Pick Me! Choosing the Right Digital PTT Technology for Your Needs

IWCE

INTERNATIONAL WIRELESS COMMUNICATIONS EXPO

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MissionCriticalPartners

Federal Engineering, Inc.

"Unleashing the Power of Technology"

Agenda

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

Participant Expectations

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

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 sites, wide area coverage, less channel reuse
- Scalable architecture
  - Supports conventional and trunked network deployments
    (multicast, simulcast, hybrid)
  - "Low speed" data services
  - Phase 1: FDMA
  - Phase 2: 2 slot TDMA
  - Both conventional and trunked infrastructure access with "backward" support for legacy LMR systems

P25 Interfaces

- Common Air Interface (CAI)
- 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

NXDN™

- Digital narrowband protocol
  - 6.25 kHz FDMA
- Product available since 2006
- Recognized as digital radio standard in 2017
- NXDN™ Forum
  - Maintains specifications and standards suite
  - 31 members*
    - www.nxdn-forum.com/our-members/who-are-members/

NXDN™

- Supports multiple configurations
  - Conventional
    - Peer-to-peer (direct)
    - Repeated
  - Trunked
    - Single or multisite
    - With or without dedicated control channel
      - Centralized or decentralized trunking
  - Sites can be interconnected to form wide area networks via IP links*

NXDN™

- Advantages
  - Spectrally efficient (6.25 kHz channels)
  - Supports digital system feature sets
    - Individual and group call
    - Low speed data service, e.g. SMS, GPS, status messages
    - Roaming
    - Digital scrambling (built in)
    - Standards based encryption (AES/DES) option
  - Easy migration from analog to digital

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
  - 66kbps 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
  - Designed to replace analog trunked technologies (MPT1327)
  - Targeted at business/professional applications
  - Less costly alternative to TETRA
- Utilizes typical LMR network architecture
  - High sites, wide area coverage, less channel reuse
- Scalable architecture, supports conventional and trunked multicast, but limited simulcast deployments
  - 2-slot TDMA protocol

LMR Standards Summary

	P25	NXDN	TETRA	DMR
Market Target	Mission Critical	Business Critical	Mission Critical	Business Critical
Infrastructure Configurations	Simulcast, Multicast, Conventional	Single site and multisite, centralized and decentralized trunking (limited), Conventional	Multicast	Simulcast (limited), Multicast, Conventional
Subscriber Equipment	Higher Cost	Lower Cost	Median Cost	Lower Cost
Coverage	➢ Higher power equipment ➢ High sensitivity receivers ➢ Fewer sites than DMR, TETRA	➢ Higher power equipment ➢ Fewer sites than TETRA ➢ More sites than P25	➢ Lower power equipment ➢ More sites than DMR,NXDN or P25	➢ Higher power equipment ➢ Fewer sites than TETRA ➢ More sites than P25
Data	➢ Low Speed	➢ Low Speed	➢ Medium Speed	➢ Low Speed

Complimentary digital services

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

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
- Mission critical standards in development

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

Emerging Technologies

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

Resources

- Project 25 Technology Group
  - http://www.project25.org/
- NXDN
  - http://www.nxdn-forum.com/
- 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/

Free Advice

- Don't be totally cost driven.
- You are buying a tool to help your team do the best job.
- Choose the technology which best helps your team accomplish their mission.
- Choose the products which serve as an effective tool for your team.
- Consider both CAPEX and OPEX in your decision equation.
- Consider ongoing supplier support for the life of the system
- Visit the vendors at IWCE. Ask hard questions!

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Questions?

Federal Engineering, Inc.
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Thanks!

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