Harmony for PTT Services?
P25 and LTE

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

Program Participants

Moderator

- **Steve Nichols,** Director, Project 25 Technology Interest Group (PTIG)

Panelists

- **Cindy Cast (Virtual),** Radio Systems Manager, Miami-Dade County,

  Chairman: Project 25 Technology Interest Group

  Chairman: State of Florida, Communications Focus Group

- **Andy Davis**, Senior Resource Manager, Project 25, MOTOROLA SOLUTIONS
  Chairman: TIA TR-8

- **Jeremy Elder,** Director of Integrated Platforms, L3HARRIS CORPORATION

- **Robin Grier**, President, Catalyst Communications Technologies

Introductions/ Agenda
PTIG P25 Resources Available

Stephen Nichols

Director Project 25 Technology Interest Group (PTIG)

Agenda

TOPIC	SPEAKER
P25 Resources Available	Steve Nichols, PTIG
Project 25 with LTE Overview & User Perspective	Cindy Cast (Virtual) Miami Dade County FL
Standards Update: ATIS/TIA LMR LTE Joint Project Committee	Andy Davis, Motorola Solutions
Business Model - Deployment models for P25 & LTE MCPTT Interworking	Jeremy Elder, L3HARRIS
A Standards Compliant Solution for LMR/LTE Interworking DHS & PSCR Funded Program Update	Robin Grier, Catalyst Communications
Open Q&A session	

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

User needs

↓

Project 25 Steering Committee (users)

↕

APCO P25 Interface Committee (users & manufacturers)

↕

Telecommunications Industry Association (TIA), TR.8 Committee(s)

The P25 ECO System Today

Established Base of over 2800+ Project 25 Systems on the air today

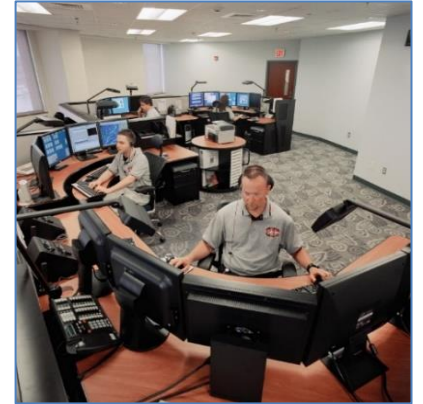Including 42 Statewide Project 25 Systems in the US.

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

WWW.Project25.org

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

Project 25 with LTE
Overview & User Perspective

Cindy Cast

Radio Systems Manager, Miami Dade County FL

Chairman, Project 25 Technology Interest Group

Chairman: State of Florida, Communications Focus Group

Overview & User Perspective

- Project 25 (P25) – Land Mobile Radio (LMR)

- Long Term Evolution (LTE) – Cellular

- FirstNet (LTE) – Public Safety Broadband Network

- Existing Radio System

- Existing Cellular Usage

- Government Users LTE Expectations

- Government Users LTE Initial Deployments

- Government Users LTE Challenges/Opportunities

- Government Users LMR/LTE Interworking
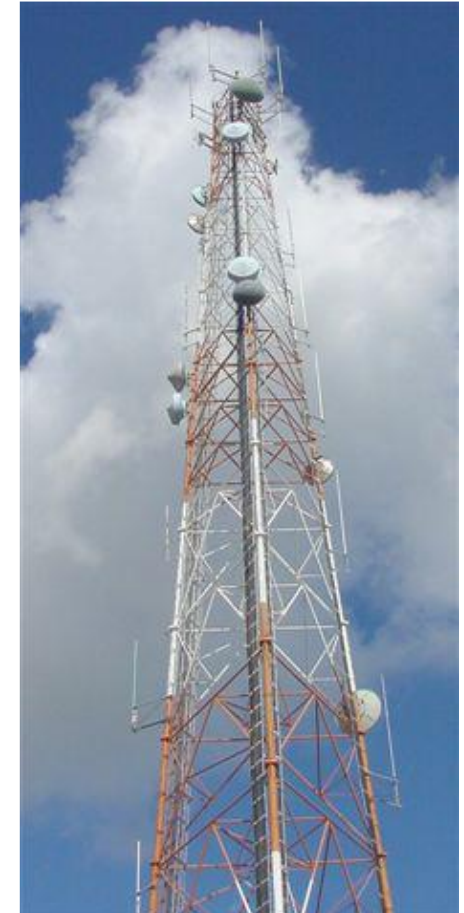
Overview

- **Project 25 (P25) – Land Mobile Radio (LMR)**

  - Standard for the design and manufacture of interoperable digital two-way wireless communications products.
  - Developed in North America with state, local and federal representatives and Telecommunications Industry Association (TIA) governance, P25 has gained worldwide acceptance for public safety, security, public service, and commercial applications

- **Long Term Evolution (LTE) – Cellular**

  - Standard for wireless broadband communication for mobile devices and data terminals, based on the GSM/EDGE and UMTS/HSPA technologies.
  - It increases the capacity and speed using a different radio interface together with core network improvements.

Overview

- **FirstNet - Public Safety Broadband Network**
  - The First Responder Network Authority of the United States was created under the Middle Class Tax Relief and Job Creation Act of 2012 as an independent authority.
  - FirstNet is a nationwide wireless broadband network being built for first responders.
  - The First Responder Network Authority is the federal entity charged with overseeing the creation and delivery of the FirstNet network. It is housed within the Department of Commerce, National Telecommunications and Information Administration.
  - AT&T was awarded the contract in April 2017 to build the LTE broadband network.
  - The agency's role is to ensure AT&T delivers on the terms of its contract and creates a network that meets the needs of public safety now and into the future.

Existing Radio System

- Government agencies rely on Land Mobile Radio (LMR) systems to support voice two-way radio communications for personnel in the field to communicate.

- Radio Systems are complex terrestrially-based, wireless communications systems. Not all radio systems are the same. The configuration of the radio system makes it unique. When developing a radio system there are many elements involved. However, some of the primary elements are:
    - o **Capacity** - # of talkpaths, # of devices, avg. length of conversation
    - o **Frequency** – VHF, UHF, 800 MHz, 700 MHz
    - o **Coverage** – street level, inside of buildings (density level) for jurisdiction
    - o **Type** – Conventional, trunked, single site, multi-site, analog, digital, encryption, local control, programming processes for interoperability
    - o **Reliability –** the performance of the system under a stated condition for a specified period of time.
    - o **Cost** – Original purchase price, plus, on-going operational and maintenance costs

Existing Cellular Usage

- Government agencies utilize Cellular systems to augment existing forms of communication

    - Mobile Data Terminals (MDT) – laptops in vehicles
        - NCIC Lookups
        - Local Computer Aid Dispatch (CAD) Systems
        - Access Shared Data Information
        - Emails
        - Internet
    - Cell phones
        - Voice Calls
        - Data transmissions
            » Emails
            » Internet

Government Users LTE Expectations

- ## Reliability
  - Equal or better

- ## Coverage
  - Equal or better

- ## Cost
  - Less money or more services

- ## Capacity
  - Equal or better

- ## Frequency
  - Band 14 plus commercial bands

- ## Type
  - Local control & seamless transfer from carrier to carrier for interoperability

Government Users LTE Initial Deployments

- Replacing existing MDT service provider equipment

- Interworking with existing P25 systems

    - Increasing coverage for non-critical users regularly going outside of jurisdiction

    - Increasing coverage gaps for non-critical users within existing systems

- Convergence of new devices (testing phase)

Government Users LTE Challenges/Opportunities

- Overcoming, State and Local government agency contracts with carriers that are not AT&T(FirstNet), which currently indicate they have enhanced coverage.

- Since there are currently, no established standards or agreements for the following, they should be developed.

  - cellular commercial carriers to ensure prioritized interoperability for critical public safety applications and access between carriers.

  - cellular commercial carriers to ensure seamless access and transferring of data between carriers.

Government Users LMR/LTE Interworking

- 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

Government Users LMR/LTE Interworking
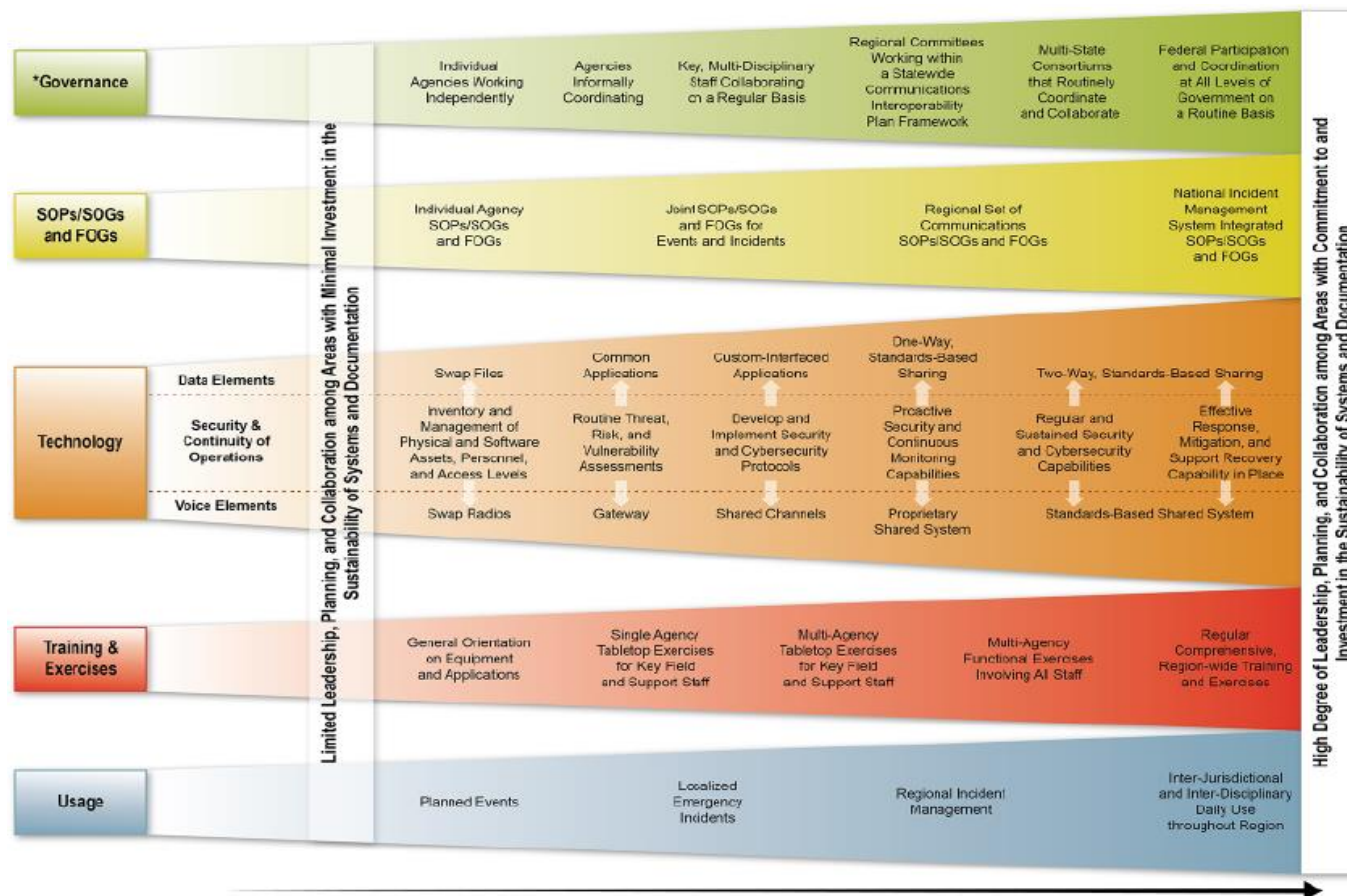
There is a place in Public Safety for LMR & LTE systems
Utilizing the best of both technologies

Thank You

Cindy Cast

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Radio Systems Manager, Miami Dade County FL

Chairman, Project 25 Technology Interest Group

Chairman: State of Florida, Communications Focus Group

P25 Standards Update
ATIS/TIA Joint LMR LTE Joint Project Committee

Andy Davis

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

ATIS and TIA Background (1 of 2)

- TIA and ATIS Memorandum of Understanding dates back to 2006 in which the two Standards Development Organizations (SDO) "agree to jointly sponsor and work cooperatively in the development of joint standards documents that are of mutual interest".

- ATIS – Alliance for Telecommunications Industry Solutions is a SDO that develops technical and operational standards and solutions for the ICT (Information and Communication Technologies) industry
  - members include manufacturers and user agencies such as AT&T and APCO

- TIA – Telecommunications Industry Association is a SDO that develops voluntary, consensus-based industry standards for a wide variety of ICT products
  - members include manufacturers and Public Safety Agency representatives

ATIS and TIA Background (2 of 2)

- TIA and ATIS began work on interworking of LTE Mission Critical (MC) and LMR services in 2012
    - Joint Project Committee known as "JLMRLTE"
    - This included Tetra, P25 Conventional, P25 Trunking and TIA-603 based Conventional Analog FM service
- In 2014 , the JLMRLTE agreed to "postpone further work in JLMRLTE until the LTE part of MCPTT work in 3GPP is more developed"
- In 2015 work resumed that created documents defining kLMR terminology and high level service descriptions
    - Provided to 3GPP in 2016
- In December 2017, JLMRLTE work resumed
    - Primary participants are 3GPP member representatives, TIA member representatives, Firstnet, AT&T
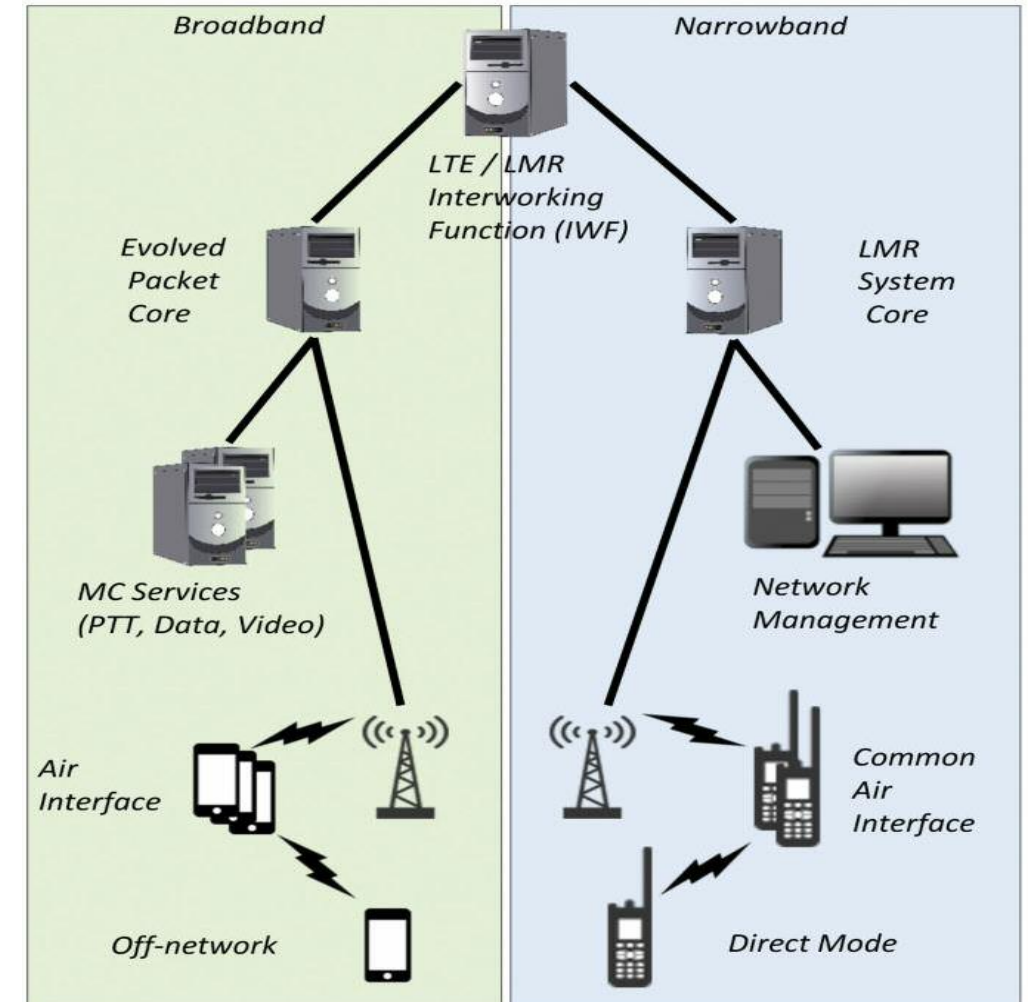
ATIS/TIA JLMRLTE Working Group Status

- 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
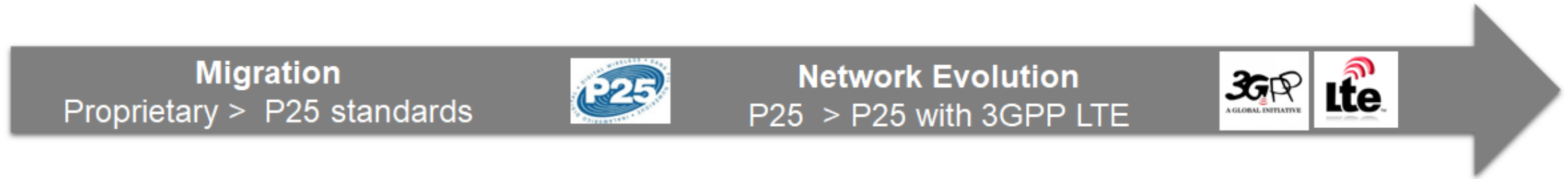
Andy.Davis@motorolasolutions.com

Business Model
Deployment model for P25 & LTE MCPTT Interworking

Jeremy Elder

Director of Product Management for Systems Infrastructure and Subscriber Equipment for L3Harris Corporation
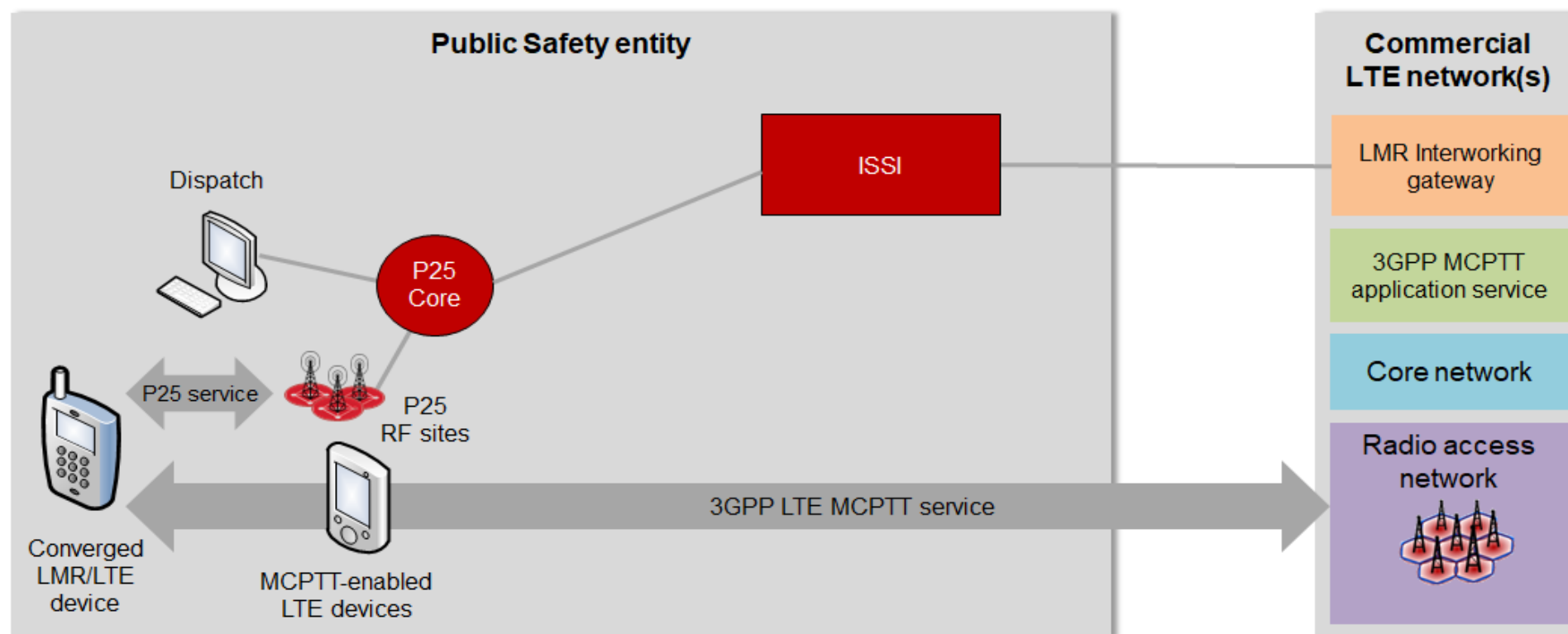
Role of P25 ISSI in LMR-LTE Interworking

| **Migration**
Proprietary > P25 standards | | **Network Evolution**
P25 > P25 with 3GPP LTE | |

- P25 migration & P25/3GPP LTE network evolution are both underway. This creates a need for Interworking technology to enable interoperability.

- There are many possible models for Interworking between P25 and LTE MCPTT. The carrier-centric model for P25/LTE MCPTT is emerging as a leading model.

- The P25 ISSI plays a key role in that implementation of P25/LTE MCPTT interworking.

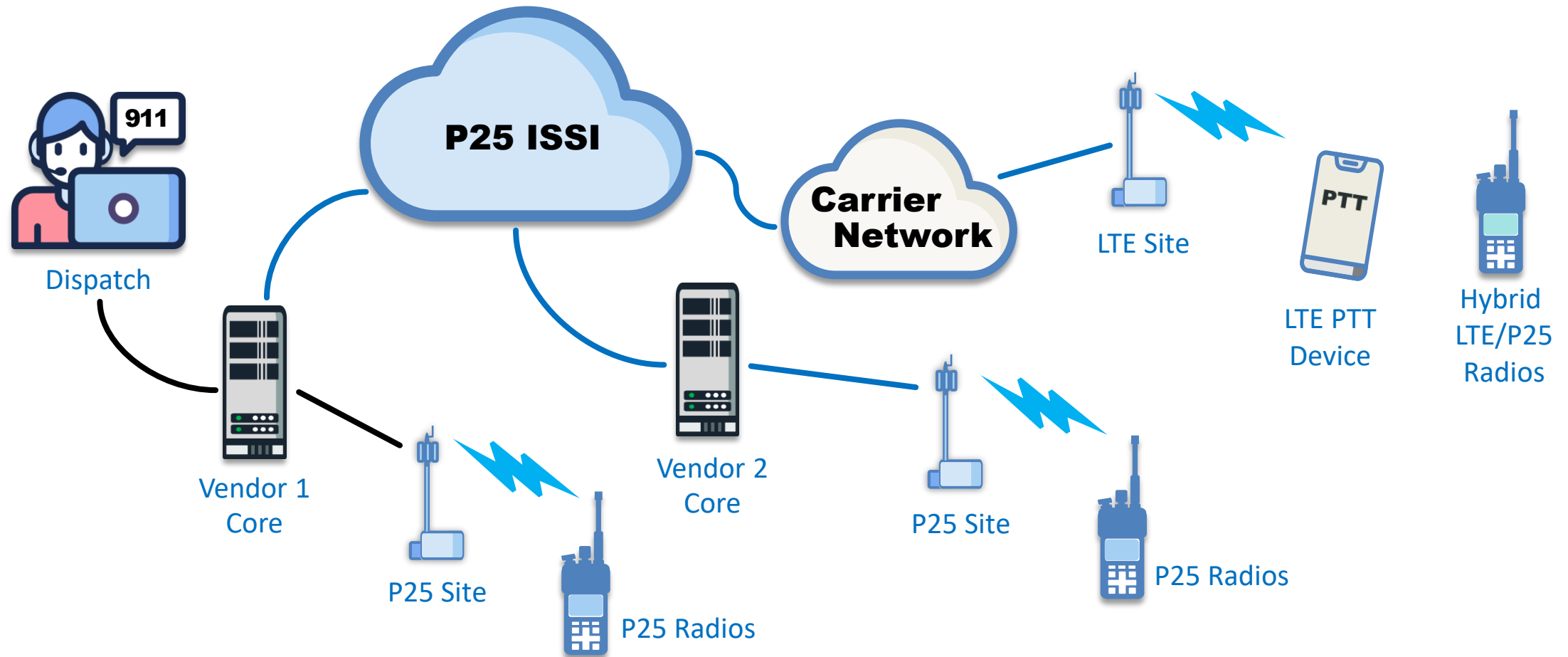- Discuss a real-world application of P25/LTE PTT interworking and lessons learned

The P25 ISSI plays a key role in standards-based approaches for LMR/LTE MCPTT interworking

Carrier-Centric Interworking Model

The P25 ISSI is a key enabling technology for interworking

Real world application of P25 ISSI interworking with LTE PTT

Dispatch

P25 ISSI

Carrier Network

LTE Site

LTE PTT Device

Hybrid LTE/P25 Radios

Vendor 1 Core

Vendor 2 Core

P25 Site

P25 Radios

P25 Site

P25 Radios

Connecting multiple public safety agencies operating on LMR networks and carrier LTE PTT.

Lessons learned from this real-world example
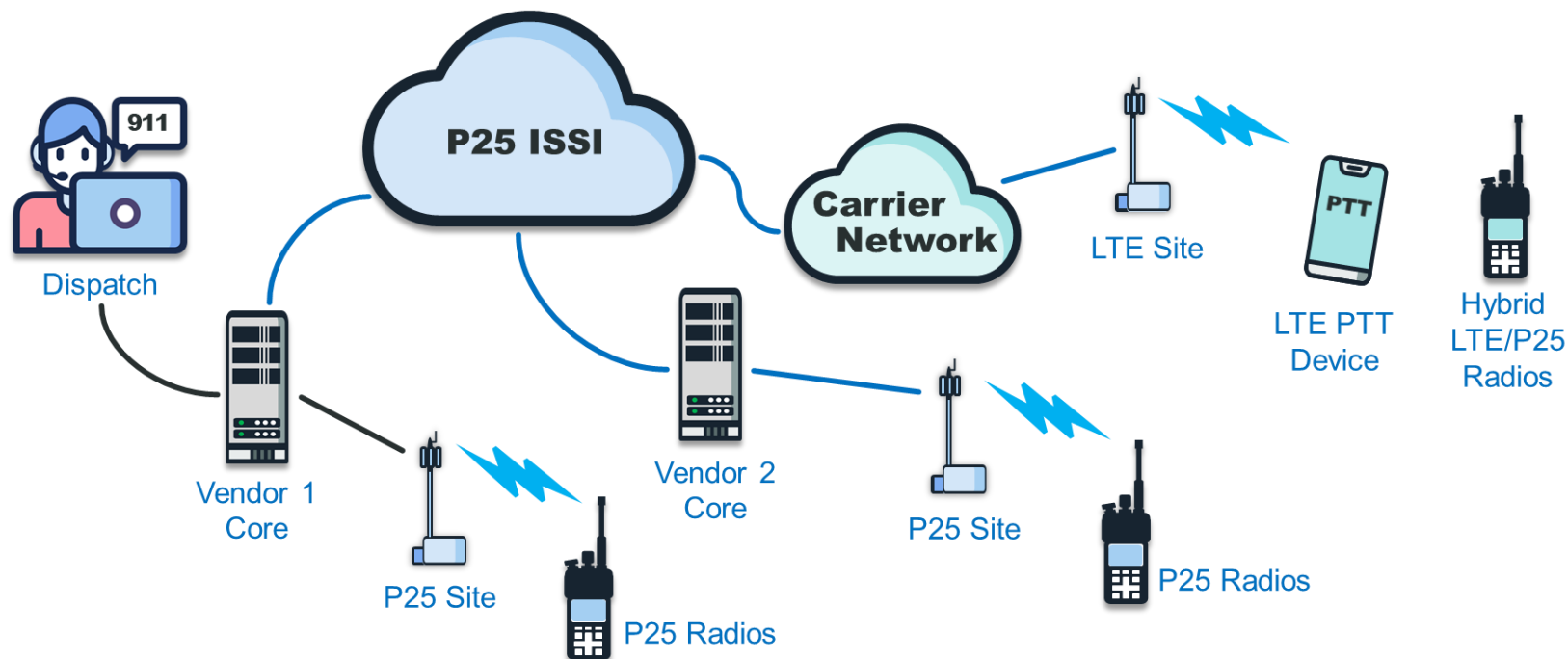
- Demonstrated customer need for both P25/P25 and P25/LTE interoperability
- Value of standards-based approach that leverages the interoperability provided by the P25 ISSI
- Need for P25 devices and Hybrid P25/LTE devices
- Migration path to MCPTT with less impact on current operations

Users, carriers, and manufacturers are learning from these early implementations

Summary – Role of P25 ISSI in LMR-LTE Interworking

- P25 migration & P25/3GPP LTE network evolution are both underway

- Carrier-centric deployment model is viable and beginning to gain traction in the market

- The Project 25 ISSI is a key enabler for interworking today and in the future
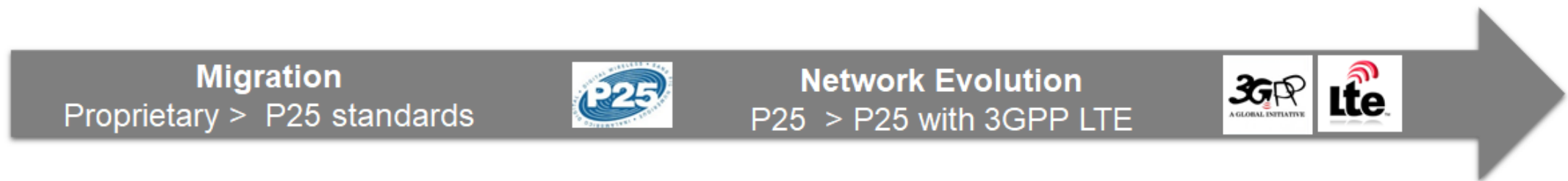
Thank You

Jeremy Elder

Jeremy.Elder@L3Harris.com

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

A Standards Compliant Solution for LMR/LTE Interworking

DHS & PSCR Funded Program Update

Robin Grier

President, Catalyst Communications Technologies

Catalyst Overview

- Founded in 1997 – 25 years of innovation and commitment to advancing public safety communications

- Pioneered Voice Over IP (VoIP) for mission critical radio communications; fielded first VoIP dispatch system in 1999

- Leadership in multi-vendor, standards-based LMR Interoperability and LMR/LTE Interworking

- Recipient of DHS and PSCR awards to research, develop, and commercialize standards-compliant LMR/LTE Interworking solutions

- Serve the Public Safety, Utility, Energy, Education and Government markets

> ➢ Dispatch
>
> ➢ Incident Command
>
> ➢ Interoperability & Interworking

Catalyst delivers enhanced access to mission critical radio communications

Public Safety Communications Inflection Point

For everyone evaluating, or considering, FirstNet™ Push-to-Talk, Verizon Push-to-Talk Responder, or other LTE-based Mission Critical Push-to-Talk…

… you are also faced with the <u>Next Problem</u> to solve:
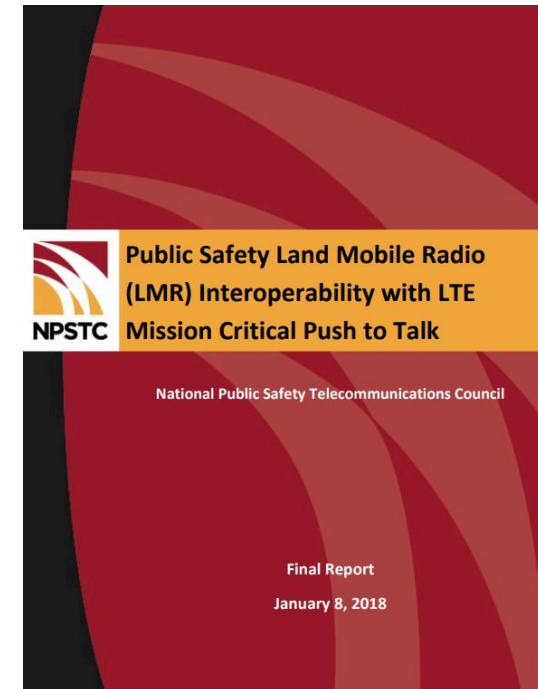
How will LTE Smartphone Users with MCPTT communicate with existing LMR Radio Subscribers?

Answer: Interworking

Project Summary

- Provide Interworking communications between P25 subscribers on LMR Radios and LTE subscribers utilizing MCPTT services

- Public Safety Requirements Mapped to Standards
    - Third Generation Partnership Project (3GPP) for LTE
    - Project 25 (P25)
    - Digital Mobile Radio (DMR)
    - Terrestrial Trunked Radio (TETRA)

- Solution Roadmap developed in DHS Phase I

- Protypes built and tested in DHS Phase II

- Commercialization underway in Phase III (PSCR)

- Public Safety benefit: facilitate transition to MCPTT on LTE for current P25 systems

NPSTC

Public Safety Land Mobile Radio (LMR) Interoperability with LTE Mission Critical Push to Talk

National Public Safety Telecommunications Council

Final Report
January 8, 2018

Project Status

- Catalyst implementing against the MCPTT Client Interface first specified in 3GPP Release 12

  - Provides essential push-to-talk interworking features
  - Fastest time-to-market, leveraging carrier MCPTT service offerings and <u>existing LMR system configurations and operations</u>

- Field demonstrations in progress, incorporating Catalyst's IntelliLink™ Interworking solution

- Standards Compliant Communications between P25 LMR and MCPTT on LTE networks (FirstNet™, Verizon, Southern Linc, etc.)

- Compliant with the MCPTT standard, versus the various existing proprietary LTE PTT solutions
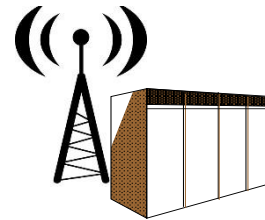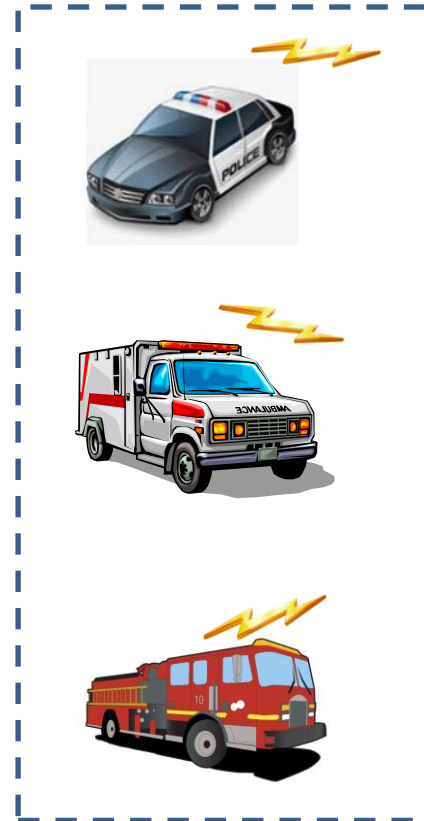
Capabilities Depend on the Features of Your Radio System and How it Connects to LTE

LMR Radio Systems

- **P25 Trunking**
- **P25 Conventional**
- Analog
- Digital Mobile Radio
- SmartNet®
- EDACS®
- NXDN
- etc.

Radio System Connections to LTE

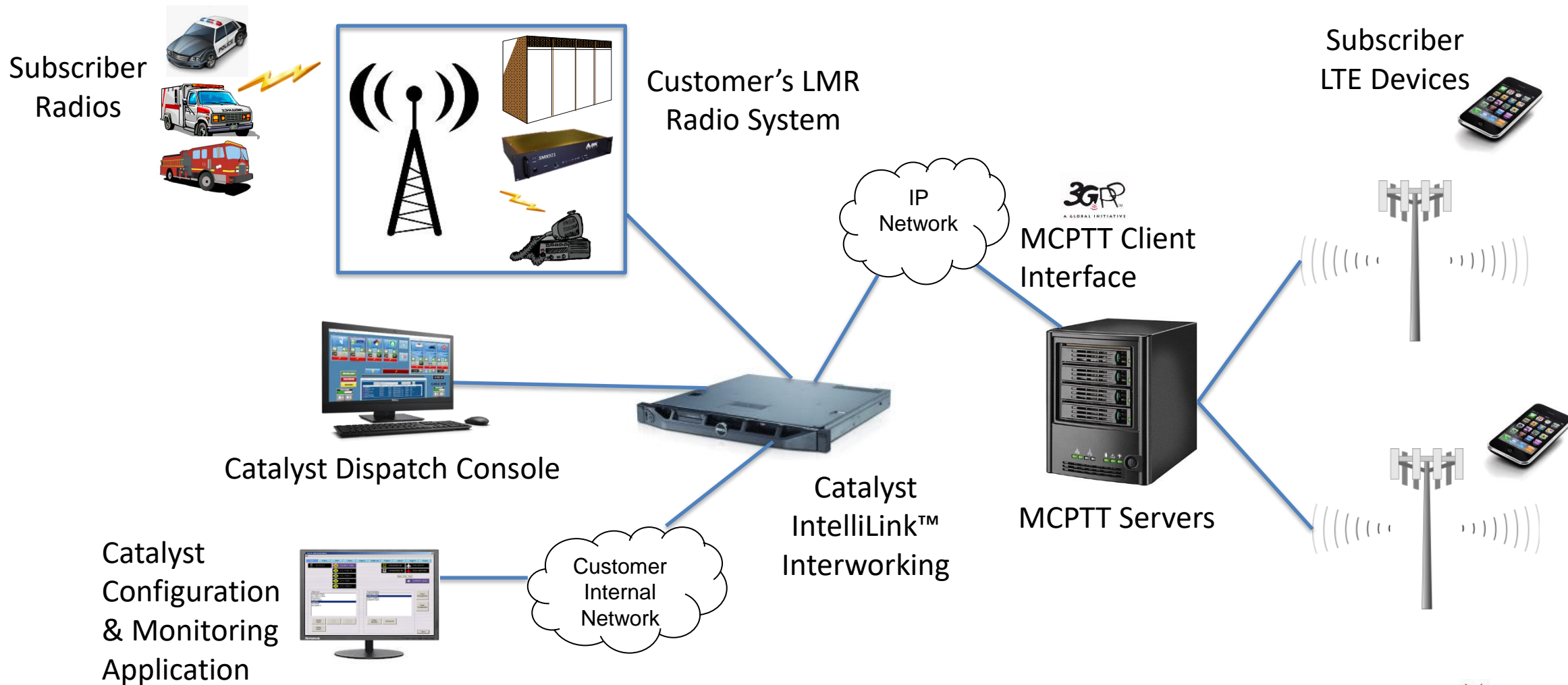Wireline Interface to Multiple Channels & Sites
P25 ISSI/CSSI, DMR AIS, etc.

Wireline Interface to Single Channel at a Single Site:
P25 DFSI, FSI, Tone Control, etc.

Over the Air Interface via a Control Station:
P25 CAI, DMR, Analog, Proprietary, etc.

Catalyst's Architecture Supports a Variety of Radio Systems and Dispatch Console Options

Subscriber Radios

Customer's LMR Radio System

IP Network

3GPP
A GLOBAL INITIATIVE

MCPTT Client Interface

Subscriber LTE Devices

Catalyst Dispatch Console

Catalyst IntelliLink™ Interworking

MCPTT Servers

Catalyst Configuration & Monitoring Application

Customer Internal Network

Functionality Available Now for Evaluation

Interworking

- Group Calls Between MCPTT and LMR
    - P25 Trunking and Conventional
    - Analog Conventional including MDC-1200 Unit ID
    - EDACS Trunking
    - DMR Trunking and Conventional, NXDN
- Remote Selection of LMR Group/Channel
- Protection Against Dropped Syllables
- Route Unit IDs from MCPTT to P25 Conventional
- Multiple Simultaneous Patches (1 per Control Station)
- Late Entry
- Recording of Audio and Meta Data

LMR/LTE Dispatch

- Seamlessly Unifies LMR and LTE Dispatch in a Single App
- Group Calls
- Private Calls
- Location (GPS)
- Caller ID/Alias
- Emergency
- Imminent Peril
- Text Message
- MCX Subscriber Presence
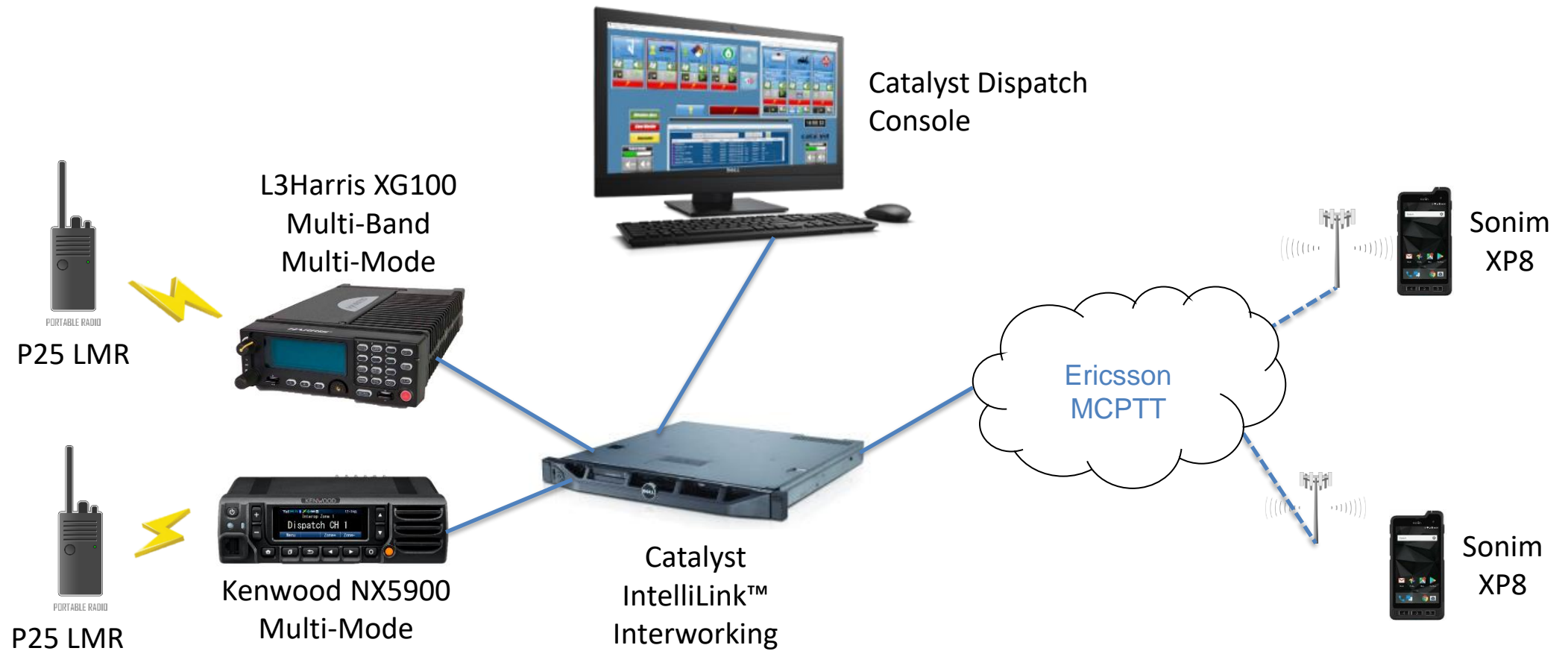- Multi-Speaker Select/Unselect Audio

Dispatch Console

Benefits

- Multi-Vendor
- Multi-Carrier
- Local Control
- Dispatcher Control
- Cost-Effective
- Available Now

Creative Commons license, Author: Patrick Giblin

IWCE Demonstration System
Booth 942

Catalyst Dispatch Console

L3Harris XG100 Multi-Band Multi-Mode

P25 LMR

Kenwood NX5900 Multi-Mode

P25 LMR

Catalyst IntelliLink™ Interworking

Ericsson MCPTT

Sonim XP8

Sonim XP8

Thank You

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Harmony for PTT Services?
P25 and LTE