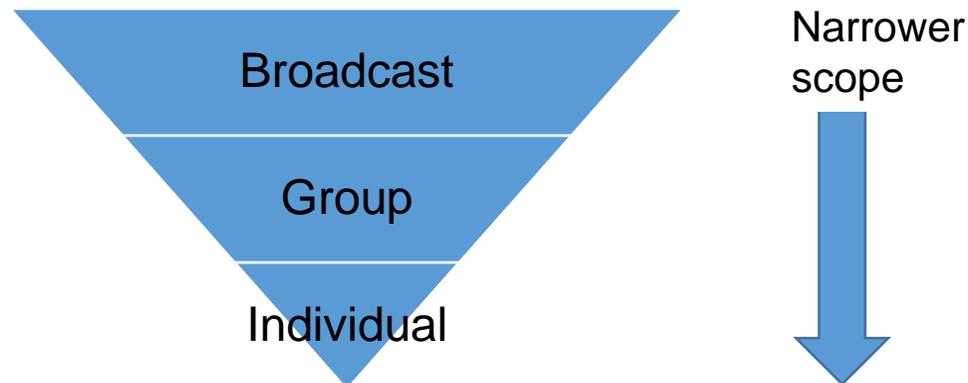
- LLE only protects the air interfaces—nothing wired
- “Protected” means that identities and user data are encrypted



# Key Management for LLE

## 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
- Key management is designed to be as seamless as possible – supporting distribution of future keys before they take affect
- Protection of the RLEK (& derived CLEK) 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



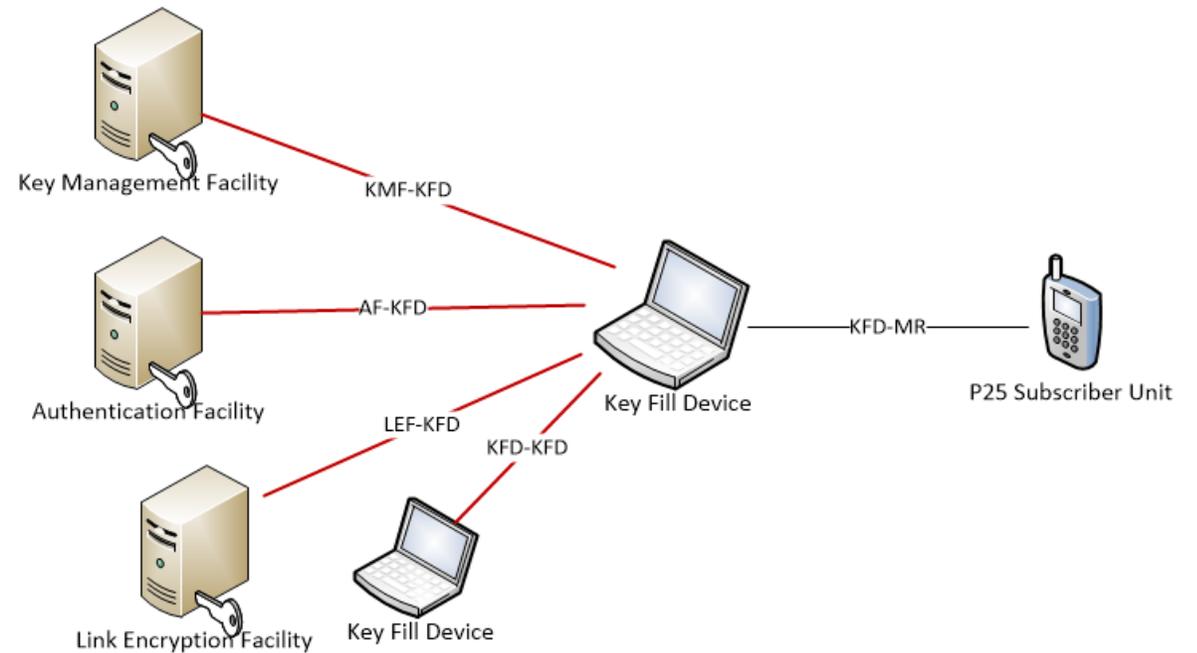
# P25 Encryption Standards Update

- Link Layer Encryption (LLE)
- **Key Fill Device (KFD) Addendum**
  - Scope of the Addendum
  - Status of the Addendum
  - User Considerations



# KFD Addendum Scope

- Enhances interoperability for P25 encryption by providing standards-based interfaces between a Key Fill Device (KFD) and the following:
  - A Key Management Facility (KMF)
  - An Authentication Facility (AF)
  - A Link Encryption Facility (LEF)
  - Another KFD



# KFD Addendum User Considerations

- TODAY: Interfaces between KMF, AF, and KFD and the KFD are proprietary—presenting challenges for interoperability between different P25 manufacturers
- There is no impact on the interface between the KMF and SU with this change—allowing support for legacy devices with new/updated KFDs
- There is still some time until the standard is published—equipment conforming new standards are typically available 12-18 months after publication



# P25 Encryption Update: Link Layer Encryption and & Key Management Improved Interoperability

## Thank You

**Jeremy Elder** Director of Integrated Platforms, L3Harris



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# P25 Steering Committee Updates

**Jim Downes**

Project 25 (P25) Steering Committee Chair



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# Importance of Continued P25 Support and LMR Sustainment

- The majority of the public safety community agrees that LMR will continue to be required for mission critical emergency response
  - P25 is the recommended technology of choice for mission critical voice and data interoperability
  - This need is further supported by SAFECOM Grant Guidance and the National Emergency Communications Plan
- P25 provides a competitive environment with multiple vendors offering standards compliant equipment and services
- The P25 Steering Committee is committed to continued improvement of the published standards and provisions for new features and functions



# P25 Steering Committee Activities

## Statement of Project 25 (P25) User Needs (SPUN)

- The Steering Committee recommended a more user friendly and informative document to replace the P25 Statement of Requirements
- The SPUN captures public safety user needs and P25 functionality and provides high-level explanations of the P25 system architecture, features, and functions as defined in the P25 Suite of Standards (P25 Standards) and/or as communicated by P25 public safety users and system administrators
- To achieve our goal to provide a usable tool, we must have both user and manufacturer participation and input. We are looking for users and manufacturers to participate in one or more of the four working groups (Infrastructure, Consoles, Subscribers, and Features and Functions)

## Vendor Crosswalk

- A reference tool to better define terms that differ between manufacturers for the same features and functions is being developed
- Assistance from users is greatly needed by providing any manuals or programming information relative to subscriber and fixed network equipment



To support these efforts, contact [Project25SC@hq.dhs.gov](mailto:Project25SC@hq.dhs.gov)

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# P25 Steering Committee Activities

## Education and Outreach

- Developing a series of informational videos that demonstrate the features, functions, and benefits of the technology
  - Current videos under development are Project 25 101, Project 25 Land Mobile Radio Sustainment, and Project 25 Land Mobile Radio Funding
- Identifying topics for a series of informational webinars and presentations including P25 101, P25 Technology, and ISSI/CSSI

## Standards Published

- Published 7 new standards this year, including Project 25 Trunking Control Channel Messages and Project 25 Digital Land Mobile Radio - Security Services Overview



# FPIC Requirements and Priorities Working Group Update

- Established as a result of the P25 Summit held in May 2018 in Portland, OR
- Overall purpose is to develop a prioritized list of user challenges that needs to be addressed via the P25 standards, user education, or manufacturer implementation. Once approved the prioritized list will be delivered to the P25 Steering Committee for disposition
- Three step process:
  - Assess and expand the list from P25 Executive Summit by engaging various user groups
  - Ask user groups to validate the final list
  - Deliver a final draft document to P25 Steering Committee for consideration
- A number of conference calls were held to engage the working group. Participants discussed internal work that has been completed on the original list to include adding potential impacts, suggested solutions, and prioritization levels for each listed issue



# FPIC Requirements and Priorities Working Group Update

- Next steps identify external groups to present the list for prioritization and approval
- Groups currently identified include:
  - SAFECOM/NCSWIC
  - International Association of Chiefs of Police (IACP)
  - P25 User Needs Subcommittee
  - Southwest Border Communications Working Group
  - Emergency Communication Preparedness Center (ECPC)
  - Association of Public-Safety Communications Officials (APCO)
  - International Association of Emergency Managers (IAEM)
  - National Association of State Telecommunications Directors (NASTD)
- Please send recommendations for additional groups to receive presentations to [FPIC@hq.dhs.gov](mailto:FPIC@hq.dhs.gov)



# ISSI/CSSI Focus Group

- The P25 ISSI/CSSI User Focus Group was established to identify and address ISSI/CSSI implementation challenges
- The Focus Group addresses implementation experiences including success stories and reoccurring challenges
- The Focus Group is identifying common implementation problems via the collection of these shared experiences, and through user discussion are developing possible solutions to each of the identified challenges



# ISSI/CSSI HSIN Portal

- The Homeland Security Information Network (HSIN) portal is available for on-going participant collaboration

The screenshot shows the HSIN (Homeland Security Information Network) portal. The header includes the HSIN logo and navigation links like 'Community Directory', 'HSIN Central', 'My HSIN', and 'Memberships'. The main content area features the FPIC (Federal Partnership for Interoperable Communications) logo and a welcome message for ISSI/CSSI users. Below the welcome message, there are several blue buttons for navigation: 'Best Practices', 'Issues and Solutions', 'Pre-Planning Support', 'Additional Implementation Resources', 'ISSI/CSSI User Focus Group', and 'ISSI/CSSI Working Group'. A sidebar on the left contains a 'Libraries' section with links to 'ISSI/CSSI Implementation 101 and Fundamental Learning', 'Best Practices', 'Issues and Solutions', 'Pre-Planning Support', 'Additional Implementation Resources', 'ISSI/CSSI User Focus Group', and 'ISSI/CSSI Working Group'. There is also a 'Discussions' section with links to 'ISSI Discussion' and 'CSSI Discussion Bulletins', and a 'Lists' section with a link to 'ISSI/CSSICalendar'.



# ISSI/CSSI Best Practices: Volume I

The Best Practices guides are a collaboration of the ISSI/CSSI Focus Group and the ISSI/CSSI user community to establish references for planning an ISSI or CSSI implementation.



Best Practices for Planning and Implementation  
of P25 Inter-RF Subsystem Interface (ISSI) and  
Console Subsystem Interface (CSSI):

Volume I

January 2019



- Volume 1 provides guidance to consider when planning and implementing an ISSI/CSSI
- Includes recommended Best Practices regarding pre-planning, partnerships and governance, technology, and policies
- Provides lessons-learned based check list for those considering implementing ISSI/CSSI



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# ISSI/CSSI Best Practices Volume II

- Volume II is currently under development and will include:
  - Stakeholder Engagement
    - Including radio personnel, network professionals, users, and vendor/manufacturer personnel
  - Technology
    - Including network connections, infrastructure, consoles, subscriber units, and features
  - Policies and Additional Governance
    - Including standard operating procedures, memoranda of understanding, and version control
  - Thinking Ahead
    - Including maintenance plans or agreements, system upgrades, and on-going testing and reporting
- User input and feedback continues to be essential. To participate, send an email to [FPIC@hq.dhs.gov](mailto:FPIC@hq.dhs.gov)



# ISSI/CSSI Features & Functions Survey

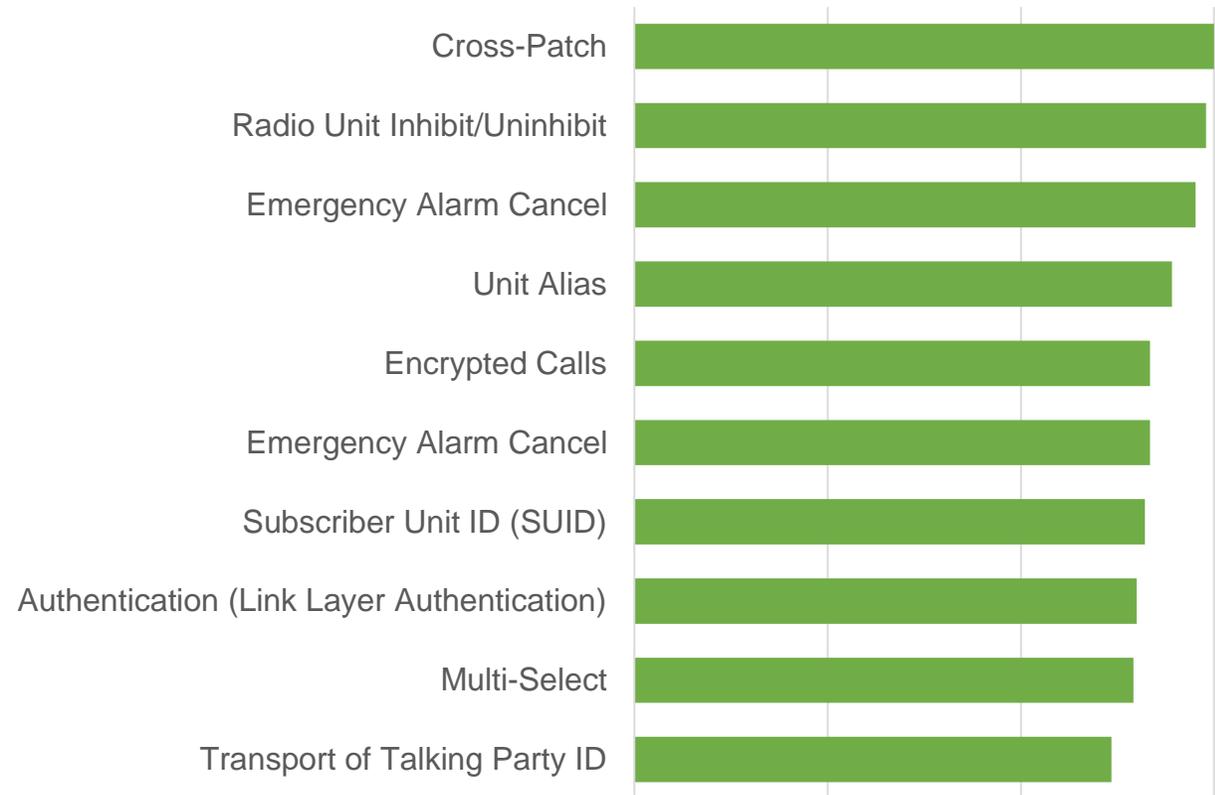
- Survey purpose is to collect information from users to understand user prioritization, uses, and expectations of ISSI/CSSI features and functions
- Distributed by Texas Department of Public Safety (DPS) and developed in coordination with the FPIC ISSI/CSSI User Focus Group
- Total of 95 valid responses recorded (as of July 22, 2019)
- Currently collecting responses through the FCC Regional Planning Committees to gain additional user input
- Those interested in participating in the survey can follow the link provided:  
<https://www.surveymonkey.com/r/788JQGB>



# Preliminary Results

- Users are asked to rate (1-4 scale) how important each feature and function is to life safety and interoperability

Top 10 Features and Functions: Importance Rating



# Project 25 Testing

- As previously addressed, the multiple vendor P25 environment dictates a critical need for consistent and reportable conformance and interoperability testing to ensure both operability and interoperability
- Project 25 Compliance Assessment
  - The ability to utilize equipment from multiple vendors and maintain both intra-system and inter-system interoperability requires the use of common standards
  - It is critical that P25 equipment and systems are compliant with the published standards and confirmed through an open and coordinated process
  - The P25 Steering Committee and the TIA TR8 Engineering Committee support the CAP process and provide jointly developed P25 Recommended Compliance Acceptance Tests (RCAT)s for CAP consideration
  - It is important that both users and vendors are actively engaged in the process



# P25 Steering Committee

- The P25 Steering Committee approved 12 test procedure documents, developed in coordination with TR-8, for forwarding to the P25 Compliance Assessment Program (CAP) for consideration in the development of Compliance Assessment Bulletins (CABs) that define the tests required for program participation
- Recommendations included four published interoperability test documents for inter-RF subsystem interface (ISSI) and trunked system standards
- Users are urged to refer to the published test procedures listed in the Project 25 List of Approved Standards when developing acquisition plans when there is no CAP approved test results available



# ISSI/CSSI Non-CAP Interoperability Test Template

- The template was developed to provide the public with test results prior to the availability of CAP recognized ISSI/CSSI testing labs and testing results
- APIC Compliance Assessment Process and Procedures Task Group (CAPPTG) forwarded a Non-CAP Interoperability Test Template for P25 Steering Committee approval. The P25 Steering Committee approved the template
- The template was intended to be used by manufacturers and users to conduct and record interoperability tests of common features/functions between different manufacturer systems
- At the request of the P25 Steering Committee, PTIG published the template and the results of testing as a method for reporting ISSI and/or CSSI P25 Interoperability test results for user and manufacturer reference [www.project25.org](http://www.project25.org)
- Both users and manufacturers are encouraged utilize the template to rapidly provide test results to the public safety community



# For Additional Information

- Project 25 Steering Committee email: [Project25SC@hq.dhs.gov](mailto:Project25SC@hq.dhs.gov)
- Project 25 Steering Committee Website  
<https://www.dhs.gov/technology>
- Project 25 Technology Interest Group (PTIG):  
<http://www.project25.org>
- DHS P25 Compliance Assessment Program (CAP)  
<https://www.dhs.gov/science-and-technology/p25-cap>



# P25 System and Console Interoperability & P25 Testing Update

## Thank You

**Jim Downes** Project 25 (P25) Steering Committee Chair



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# Project 25 What's New Today and What's Coming Next



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