

Radio 101 for the PSAP Manager



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Today's Session:

- Introductions
- History of Public Safety Radio Systems
- Coverage
- Trunking
- Interoperation
- Consoles
- Paging
- System Specific issues
- Q&A and Discussion

Introductions; Who am I?

- Neil Horden
 - Chief Consultant
- Federal Engineering, Inc.
 - Nationwide independent consulting firm
 - Focused on Public Safety communications

Participant Expectations: Who are you?

- What is your roll in your center?
- What are your expectations from this session?
- What would you like to take away?
- How can we help you do your job?



A Brief History of Radio

- Radio and the FCC
- Bands
- Analog / Digital
- Conventional / Trunking
- P25
- Narrowbanding and Rebanding
- FirstNet / LTE
- Future

Radio and the FCC; Who is the FCC (and why do you care)?



- The Federal Communications Commission
 - The Federal Department responsible for all 'Communications' issues.
 - Wireless
 - Radio including LMR, Broadcast, Cellular, etc.
 - Wired
 - Telephone, Including 911
 - Internet
- And why do we care
 - Establish Rules and Regs
 - Set frequency allocations
 - Grant licenses
 - Enforcement (Fines)



Frequencies and Channels

- Frequency

- The specific portion of the radio spectrum used for communications
 - 153.6825
 - 453.1275 / 458.1275
 - 806.1275 / 851.1275

- Channel

- The name, purpose, or other definition of a communications path
 - Fire 1
 - South Repeater
 - County Interop
 - 153.6825
 - “6825”

Radio Frequency Bands; Why so confusing?

- **Technical definition** and Practical names
- **VHF (30 MHz – 300 MHz)**
- VHF Low Band (Usually called “Low Band”)
 - 30 MHz – 50 MHz
- VHF High Band (Usually called “VHF”)
 - ~150 MHz – 174 MHz
- **UHF (300 MHz – 3000 MHz)**
- UHF
 - ~450 MHz – ~470 MHz
 - 403 MHz – 450 MHz (Government reallocated)
 - 470 MHz – 512 MHz T-Band (TV reallocated)
- 800 MHz
 - National Public Safety Planning Advisory Committee (NPSPAC)
 - Regional Planning Committees (RPCs)
- 700 MHz
 - RPCs also

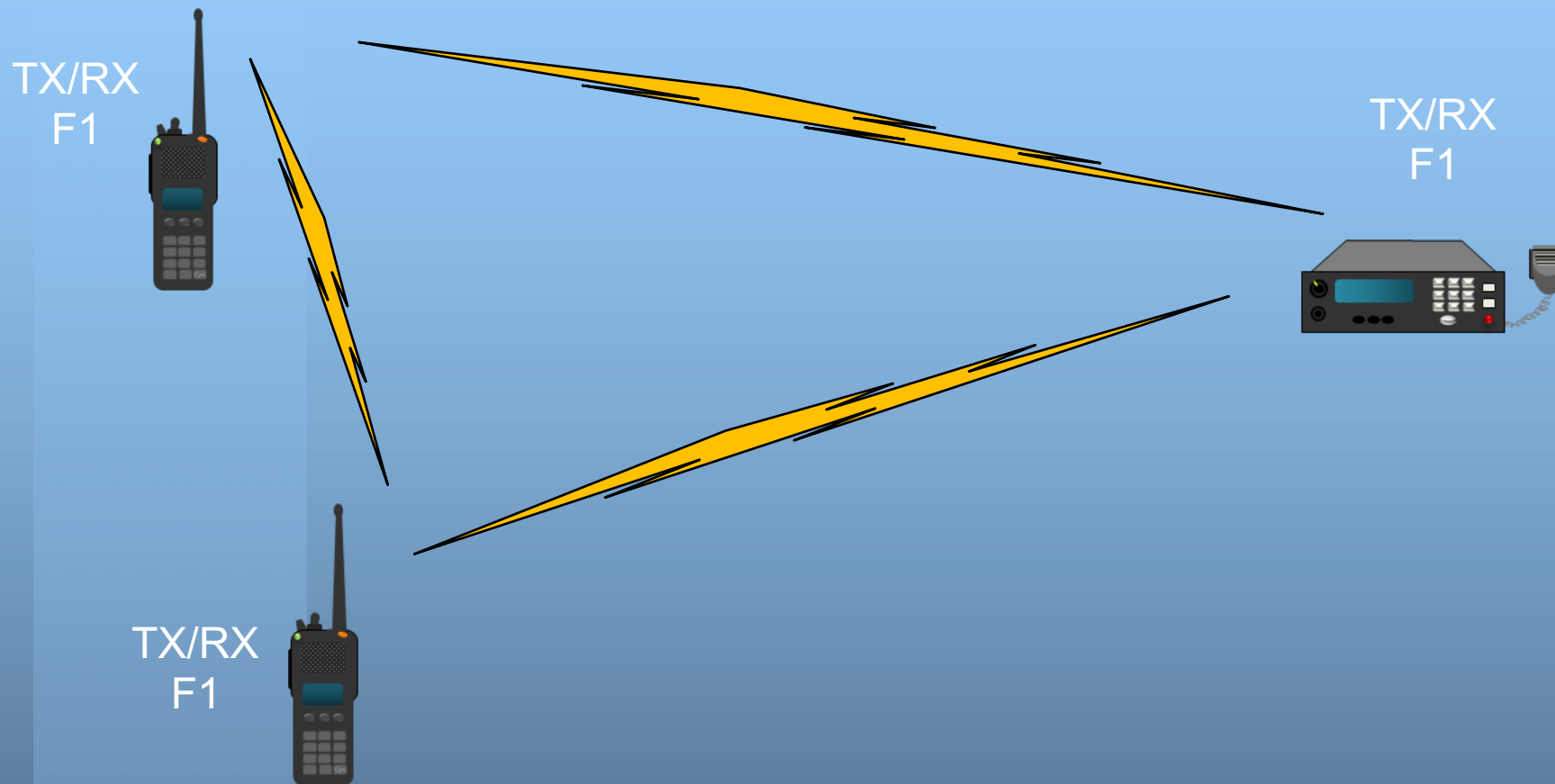
Technology: Why so many terms?

- System types
- Analog
- Digital
- Conventional
- Trunking
- P25
- LTE
- Simulcast
- Voting
- Etc.

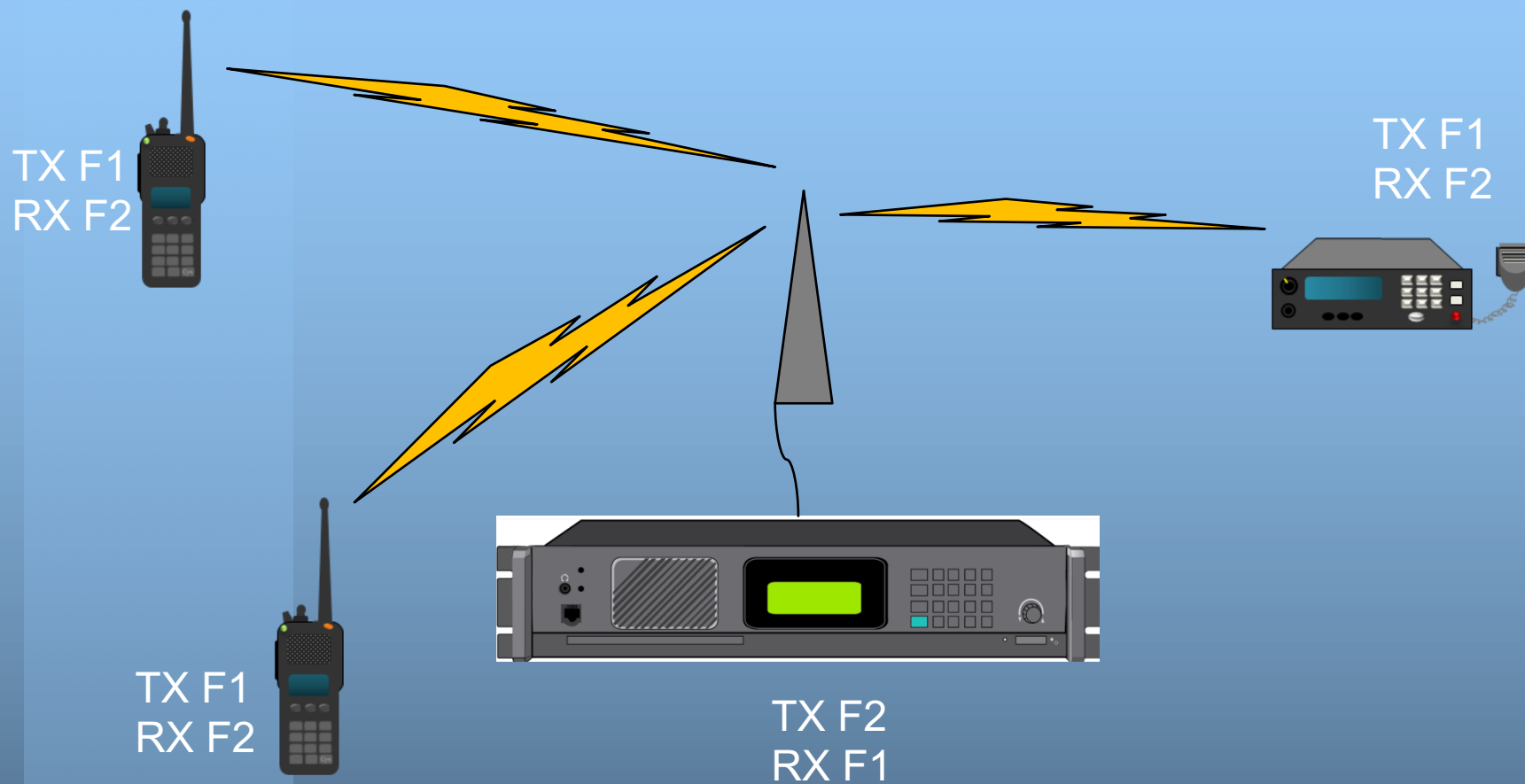
Public Safety Radio Systems: Base Stations, and Repeaters, and Control Stations; Oh My!

- Land Mobile Radio (LMR)
 - Simplex
 - Repeaters
 - Control Stations
 - Talk-Around
- Multi-site system
- Trunked systems
- Multi-site trunked systems
- Interconnected systems

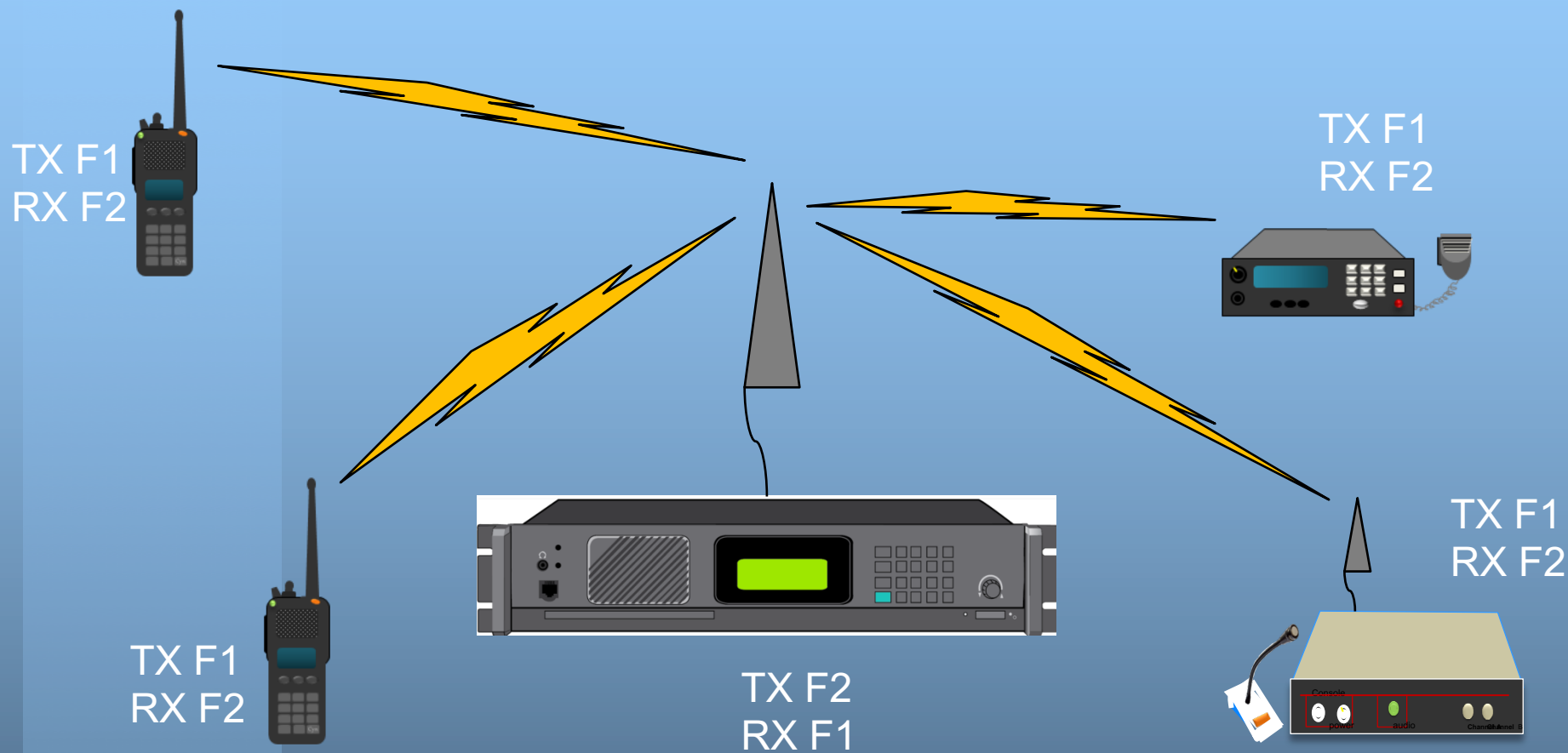
Simplex



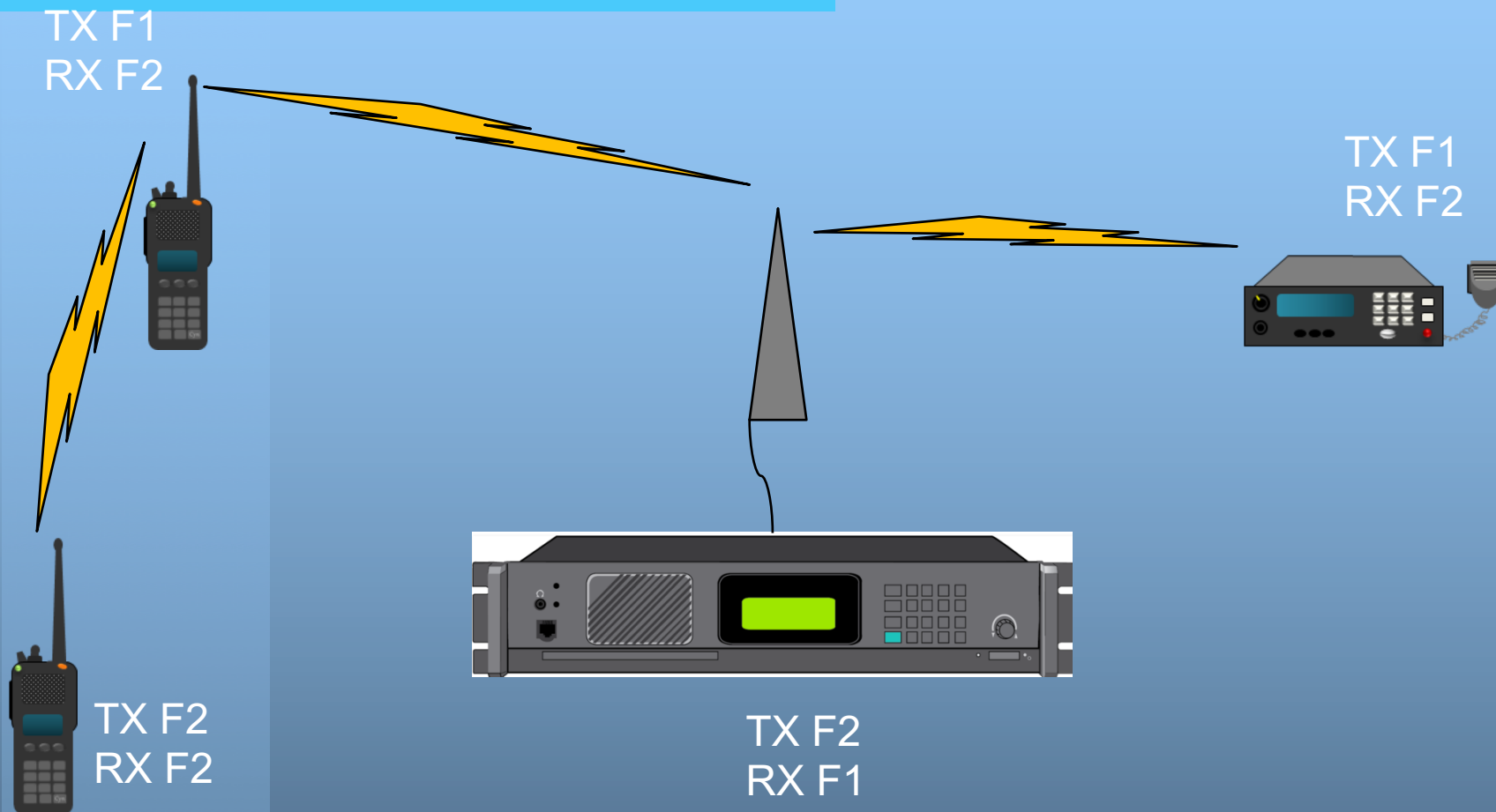
Repeater



Repeater w/ Control Station



Repeater w/ Talkaround



Analog vs. Digital

- Analog

- The message (your voice) is directly applied to the radio signal
 - Similar to the groove in a vinyl record
- When recovered (received) you get the message plus any noise and missing any loss

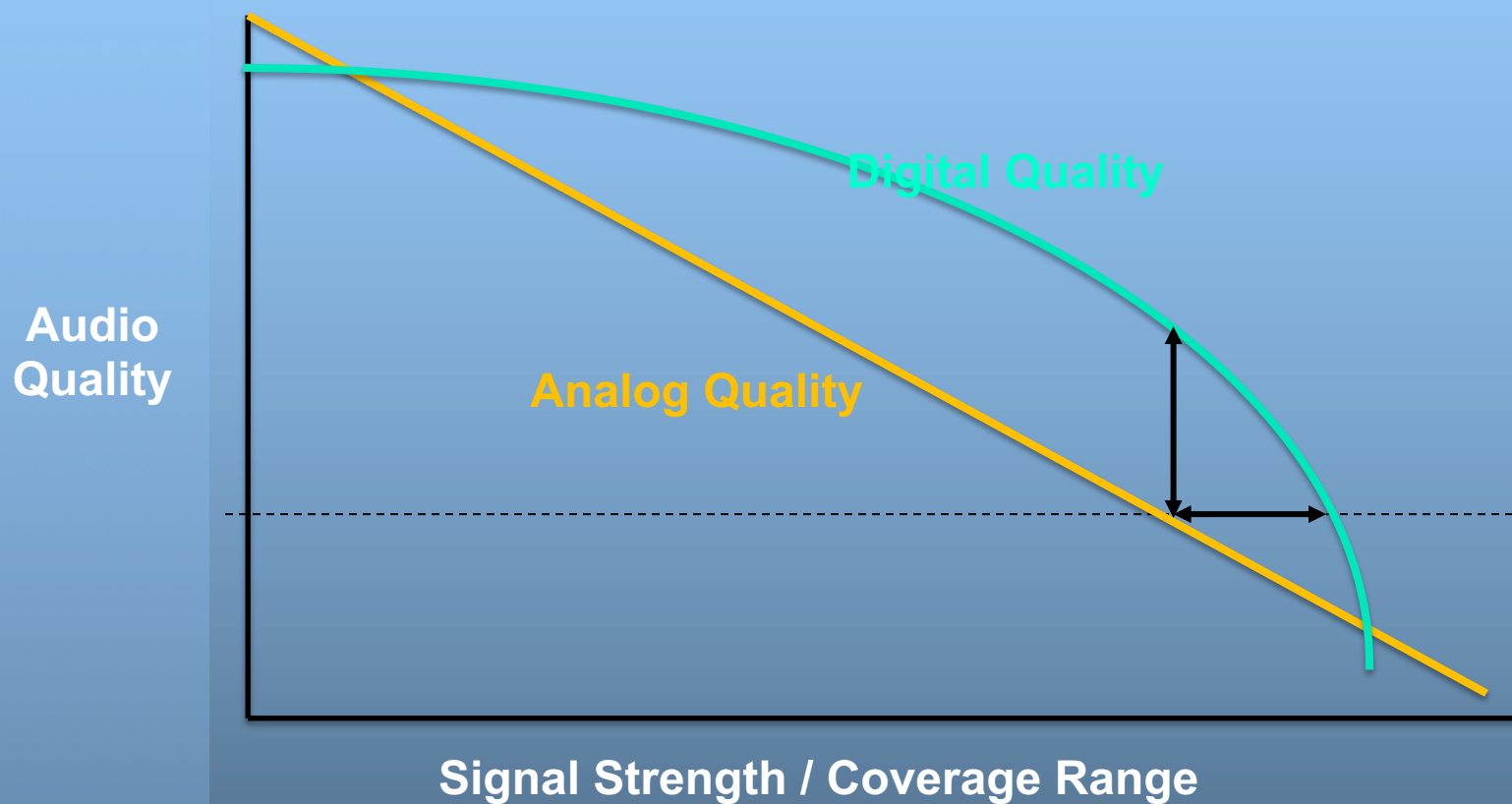
- Digital

- The message (your voice) is converted into digital data and encoded onto the radio signal
 - Similar to a CD or DVD
- When recovered, small amounts of message loss due to noise have little effect
- However; large losses or noise make the message unrecoverable

- P25 - Project 25 (APCO 25)

- Standard for public safety digital LMR

Digital vs. Analog



Conventional vs. Trunking

- Conventional

- Each radio channel is used for a single purpose (sometimes more than one)
 - Police Dispatch
 - Fire Tac 1
 - Public Works
- When the channel is busy, all users have to wait

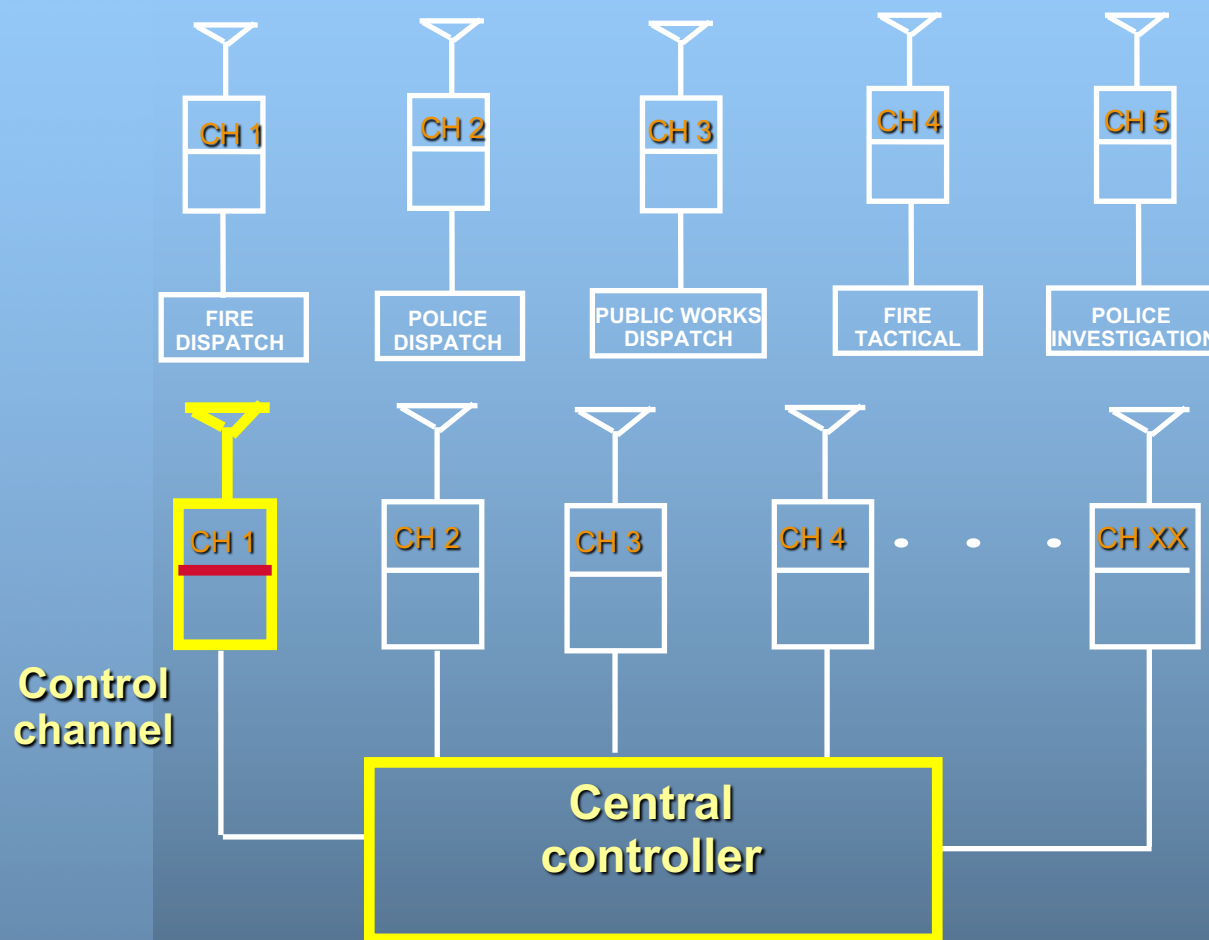
- Trunking

- Several channels are shared by many groups of users
- Users are assigned ‘virtual’ channels called “Talkgroups”
- Talkgroups are assigned to channels on an as-needed basis

- P25

- The P25 standard includes conventional and trunking operation
 - The term P25 is often associated with trunked systems

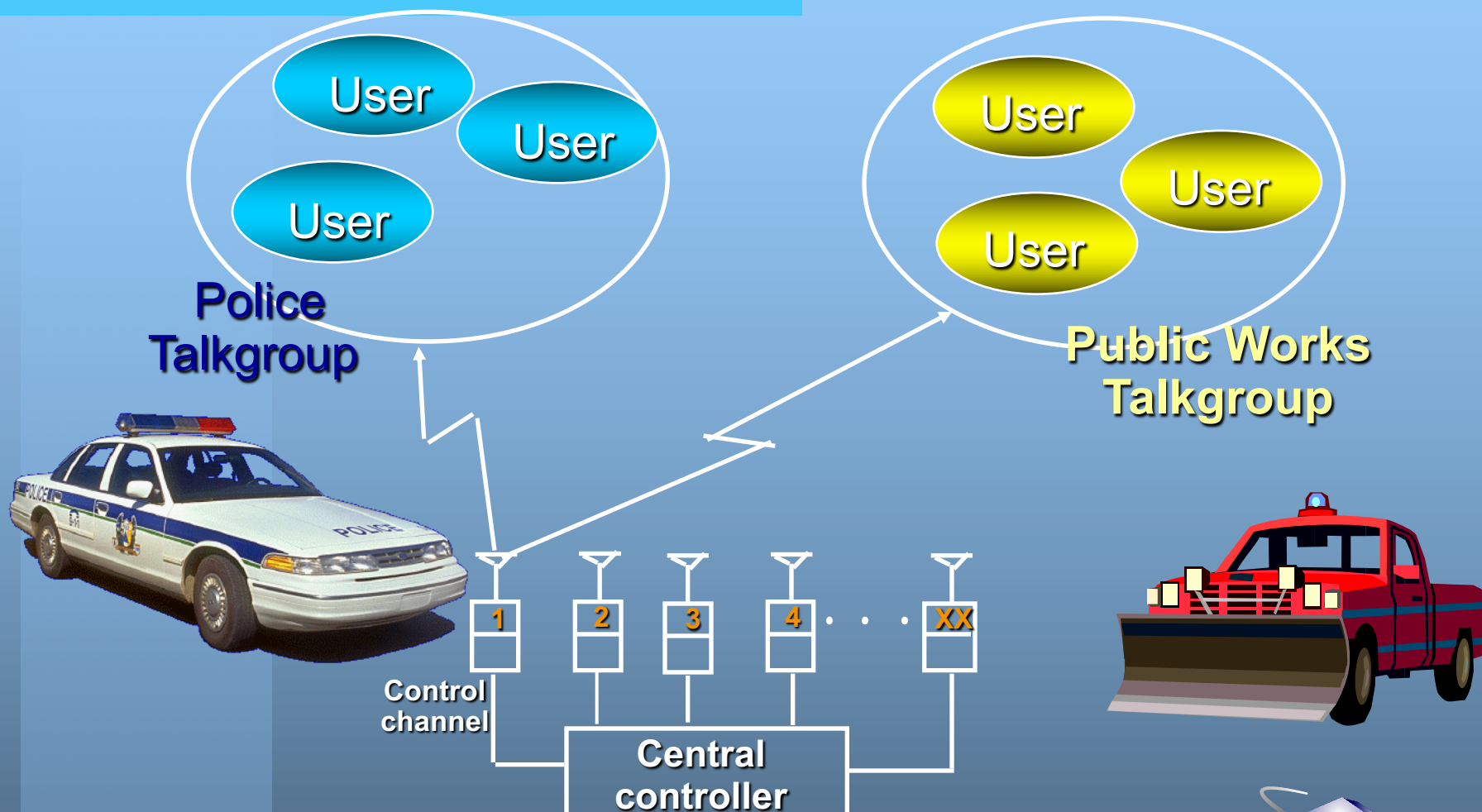
Conventional vs. Trunking (Diagram)



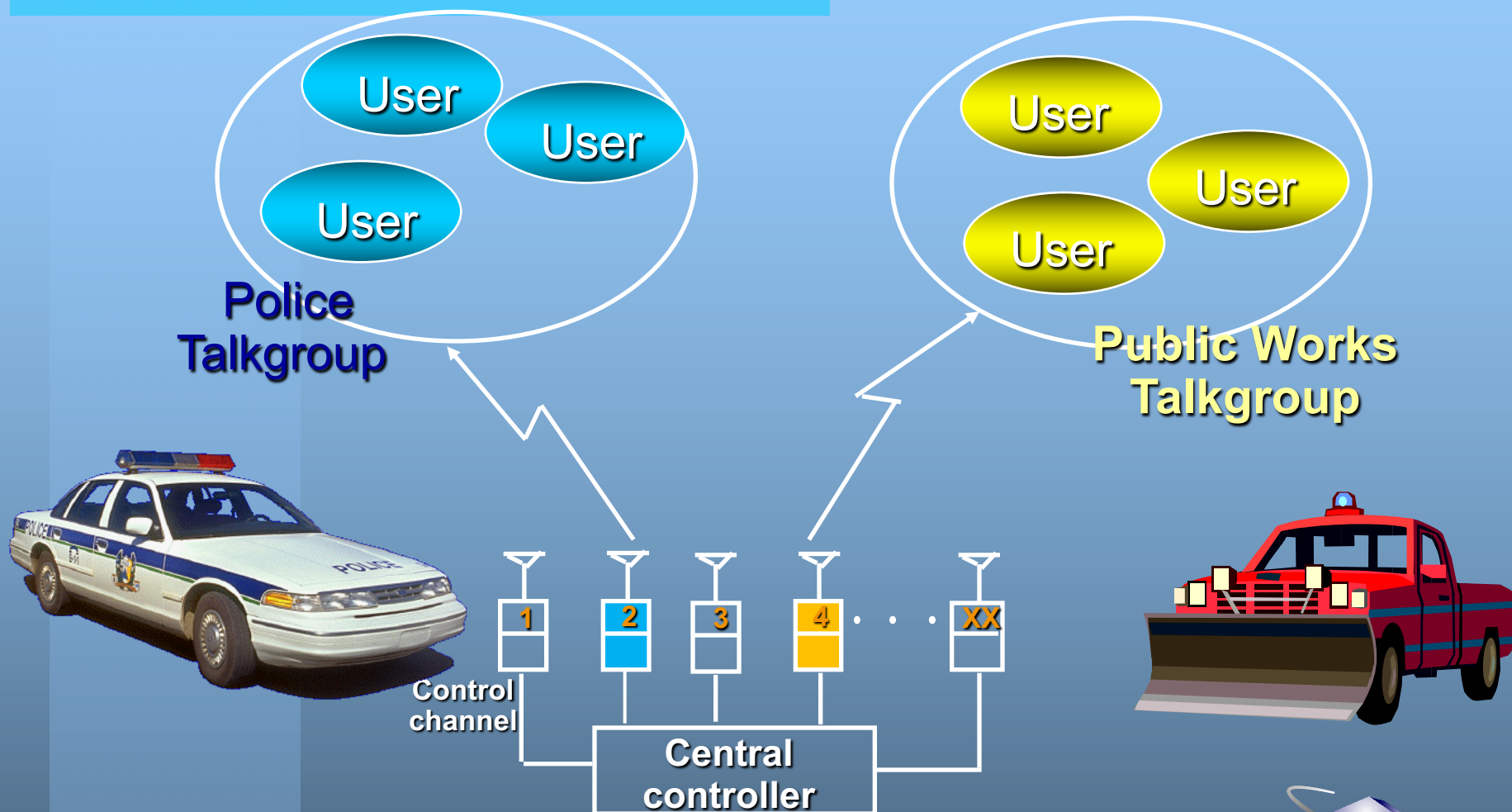
Trunking

- Groups / Talkgroups
- Queuing / Busy / Callback
- Private Call / Unit Call
- Encryption / Security

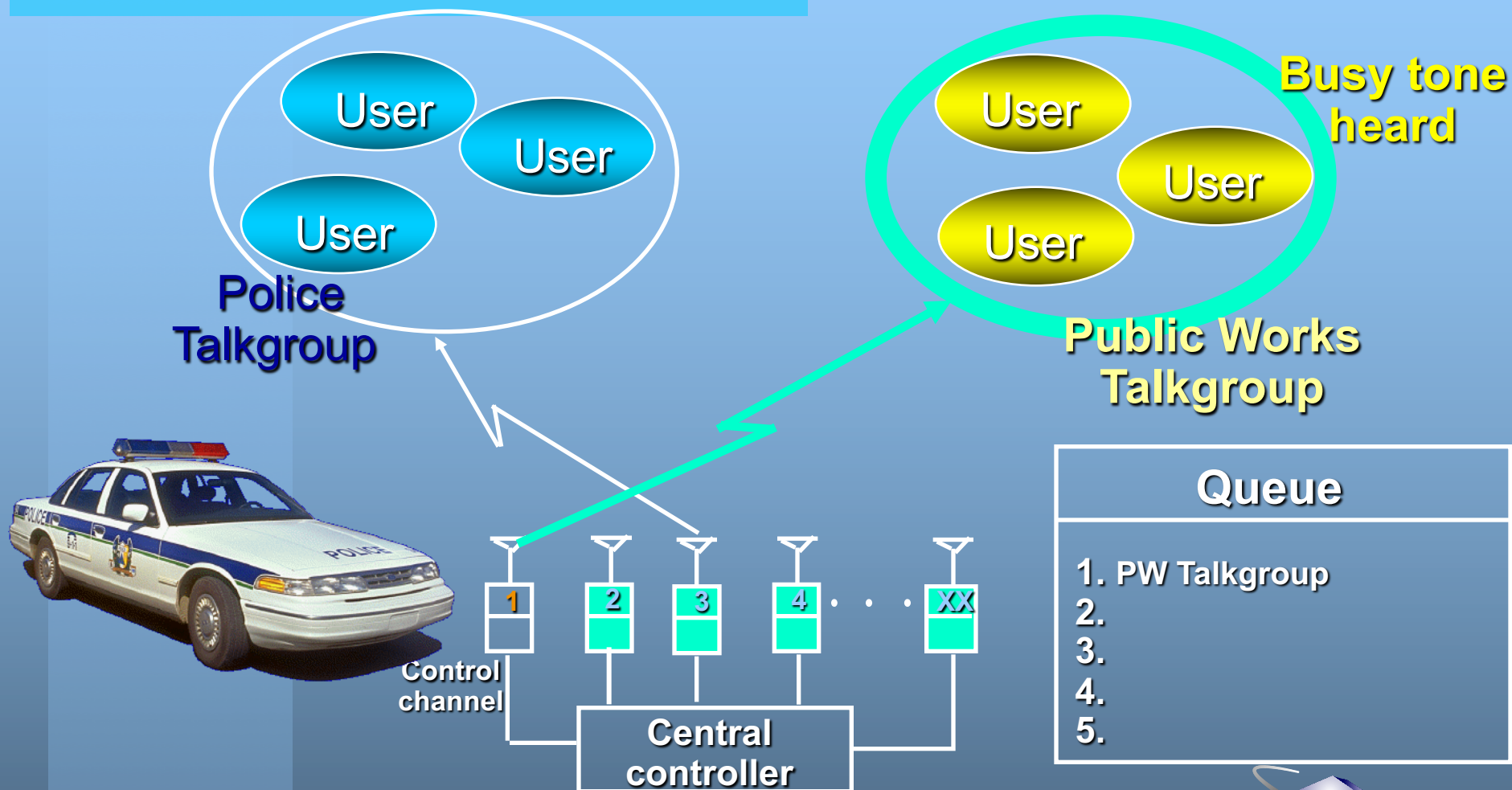
Trunked system ... no conversations



Trunked system ... w/ conversations



Call placed in queue



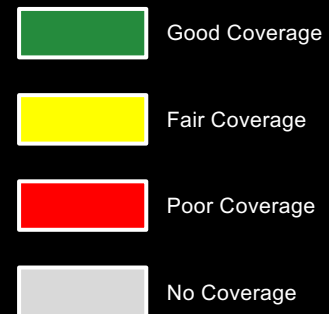
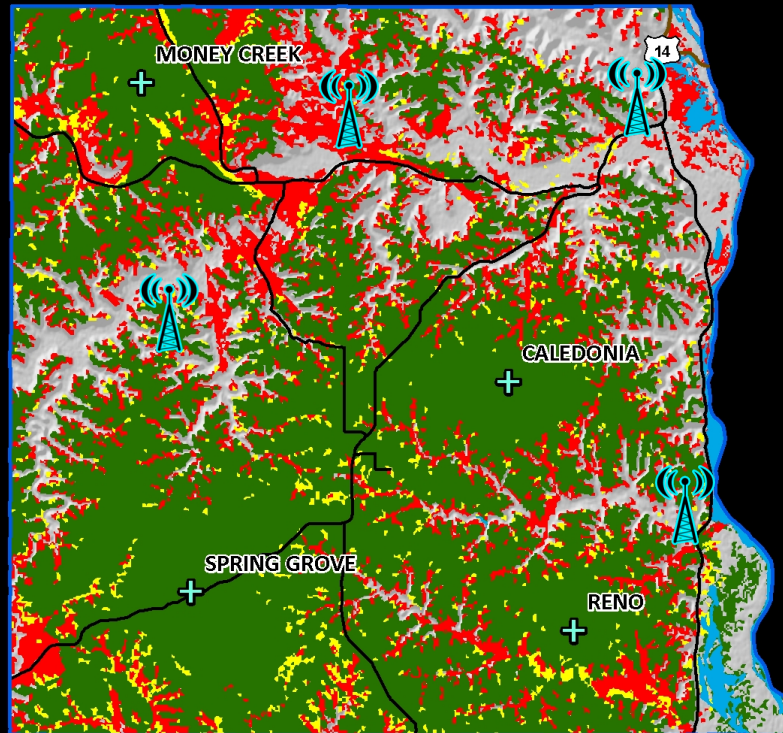
Coverage

- Definition
- Coverage solutions

Coverage Definition

- Percent
 - Percent of area
 - Percent of time/situations
- Equipment
 - Mobile vs. portable
 - Antenna types
- Environment
 - In open
 - In clutter
 - In buildings
- Buildings
 - Types
 - Locations

Add Hypothetical Antenna Sites



Coverage solutions

- Sites
 - Placement
 - Design of the site
- Multisite systems
 - Steering
 - Voting
 - Simulcast

Multisite Systems

- Voting
 - System that selects the best audio from several receivers
 - Provides increased receive coverage
- Steering
 - System that allows the selection of one transmitter site
 - Often paired with voting to automate site selection
- Simulcast
 - System that transmits from all site simultaneously
 - Provides increases transmit coverage
 - Almost always paired with voting

Consoles; Your connection to the system

- Resources – Communications paths
 - Channels
 - Talk Groups
 - Other resources
- Computer Aided Dispatch (CAD)
 - Radio system interfaced
- Other functions
 - Some radio related
 - Some not

Interoperation

- Who needs to communicate with who
 - Who has access
- Where do they need to communicate
 - What do they cover
- Interoperation on your system
- Interoperation on other agency systems
- Interoperation of shared channels
- Overlay systems

Paging

- Personal pagers
- Mobile alerting
- Type of signaling
 - Tone and Voice
 - Digital
- Station Alerting
- Siren activation

System Specific issues

- Unique operating modes
- Location
- CAD interfaces
- Logging Recorder

The Rest of the Story

- Narrowbanding and Rebanding
- FirstNet / LTE
- Future

Q&A - DISCUSSION



For More Information

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