



APCO 2017
August 13-16 | Denver, CO

TECHNOLOGY CHOICES

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SLIDE HEADER

Technology choices;

How and where emerging technologies fit in
your communications planning.

Evaluating P25, DMR, TETRA, WiFi, and LTE in
meeting your agencies' needs

AGENDA

- Overview of digital land mobile radio (LMR) standards
- Primary differences in digital LMR technologies
- Complimentary digital wireless technologies
- Q&A



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PARTICIPANT EXPECTATIONS



- What are your expectations from this session?
- Why are you here?
- What would you like to take away?



LAND MOBILE RADIO STANDARDS

- Project 25
 - APCO NASTD FED
 - TIA Standard
- TETRA
 - Terrestrial Trunked Radio (formerly known as Trans-European Trunked Radio)
 - ETSI Standard
- DMR
 - Digital Mobile Radio
 - ETSI Standard



BROADBAND RADIO STANDARDS

- LTE
 - 3GPP Standard
 - 4G Cellular and FirstNet
- WiFi
 - IEEE Standard
 - Wi-Fi Alliance



PROJECT 25

- Project 25 (P25)
 - Global open standard for digital radio
- Designed primarily for public safety and/or “mission critical” environments
- User driven standards defined in Telecommunications Industry Association (TIA 102 series) documents
- Compliance testing
 - Project 25 Compliance Assessment Program (P25 CAP) is a formalized, independent process for certifying products
 - Testing performed at certified labs

P25

- Utilizes typical LMR network architecture
 - High and mid-level sites, wide area coverage, little channel reuse
- Scalable architecture
 - Supports conventional and trunked network deployments
 - Single site, multicast, simulcast, hybrid configurations
 - Supports conventional and trunked infrastructure
 - “Backward Compatibility” support for legacy (analog) LMR systems
 - “Low speed” data services
 - Phase 1: FDMA; Direct, Conventional, and Trunked
 - Phase 2: 2 slot TDMA, Trunked Operation

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P25 INTERFACES

- Common Air Interface (CAI)
 - FDMA (Phase 1)
 - TDMA (Phase 2)
- Subscriber Data Peripheral Interface
- Fixed Station Subsystem Interface (FSSI)
- Console Subsystem Interface (CSSI)
- Inter-RF Subsystem Interface (ISSI)
- Network Management Interface
- Data Network Interface
- Telephone Interconnect Interface

TETRA

- TERrestrial Trunked RAdio (TETRA)
 - European Telecommunications Standards Institute (ETSI) open standard for digital radio
- Designed primarily for public safety and/or “mission critical” environments
- User driven standards defined in ETSI documents (EN,TR,TS series)
 - EN: European Norm, TS: Technical Specification, TR: Technical Report
- Compliance testing
 - Certification process managed by the Technical Forum (TF) of the TETRA critical communications association (TCCA)

TETRA

- Utilizes cellular-type network architecture
 - Dense sites with channel reuse
- Scalable architecture allowing network deployments
 - Multiple site local area coverage systems to wide area national coverage networks
- Provides four user communications paths on one radio channel (carrier)
 - Supports both voice and data services
 - Trunked, 4-slot TDMA
- Supports aggregated channels for data
 - 66 kbps in a 25 kHz channel
 - 538 kbps in a 150 kHz channel (Defined)

TETRA INTERFACES

- Air Interfaces
 - Infrastructure: base station to radio terminals
 - Direct Mode Operation (DMO)
- Peripheral Equipment Interface
- Remote Dispatcher Interface*
 - Manufacturer specific
- PSTN/ISDN/PABX
- Inter-System Interface (ISI)
- Network Management Interface

DMR

- Digital Mobile Radio (DMR)
 - ETSI standard for digital radio
- Targeted at business/professional environments
- User driven standards defined in ETSI documents (EN, TR, TS series)
- Compliance testing
 - Interoperability (IOP) Process managed by the Technical Working Group (TWG) of the DMR Association
- DMR Tier I (Unlicensed)
- DMR Tier II (Conventional)
- DMR Tier III (Trunked)

DMR INTERFACES

- Air Interface
- Voice and generic services
 - Call types and handling
 - Tier 2 (conventional)
- Data protocol
 - Call types and handling
- Trunking protocol
 - Tier 3 (Trunking)
- No defined dispatch equipment interface
 - DMR Association approved the AIS (Application Interface Specification) protocol for use by dispatch consoles in either Tier 2 or Tier 3 systems

DMR

- ETSI standard for digital radio
 - 2-slot TDMA protocol
 - Targeted at business/professional applications
 - Less costly alternative to TETRA
 - Designed to replace analog trunked technologies (MPT1327)
- Utilizes typical LMR network architecture
 - High sites, wide area coverage, less channel reuse
- Scalable architecture, supports conventional and trunked
 - Primarily single site and multicast, but limited simulcast deployments

LMR STANDARDS SUMMARY

	P25	TETRA	DMR
Market Target	Mission Critical	Mission Critical	Business Critical
Infrastructure Configurations	Simulcast, Multicast, Conventional	Multicast	Simulcast (limited), Multicast, Conventional
Subscriber Equipment	Higher Cost	Median Cost	Lowest Cost
Coverage	<ul style="list-style-type: none"> ➤ Higher power equipment ➤ High sensitivity receivers ➤ Fewer sites than DMR, TETRA 	<ul style="list-style-type: none"> ➤ Lower power equipment ➤ More sites than DMR, P25 	<ul style="list-style-type: none"> ➤ Higher power equipment ➤ Fewer sites than TETRA ➤ More sites than P25
Data	<ul style="list-style-type: none"> ➤ Low Speed 	<ul style="list-style-type: none"> ➤ Medium Speed 	<ul style="list-style-type: none"> ➤ Low Speed

COMPLIMENTARY DIGITAL SERVICES

- Commercial Digital Cellular Services
- Wide Area Digital Services
- Local Area Digital Services



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BROADBAND RADIO STANDARDS

- LTE
 - Current 4G Standard
 - The target standard for FirstNet
 - Versions being proposed for Wireless Internet Service
- WiFi
 - Industry standard for wireless local area networks
 - Often implemented for municipal area networks



COMMERCIAL DIGITAL CELLULAR SERVICES

- Commercial 3rd generation (3G) and Long-Term Evolution (LTE) 4th generation (4G)
 - Widely used by public safety, utilities, and transit for broadband mobile data services
 - Virtual Private Network (VPN) tunnels often required
 - Used by some utilities for SmartGrid, telemetry, and supervisory control and data acquisition (SCADA) applications
 - Used by some transit operations for telemetry, automatic vehicle location (AVL), smart signs, etc.
- Typically not designed for Mission-Critical communications
 - FirstNet should resolve many of these issues

WIDE AREA DIGITAL SERVICES

- Public or Metro-area Wi-Fi
 - Reporting, large file upload and download, system updates
 - VPN often required
- Typically provides limited coverage
- May include local system extensions
- No expectation of roaming

LOCAL AREA DIGITAL SERVICES

- Internal (organization owned) Wi-Fi
 - Reporting, large file upload and download, system updates
- Targeted Coverage
- Some convergence with Metro Wi-Fi

EMERGING TECHNOLOGIES

- Enhancements to Wi-Fi
- “Unlicensed LTE”
- “5G” services
- Backend Data Integration

RESOURCES

- Project 25 Technology Group
 - <http://www.project25.org/>
- DMR Association
 - <http://dmrassociation.org/>
- TETRA Critical Communications Association
 - <https://tandcca.com/>
- FirstNet
 - <http://www.firstnet.gov/>
- Wi-Fi Alliance
 - <http://www.wi-fi.org/>

QUESTIONS?

Thank you for participating!

Did we meet your expectations?

Please complete your session evaluation on

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THANKS!



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