CORE CONCEPT

Mission-Critical Radio Networks Course: TETRA, DMR, P25 and MCPTT over LTE/5G

5 – 16 April 2027
London - Central London four-star

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Introduction:

Mission-critical radio networks, covering TETRA, DMR, P25 and MCPTT over LTE/5G, is a 2-week course for radio engineering, planning and operations units that ends with a Mission-Critical Radio Network Design and Migration Roadmap for a case organisation. Police, civil defence, utility and oil field crews lose contact when coverage holes, blocked group calls, weak key handling or isolated agencies go unnoticed until an incident. Nominees already maintain, plan or operate professional mobile radio systems, and learning is by case study on link budgets, fleet maps, traffic records and alarms. CoreConcept Training Center delivers this mission-critical radio networks course.

Course Objectives:

- Compare TETRA, DMR and P25 architectures, trunked and direct modes, and select the standard that fits an organisation's field requirements
- Calculate radio link budgets, coverage predictions and trunked channel capacity to size a narrowband radio network
- Build fleet maps, talkgroup hierarchies and numbering plans that match dispatcher and field crew workflows
- Specify air-interface and end-to-end encryption, key management and site fallback arrangements for a radio network
- Configure interoperability between agencies and standards through ISSI, the TETRA inter-system interface and gateway patching
- Plan the move from narrowband radio to MCPTT, MCData and MCVideo over private LTE/5G with LMR interworking in a Mission-Critical Radio Network Design and Migration Roadmap

Target Audience:

- Radio network engineering units responsible for TETRA, DMR or P25 base stations, switching and terminals
- Radio planning units responsible for coverage prediction, frequency plans and new site requirements
- Communications operations units that run dispatcher consoles, talkgroups and the network management system
- Technical units in police, civil defence and emergency services that specify, test and accept radio systems
- Telecommunications units in utilities, airports and oil and gas operators that support field crews with radio voice and data
- Technical project units preparing the move from narrowband radio to broadband mission-critical services

Course Outline:

Day 1: Professional Mobile Radio Landscape and Mission-Critical Requirements

- PMR Versus Carrier Push-to-Talk for Critical User Groups
- Mission-Critical Voice Requirements for Group Calls and Priority
- Narrowband Standards Landscape With TETRA, DMR and P25 Compared
- User Organisation Profiles for Police, Utilities, Airports and Oil Fields
- Existing Radio Estate Inventory and Requirements Capture Template

Day 2: TETRA, DMR and P25 Air Interfaces and System Architecture

- TETRA Four-Slot TDMA Carrier and Trunked Mode Architecture
- TETRA Direct Mode Operation With Gateway and Repeater Functions
- DMR Tier II Conventional and Tier III Trunked Operation
- P25 Phase 1 FDMA and Phase 2 TDMA Operation Compared
- Switching Node, Base Station and Dispatcher Console Interfaces Mapped

Day 3: Coverage and Capacity Planning for Narrowband Radio Networks

- Radio Link Budget for Portable and Vehicle Terminals
- Propagation Models and Coverage Prediction Map Interpretation
- In-Building and Tunnel Coverage With Bi-Directional Amplifiers
- Erlang B Traffic Model for Trunked Channel Dimensioning
- Site Count, Frequency Reuse and Channel Plan Drafting

Day 4: Talkgroup Design, Fleet Mapping and Network Management Data

- Fleet Mapping Workbook for Organisations, Talkgroups and Users
- GSSI and ISSI Numbering Plan and Talkgroup Hierarchy
- Dispatcher Console Talkgroup Patching and Call Priority Settings
- Short Data, Status Messages and Terminal Location Reporting
- Network Management System Alarms and Traffic Statistics Review

Day 5: Guided Case Study on a Multi-Site Utility Radio Network

- Case Utility Field Requirements and Radio Estate Review
- Case Network Link Budget and Coverage Gap Analysis
- Case Trunked Channel Dimensioning From Busy-Hour Traffic Records
- Case Fleet Map and Talkgroup Structure Draft
- Week-One Design Note for the Case Radio Network

Day 6: MCPTT, MCData and MCVideo Over Private LTE and 5G

- 3GPP MCPTT Architecture, Group Management and Floor Control
- MCData and MCVideo Services for Field Units and Control Rooms
- Priority, Pre-Emption and Quality of Service for Critical Bearers
- Off-Network MCPTT and Direct Device-to-Device Communication
- LMR Interworking Function Between MCPTT and TETRA or P25

Day 7: Encryption, Key Management and Radio Network Resilience

- TETRA Air-Interface Encryption Classes and End-to-End Encryption
- P25 AES Encryption and Over-the-Air Rekeying Procedures
- Key Fill Device Handling and Crypto Key Management Policy
- Terminal Authentication, Stolen Radio Disabling and Registration Control
- Site Fallback Mode, Redundant Switching and Backup Power Design

Day 8: Interoperability Gateways and Multi-Agency Radio Coordination

- P25 ISSI Links Between Separate Radio Subsystems
- TETRA Inter-System Interface for Network-to-Network Group Calls
- Cross-Band and Cross-Standard Gateway Patching Arrangements
- Multi-Agency Interoperability Talkgroups and Standard Operating Procedures
- User Change Management and Radio Discipline Briefing Plan

Day 9: Radio Network Performance KPIs and Broadband Migration Planning

- Call Setup Time, Grade of Service and Queuing KPIs
- Drive Test Coverage Verification Against Design Targets
- Radio Network Availability Reporting and Fault Trend Analysis
- Hybrid LMR and Broadband Coexistence Migration Scenarios
- Total Cost of Ownership Comparison for Migration Options

Day 10: Case Study Capstone on the Mission-Critical Radio Network Design and Migration Roadmap

- Case Organisation Coverage and Capacity Design Review
- Case Fleet Map, Encryption and Interoperability Design Check
- Case Resilience Arrangements and Radio KPI Target Set
- Case Phased Migration Path to MCPTT Services
- Mission-Critical Radio Network Design and Migration Roadmap Completion

Skills You Will Gain:

- Radio Link Budget Calculation
- Trunked Channel Dimensioning
- Fleet Mapping and Talkgroup Design
- Radio Encryption Key Management
- Interoperability Gateway Configuration
- MCPTT Service Architecture
- Radio Network KPI Reporting
- Narrowband-to-Broadband Migration Planning

Why Attend This Course:

- Hand the head of communications and the operations director a Mission-Critical Radio Network Design and Migration Roadmap for a case organisation
- Decide when a new site, extra channel or gateway is needed and when a narrowband service should move to MCPTT
- Avoid coverage holes, blocked group calls and compromised encryption keys during incidents and planned upgrades
- Coach engineering and dispatcher colleagues with the fleet mapping workbook, link budget sheet and KPI set built during the course

Conclusion:

Back at work, the participant gives the head of communications and the operations director a Mission-Critical Radio Network Design and Migration Roadmap covering coverage, capacity, talkgroups, encryption, interoperability and the path to MCPTT. Planners use it to justify new sites and channels, operations units use its KPI targets to judge network performance, and project units use its phases to schedule broadband trials. After the first drive test campaign or multi-agency exercise under the roadmap, the unit should compare coverage, call setup and availability results with the targets and revise the design.

Frequently Asked Questions FAQ:

What should participants know before a mission-critical radio networks course?

Participants should already maintain, plan or operate TETRA, DMR or P25 equipment, or support radio users in the field, and be able to read coverage maps and alarm reports. Bringing a fleet map, channel plan or traffic report helps them apply each case study to their own network.

How does a mission-critical radio networks course differ from a general LTE or 5G radio access engineering course?

This course centres on group voice, talkgroups, direct mode, encryption keys and agency interoperability on professional radio, then the move to MCPTT. General cellular engineering courses tune public radio access networks for subscriber data and leave out narrowband trunking and dispatch.

Why do mission-critical radio networks still use TETRA, DMR and P25 alongside MCPTT over LTE/5G?

Narrowband trunked radio gives proven group calls, direct mode between terminals and wide coverage from few sites, while MCPTT adds broadband data and video. Most organisations run both for years, joined by interworking functions, until broadband coverage and terminals meet every field requirement.

What do participants take back from the mission-critical radio networks course?

Participants take back a Mission-Critical Radio Network Design and Migration Roadmap with a link budget sheet, a channel dimensioning model, a fleet mapping workbook, an encryption and fallback checklist, a KPI set and a phased migration path they can adapt to their own network.