



P25 Standards Update & JLMRLTE (LMR-LTE) Interworking Update. December 2024

John Lambrou

TIA TR-8 - P25 Standards Face to Face Meeting, Nashville TN February 25-26



Location:

180 Drury Plaza Hotel Nashville Downtown
300 Korean Veterans Blvd
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Project 25 Standards TR-8 Update



TR-8.1

- Correction to the High Signal Strength Intermodulation Rejection Tests are in progress
A clarification to the FDMA, TDMA and Analog FM Performance recommendations has been identified. This corrects “shall not exceed” text to “shall meet or exceed”. Manufacturer’s understood the error but the standards will be corrected.
- Comment resolution completed on all 3 documents, approved to ballot in Lakewood.
- **Technical ballots for all 3 documents closed successfully on Nov 21 and a motion to publish all 3 is underway.**

Project 25 Standards TR-8 Update



TR-8.3

- A revision to the Key Fill Device Interface Standard is in progress

This will enable a Key Fill Device (KFD) to interface with 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.

- The revision is occurring in phases. Each phase covers specific sections. All Phases (1 thru 6) are complete. Phase 6 is a final review of the entire document prior to going to ballot.
- **The document was approved for technical ballot at the meeting in Lakewood on Nov 15 and closes on Dec 16.**
- A revision to the Inter KMF Interface is in progress

Manufacturer testing revealed differing interpretations of the use of S/MIME that will be clarified to prevent future interoperability issues.

 - The document was published in July
- An addendum to the Inter KMF Interface is in progress

This addendum adds Transport Layer Security (TLS) 1.3.

 - **A project was opened and the document was approved for technical ballot in Lakewood. The ballot closed on Nov 22. Publication is pending.**

Project 25 Standards TR-8 Update



TR-8.3 (cont)

- An issue with the operation of Mutual Authentication has been identified

St. of PA noted they had issues when a radio attempted mutual authentication on an infrastructure that did not support mutual authentication. The representative of the State reviewed the standard and feels that clarifications may be in order.

- **A project was approved to address this specific issue at the meetings in Lakewood on Nov 15.**

Project 25 Standards TR-8 Update



ETG

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

This architecture work is occurring in the Encryption Task Group and is expected to impact several published TIA standards. This service is for improved Security for all air interfaces of P25. It protects control messages, hides group and individual IDs and is being designed to interoperate with legacy equipment.

- LLE Overview comment and comment resolution as needed.
- LLE **Trunking** Messages and Procedures document comment resolution is in progress.
- **LLE Conventional Messages and Procedures document is being drafted.**
- MSI is working on LLE revisions to the FDMA Common Air Interface.
- Etherstack reviewed the KFD and OTAR Key Management expectations in the LLE Overview and has provided a submission on LLE Key Fill. **Comments have been received and comment resolution is in progress.**
- Etherstack reviewed the wireline interface expectations in the LLE Overview document has provided submissions for LLE ISSI and DFSI. **Review is pending an update to the original drafts.**

Project 25 Standards TR-8 Update



TR-8.10

- Work on a new standard for Location on PTT is in progress

This will provide location of a voice transmitting trunking subscriber to a dispatch operator with a mapping application. Due to previous, non standard deployments by both Motorola Solutions and L3Harris, draft documents distributed for review include both deployed methods and use the respective MFIDs.

- Addenda for FDMA Trunking documents were considered first. All 3 FDMA documents have been published.
 - TDMA submissions were distributed and comments received. **Technical ballots on two addenda closed successfully on December 2 and editorial comment resolution is underway.**
- Work on a new standard for FDMA and TDMA over the air User Alias is in progress
- This feature enables a listening subscriber unit to receive the user alias of another subscriber user conducting a voice call. Both Motorola and L3Harris have non standard deployments. MSI has declined standardization. Draft documents describing the L3Harris method have been distributed for review.*
- Addenda for FDMA Trunking documents were considered first. FDMA documents have been published.
 - TDMA submissions were distributed and comments received. **Technical ballots on two addenda closed successfully on December 2 and editorial comment resolution is underway.**

Project 25 Standards TR-8 Update



TR-8.10 (cont)

- Work on an addendum to the Trunking Control Channel Messages and Procedures document is in progress (Remotely Activated Emergency - bit)

The proposal is to specify additional messages associated with the RAE Trunking Procedures and to specify one of the currently unused bits in the Emergency Alarm Request message. This flag is intended for use when a subscriber user is in an emergency situation and is unable to initiate an alarm request. For example, a trapped firefighter may not be able to initiate an alarm request, and remotely activating an emergency on their subscriber unit may facilitate their rescue. This emergency alarm special information field will inform other users of this situation.

- Technical ballot closed successfully on November 20 and editorial comment resolution is underway.
- Comment resolution on an addendum to the Trunking Procedures document is in progress
The proposal describes procedures for Remotely Activated Emergency (RAE).
 - Technical ballot closed successfully on November 20 and editorial comment resolution is underway.

Project 25 Standards TR-8 Update



TR-8.10 (cont)

- Revision of the Trunking Procedures document is in progress

Recommended modifications to the Emergency Alarm, Call and Cancel services have been proposed by a joint TR-8.10/TR-8.19 working group. This work is intended to enable creation of new ISSI Interoperability tests and may affect Trunking Air Interface Interoperability Tests. As part of this effort, 2 published addenda will be merged into the parent document.

- Comments on proposed Trunking Procedures document changes for Emergency behaviors have been received and document modifications are in progress.
 - **On track to distribute the initial draft this month.**

Project 25 Standards TR-8 Update



TR-8.19

- 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.

- An updated draft of the Messages and Procedures document with companion Message Sequence documents has been reviewed. Comments were received from Etherstack and L3Harris. Compiled comments with author responses have been distributed. Offline comment resolution discussions are in progress. Etherstack is also adding Message Sequence Charts to the last draft.
- ISSI Interoperability Test Procedures for Trunked Voice Operation Involving the ISSI
This effort will address errata collected since the last publication. These modifications will also consider new tests for Group Emergency Cancel and vocoder mode combinations.
- Digital Fixed Station Interface addendum for interfacing with a 3GPP IWF is in progress.
This effort will describe how a Conventional Fixed Station or Fixed Station Host may be used with an IWF.
 - A first draft has been distributed and comment resolution was completed. Second draft pending.

Project 25 Standards TR-8 Update



TR-8.19 (cont)

- A new submission for Remotely Activated Emergency across an ISSI/CSSI is under consideration
- Group Emergency Cancel Behaviors are being clarified

This work will affect Trunking Procedures as well as ISSI procedures and will enable the creation of new interoperability tests.

- TR-8.10 and TR-8.19 will plan joint comment resolution discussions (pending release of updated emergency procedures)

ISSI TG

- Work is resuming for completion of the ISSI Interoperability Test for Trunked Supplementary Data.

This resumes work on the last ISSITG draft (2018) and will add emergency alarm cancel and group emergency cancel tests.

- Comments not associated with Emergency Cancel are resolved and a new draft will be provided.
- Progress on the Emergency Cancel procedure updates is expected to trigger updates to existing ISSI and Trunking Procedure standards.

Project 25 Standards TR-8 Update



ISSI TG (cont)

- Work is resuming for completion of the ISSI Conformance Test for Trunked Supplementary Data
This resumes work on the last ISSITG draft (2018) and will add emergency alarm cancel and group emergency cancel tests.
 - **Plan to provide a new draft without waiting on the emergency alarm/call tests effort. The document will be revised to more closely align with the interoperability tests.**
- A new submission for connecting Location Service Host Systems is under consideration
 - Comments on the first 4 sections have been received. **Work on comment responses is underway.**

Data TG

- Work is resuming for consideration of Conventional Location services
This resumes work on the need for Location on PTT in several different Conventional configurations and consideration of the need for Unique Identifiers
 - DVSI has proposed making use of unused space in vocoder signaling that may carry Location on PTT Information.
 - Currently reviewing past User Requirements. Linked Repeater configuration testing is pending.
 - BLM provided new user requirements

TIA (non-P25) Standards TR-8 Update



TR-8.18

- New request for consideration of indoor coverage extender evaluations is being considered; TSB-88.6 “Part 6: Recommended Methods for Measurement and Interference Assessment for In-Building Emitters”

This effort is intended to address methods for measurement and interference assessment for in-building emitters.

- Drafting is in progress

TIA (non-P25) Standards TR-8 Update



TR-8.21

- CSA Status: ICHL: Canada IS plan for LMR is to harmonize with the TIA-4950 Standard and develop a bi-national standard. Volunteers were identified to work on the draft and CSA will work out administrative details to enter into an agreement with TIA.
- **CSA and TIA continue to discuss and review updates to the MoU before drafting work on the bi-national standard will begin.**

ATIS/TIA JLMRLTE Working Group Status



JLMRLTE

- The 2024 work on the JLMRLTE study is considered Phase 7 of the study document
This work included cleanup of material on common P25 trunking standard services and consideration of Emergency Alarm interworking.
- JLMRLTE calls have been held approximately every month.
- The Phase 7 version of the study document is complete and has been distributed to TIA.
- Phase 8 scope is dependent on submissions with target completion date of December 2025.
- Study publication is scheduled to complete 2025 Q1.
- **Calls were held July 23, September 25, October 22 and December 5. The Phase 7 version of the document is complete and will be provided to TIA and prepared for publication by ATIS.**
- **ATIS and TIA are now moving forward with ballot approval and publication of the Phase 7 version.**

P25 Standards Update & JLMRLTE (LMR-LTE) Interworking Update.

Questions ??



John Lambrou



P25 Standards Update and Future Projects

PPT from APCO 2024 Panel

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

P25/TIA Document Types



- **To date, TIA TR-8 (Mobile and Private Radio Engineering Committee) has created and maintains all documents included in the P25 Suite of Standards (80+ documents)**
 - Air Interfaces - Frequency Division (FDMA) for trunking/conventional voice and packet data services and Time Division (TDMA) for trunking voice and control channel
 - Wireline Interfaces - Inter Sub System Interface (ISSI), Console Sub System Interface (CSSI) and conventional Fixed Station Interface (FSI)
 - Security services; Over the Air Rekeying, Trunking Authentication, AES256 Voice and Data Encryption
 - Location services; Tier 1 (conventional) and Tier 2 (trunking or conventional)
- **Standards enable interoperability between equipment of different manufacturers**
 - User agencies (via User Needs Working Group (UNWG)) and/or customer Request for Proposals via manufacturers) identify interfaces and functionality that need to interoperate
 - Manufacturer and user agency representatives work together to create TIA standard documents
 - Project 25 Steering Committee approves TIA standards for inclusion in the P25 Suite of Standards
 - Customers choose what standard functionality they desire, manufacturers build to the standards that support their customers and standard tests validate interoperability of manufacturer implementations

P25/TIA Document Types (cont.)



- **Standard messages and procedures documents**
 - Explain how standard services/features work
 - Define message content and message exchange procedures
 - Enable interoperable implementations by equipment manufacturers
- **Standard test documents**
 - Performance, conformance and interoperability
 - Standard test methods ensure implementations interoperate and comply with standard messages and message exchange procedures with specific configurations
- **Telecommunications Systems Bulletins**
 - Provide overviews of standard interfaces and standard services
 - Provide consistent methods for modeling coverage and interference and for validating coverage

Summary of Improvements and Ongoing Work for; P25 Air Interface Standards



- **New Radio Measurements Methods and Performance Recommendations for mobile/portable receiver interference rejection**
 - *Should interference from broadband base station signals occur, these set expectations on what interference protection may be reasonably expected from P25 and Analog mobile and portable receivers.*
 - *FDMA, TDMA and Analog FM documents have been published.*
- **Improving documentation for modeling noise and interference and for coverage modeling and verification**
 - *Now addresses interference issues for radios in proximity of short-tower cellular systems at 700/800 MHz, RF penetration through low-emittance (so-called "green") glass and additional factors for Coverage Acceptance Plans (CATPs).*
 - *Clarifies Delivered Audio Quality verification methods.*
 - *New effort for consideration of indoor coverage extender evaluations is in progress.*

Summary of Improvements and Ongoing Work for; P25 Air Interface Standards



- **New Emergency Alarm activation and indication for Trunking and Conventional**
 - *This is intended for use when a subscriber user is in an emergency situation and is unable to initiate an alarm request (example; downed firefighter) and an alarm is remotely activated. This emergency alarm special information field will inform other users of this situation.*
- **New User Alias Download feature for Trunking**
 - *Allows radios to translate the standard defined numeric identities received during voice calls to a system operator defined alpha numeric alias to improve the radio operator's awareness of who they are listening to in a call.*
 - *FDMA published; TDMA pending.*
- **New Location on Push to Talk feature for Trunking**
 - *This will embed location in trunking voice transmissions for use by a mapping application*
 - *FDMA published; TDMA pending.*

Summary of Improvements and Ongoing Work for; P25 Security Standards



- **New NIST approved Over the Air Rekeying Message Authentication method**
 - *Published: This adds a new standard MAC method for interoperability of new equipment while maintaining the previously standardized CBC MAC method for interoperability with legacy equipment.*
- **Improved Interoperability for End to End encryption key sharing between Key Management Facilities (KMFs)**
 - *Manufacturer testing revealed differing interpretations of the use of S/MIME that are being clarified to prevent future interoperability issues; Approved for publication.*
 - *Use of Transport Layer Security (TLS) version 1.3 will be considered next.*
- **Operation of Mutual Authentication is under review**
 - *The review will evaluate recent equipment issues identified by customers.*

Summary of Improvements and Ongoing Work for; P25 Security Standards



- **New capabilities for P25 Key Fill Devices**
 - *The published standard enables interoperability of Key Fill devices when used for key management of portables/mobiles. New capabilities will allow interoperability of these devices when moving End to End keys between KMFs or KFDs, moving keys from KMFs to portables/mobiles and synchronizing Authentication keys between Authentication Facilities and portables/mobiles.*
- **New P25 Link Layer (Air Interface) Encryption service protecting all air interface signaling**
 - *Users and manufacturers are working together in the APCO Project 25 Interface Committee's Encryption Task Group to define the service.*
 - *This service will selectively encrypt air interface signaling and be interoperable with legacy air interface signaling.*
 - *This new system level service will affect nearly all published Air Interface standards in addition to published Security and Wireline Interface standards.*

Summary of Improvements and Ongoing Work for; P25 Wireline Interface Standards



- **Control of “Group Regrouping” across the Inter Sub System Interface (ISSI) and the Console Sub System Interface (CSSI)**
 - *Group Regrouping maximizes efficient use of RF resources when talkgroups are patched together. Both the Motorola and L3Harris methods of Air Interface signaling are included in published Air Interface standards. This new work will enable control of the Air Interface signaling when systems are connected with an ISSI or have dispatch equipment connected with a CSSI.*
- **Standard revisions for Emergency Group Call and Cancel**
 - *Clarifications of signaling and associated equipment behaviors to enable new test cases*
- **New Interoperability and Conformance tests for ISSI and CSSI**
 - *New Trunking Interoperability tests include tests for vocoder mode combinations, tests for Supplementary Data Services such as Call Alert, Emergency Alarm, Emergency Group Call Cancel, etc.*
 - *New Conformance tests will cover Supplementary Data Services.*

Summary of Improvements and Ongoing Work for; P25 Wireline Interface Standards



- **New feature for Remotely Activated Emergency Alarm**
 - *Considers control signaling across an Inter Sub System Interface (ISSI) and Console Sub System Interface (CSSI) to activate a radio's emergency alarm.*
- **Modifications to the P25 Inter Sub System Interface (ISSI), the Console Sub System Interface (CSSI) and Digital Fixed Station Interface (DFSI) to enable future Interworking with Broadband Cellular Public Safety Systems**
 - *Published: ISSI/CSSI addendums defining use of the P25 ISSI/CSSI for connecting P25 Trunking systems to a 3GPP Inter Working Function (IWF).*
 - *In review: DFSI addendum defining use of the P25 DFSI for connecting P25 Conventional or Analog FM base stations to a 3GPP IWF.*
 - *Pending: Revision or addendum to the P25 Conventional ISSI/CSSI standard for connecting P25 Conventional or Analog FM base stations to a 3GPP IWF.*

ATIS/TIA JLMRLTE Working Group



- 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 Inter Working Function (IWF) to enable interoperability of standards services between a 3GPP mission-critical standards based LTE system and a TIA standards based LMR system. TIA standards based LMR systems being considered are: P25/TIA-102 Trunking, P25/TIA-102 Conventional, and TIA-603 analog conventional FM.
- The Interworking Study document does not prescribe a particular LMR interface to the IWF although the P25 Inter-RF Subsystem Interface (ISSI) and Digital Fixed Station Interface (DFSI) have been chosen by TIA.

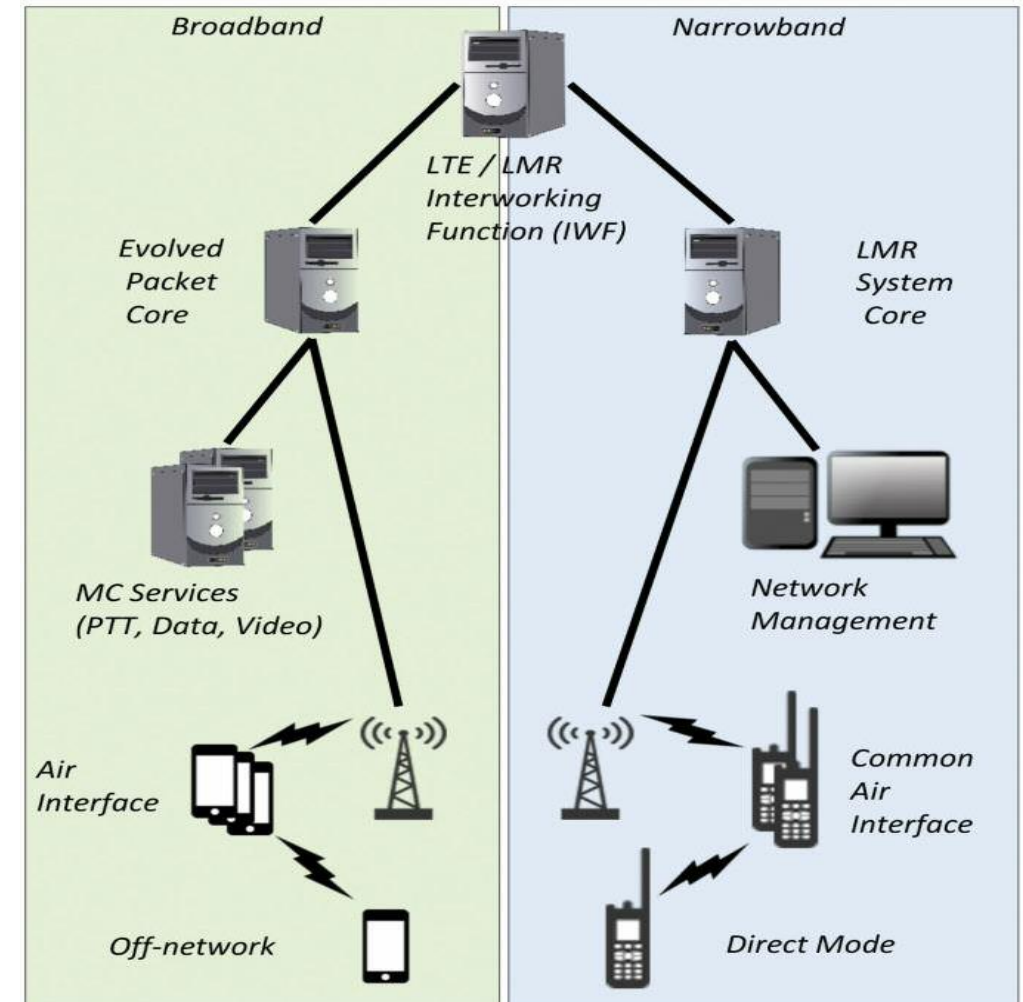
ATIS/TIA JLMRLTE Working Group



- The JLMRLTE Interworking Study document describes how the common standardized services (features) work in P25 Trunking, P25 Conventional, Analog FM and 3GPP and how the standard features in the 2 very different technologies may be made to interoperate. This includes generic message exchange, media translation and identity translation expected of an IWF.
 - This enables 3GPP or TIA work to define the necessary messages and procedures to enable interoperable implementations.
- The study document also identifies P25 features that do not have similar 3GPP features and may not be expected to interoperate.
- Publication of the Study document by ATIS is TBD.

LTE/LMR Inter Working Function

- The 3GPP Interworking architecture defines an interworking functional entity (IWF).
- 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.
- This IWF supports interworking between LMR systems and LTE systems using standard TIA LMR interfaces and the standard 3GPP IWF interfaces.
- For LMR, the P25 Inter-RF Subsystem Interface (ISSI/CSSI) and Digital Fixed Station Interface (DFSI) have been chosen by TIA.



ATIS/TIA JLMRLTE Working Group



TIA Published 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 of enabling the interoperability of a set of standard trunking services (features) common between the 3GPP MCPTT standards the P25 trunking standards.

ATIS/TIA JLMRLTE Working Group



TIA Working Documents:

- TIA TR-8.19 (Wireline Interfaces Subcommittee) is working on a Digital Fixed Station Interface standard to enable connection to an IWF.

This work will describe use of the DFSI for connection to a 3GPP IWF for the purpose of enabling the interoperability of a set of standard conventional services (features) common between the 3GPP MCPTT standards the P25 Conventional and Analog FM standards

- TIA TR-8.19 (Wireline Interfaces Subcommittee) is considering work on the Conventional ISSI standard.

This work will describe use of the Conventional ISSI/CSSI for connection to a 3GPP IWF for the purpose of enabling the interoperability of a set of standard conventional services (features) common between the 3GPP MCPTT standards the P25 Conventional and Analog FM standards



P25 LMR & LTE.....Better Together

P25 LMR and Cellular LTE (FirstNet) are different Technologies

You don't need to choose one or the other.

They are Better Together

- The rollout of 3GPP LTE services is in progress and is expected to continue to progress in the coming years.
- There will likely be a long, 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.
- 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

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