

JVCKENWOOD



2024 Telecommunicator Training Symposium

Radio 101 for the PSAP Manager

What is Behind the Console

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EF Johnson - JVCKENWOOD

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Today's Session:

Introductions

History of Public Safety Radio Systems

Coverage

Trunking

Interoperation

Consoles

Paging

New Technology and System Specific issues

Q&A and Discussion

Introductions; Who am I?

Neil Horden

Channel Solutions Engineer

EF Johnson Technologies, Inc.

A JVCKENWOOD Company

- 20+ years in Public Safety Communications Consulting
- Communications Engineer for Orange County CA
- Systems Engineer for a major radio manufacturer

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

Radio Bands

Analog / Digital

Conventional / Trunking

P25 – Project 25

Narrowbanding and Rebanding

Broadband / LTE / FirstNet

AI and The Future

Radio and the FCC; Who is the FCC ?

(and why do we 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
- ◆ Provide Enforcement (Fines)

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 (as usually used)
 - 450 MHz – 470 MHz
 - 403 MHz – 450 MHz (Government reallocated)
 - 470 MHz – 512 MHz T-Band (TV reallocated)
 - 800 MHz
 - 806–824 MHz and 851–869 MHz
 - National Public Safety Planning Advisory Committee (NPSPAC)
 - Regional Planning Committees (RPCs)
 - 700 MHz
 - 769-775 MHz and 799-805 MHz
 - RPCs also

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”

Technology: Why so many terms?

System Types

- Analog
- Digital

- Conventional
- Trunking

P25

LTE

- Multicast
- 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

TX/RX
F1



TX/RX
F1



TX/RX
F1



Repeaters

TX F1
RX F2



TX F1
RX F2



TX F1
RX F2



TX F2
RX F1

TX F1
RX F2



TX F1
RX F2



TX F1
RX F2



TX F2
RX F1



Repeater
w/ Control
Station

Repeater w/ Talkaround

TX F1
RX F2



TX F1
RX F2



TX F2
RX F2



TX F2
RX F1

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 audio from any loss
 - You can often hear much of the message even with noise and losses

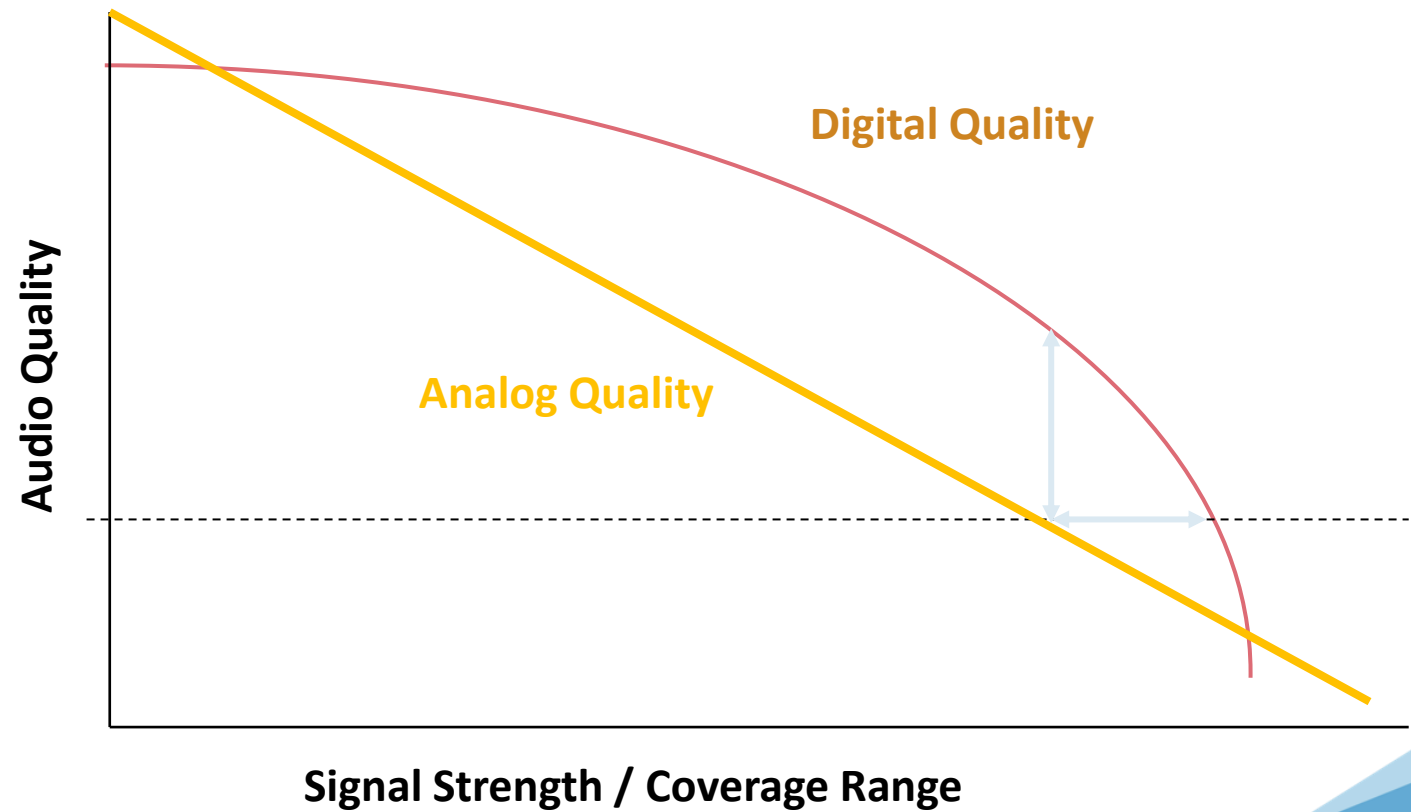
◆ Digital

- ❑ 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 can make the message unrecoverable

◆ P25 - Project 25 (APCO 25)

- ❑ Standard for public safety digital LMR, Other digital standards include DMR and NXGN (NextEdge)

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

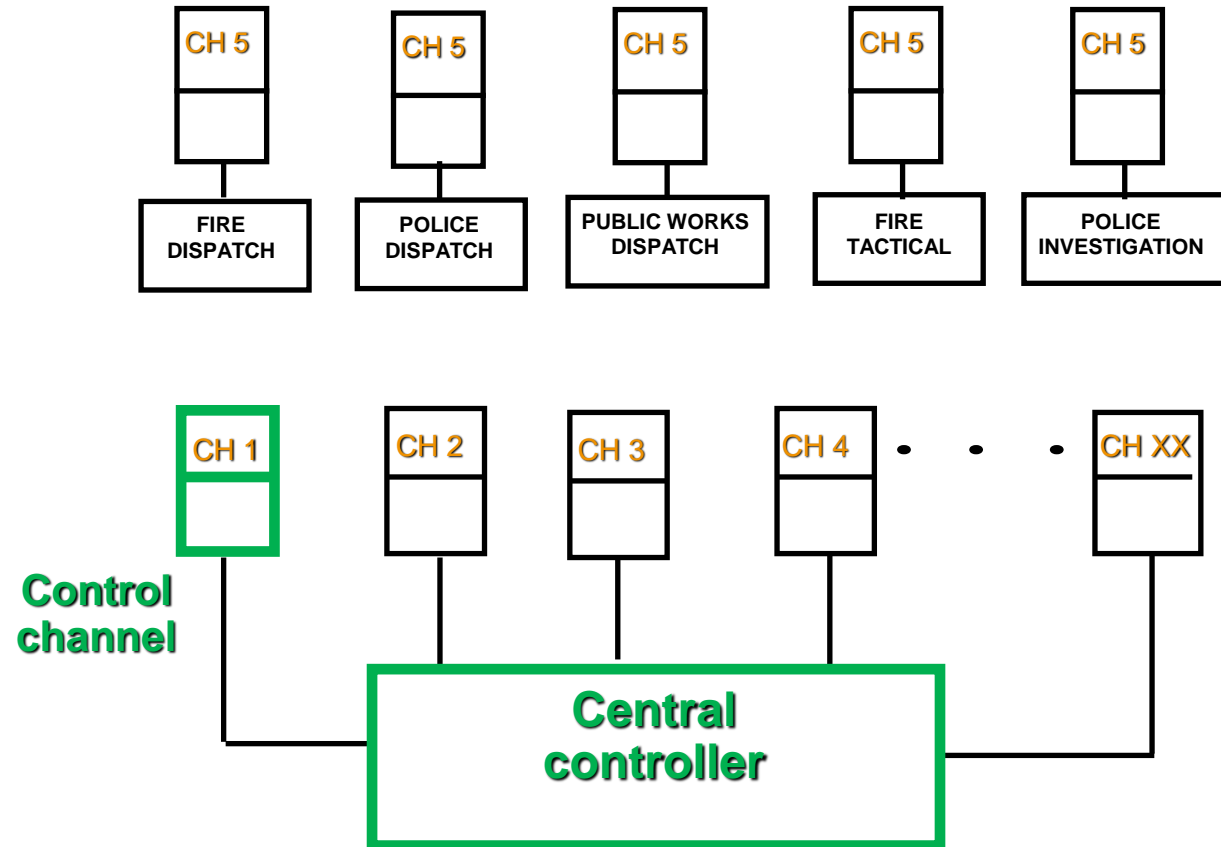


P25

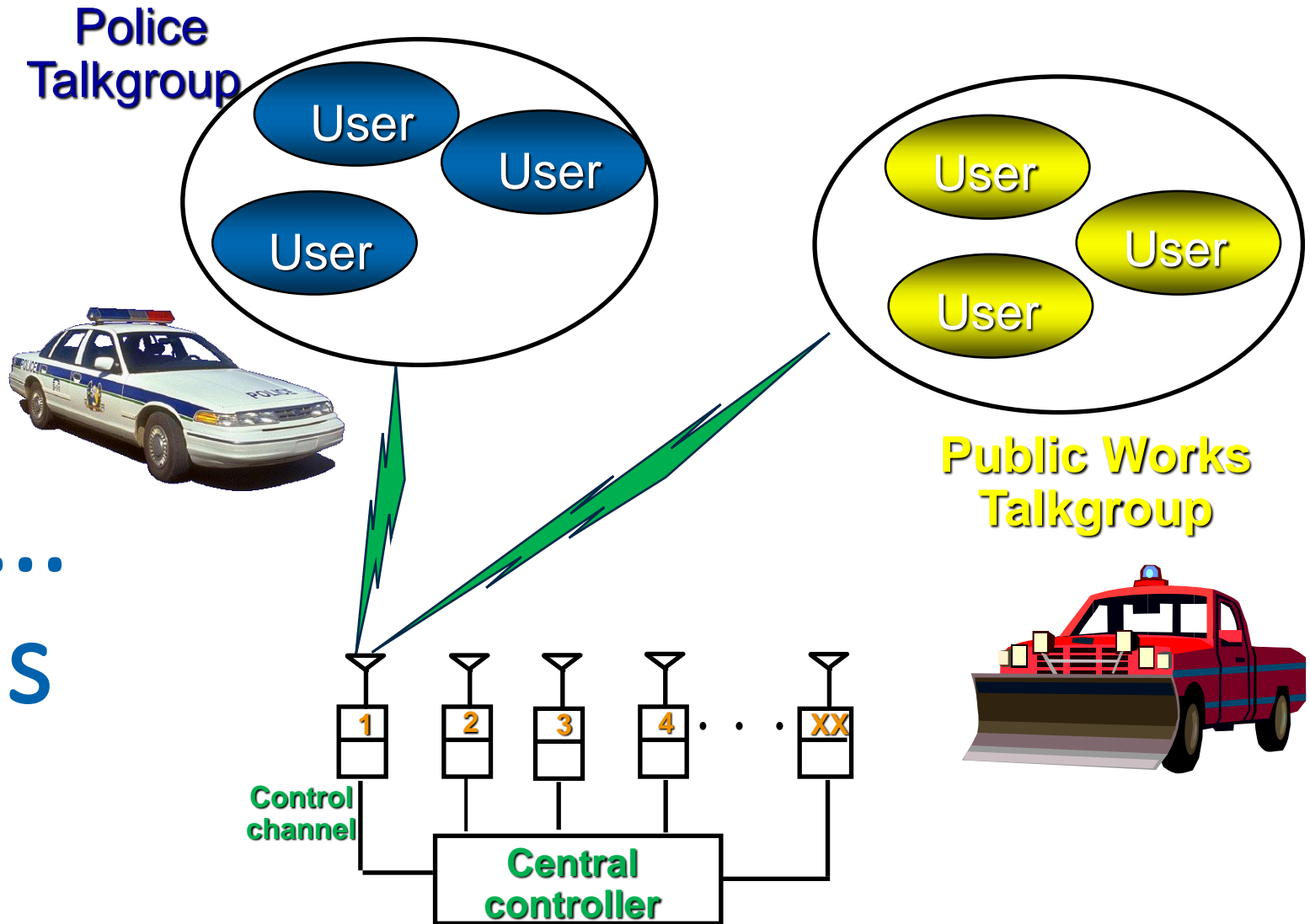
The P25 standard includes conventional and trunking operation

- The term P25 is often associated with trunked systems

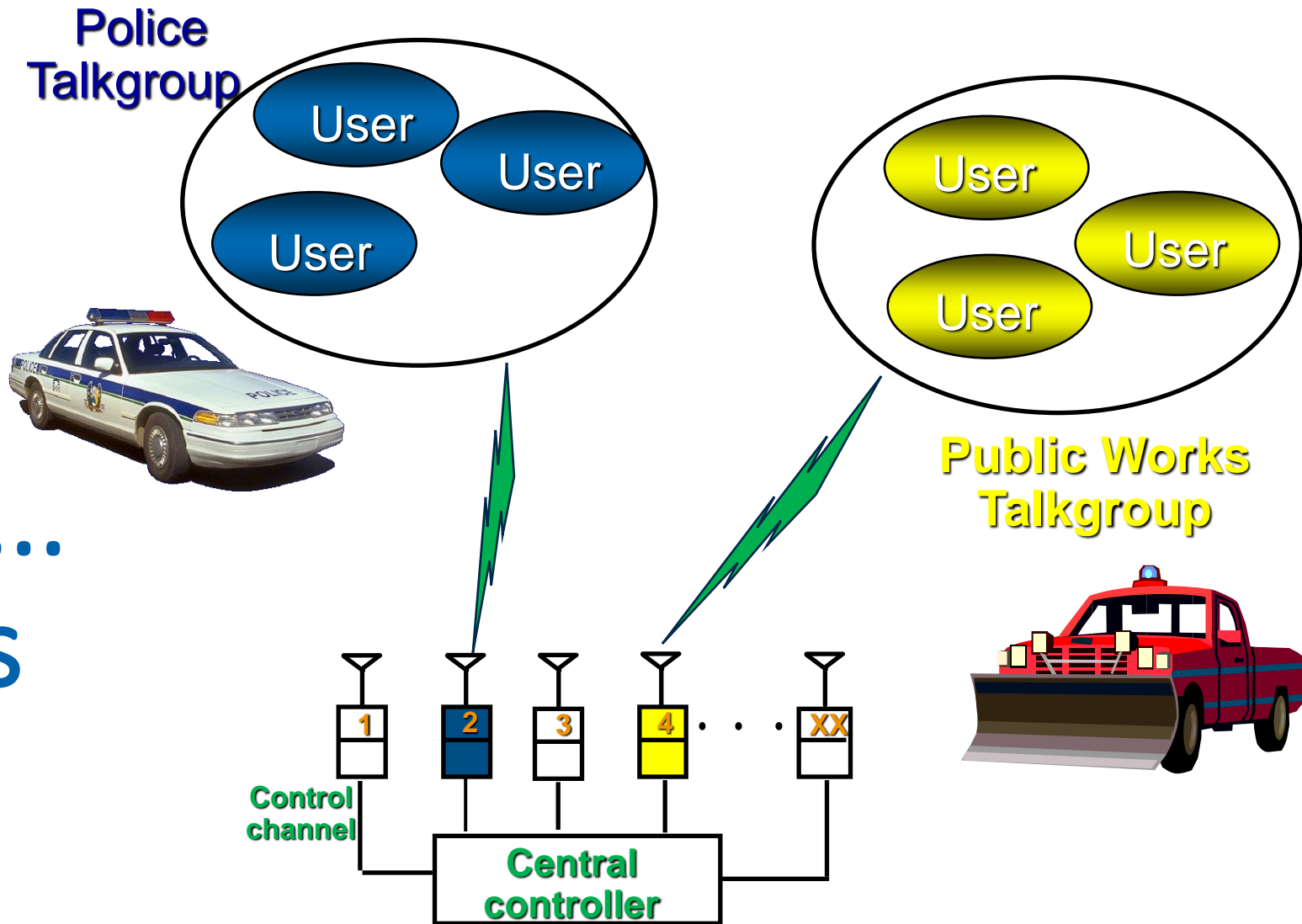
Conventional VS. Trunking



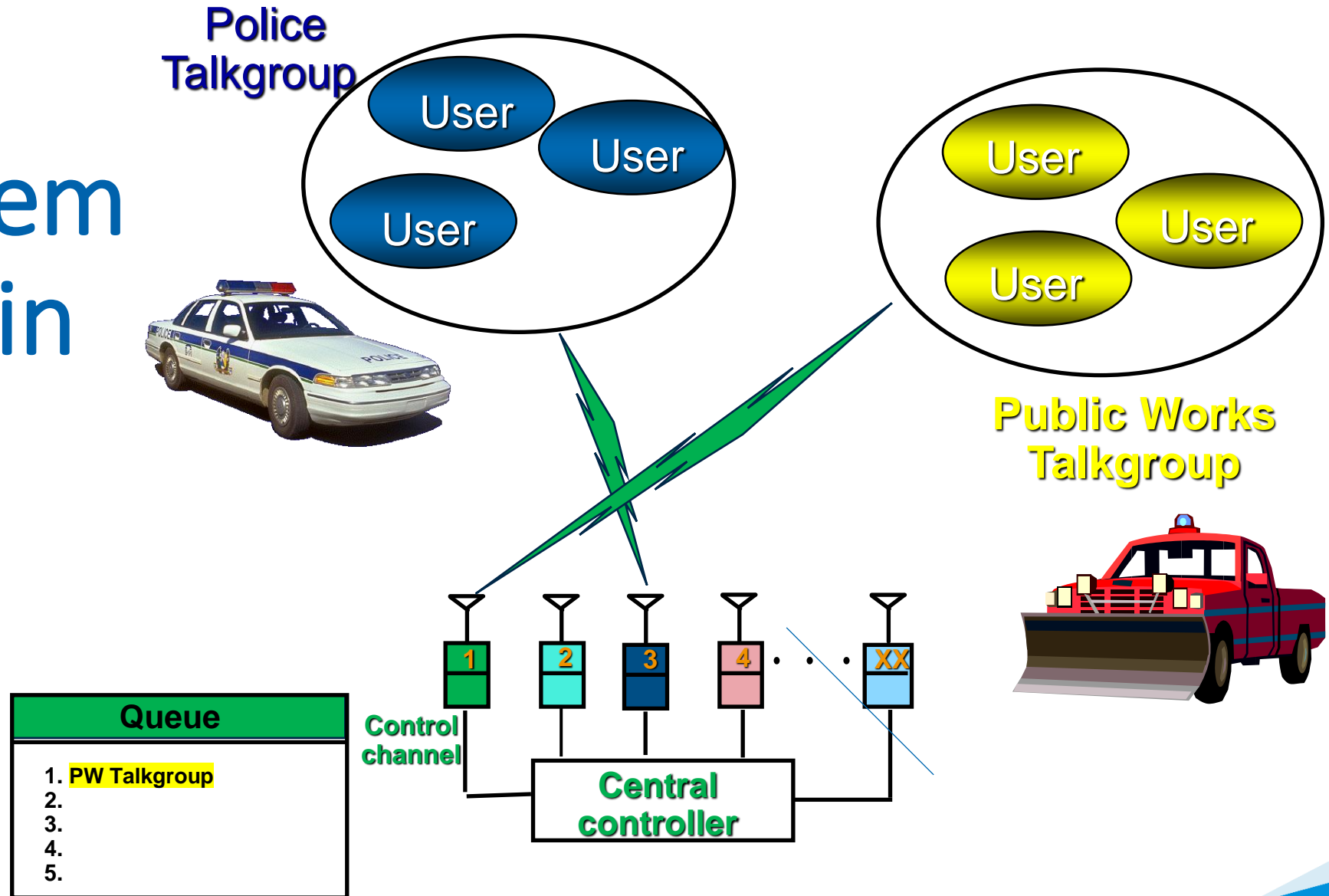
Trunked system ... No conversations



Trunked system ... w/ conversations



Trunked system Call placed in queue



Trunking



Groups / Talkgroups



Queuing / Busy / Callback



Private Call / Unit Call



Encryption / Security

Coverage



Definition

Coverage
Solutions

Coverage Definition Factors



Area

Service Area
Jurisdictional Area
Inter-operational
Area



Percent

Percent of area
Percent of
time/situations



Equipment

Mobile vs. portable
Antenna types



Environment

In open
In clutter
In buildings



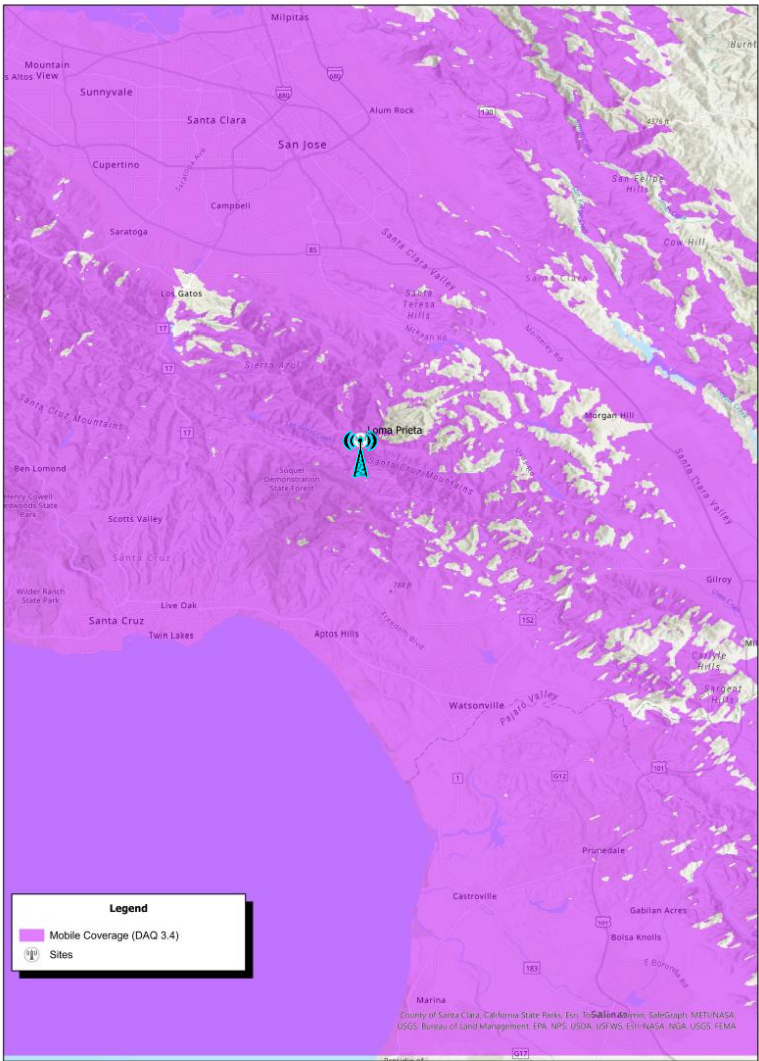
Buildings

Types
Locations

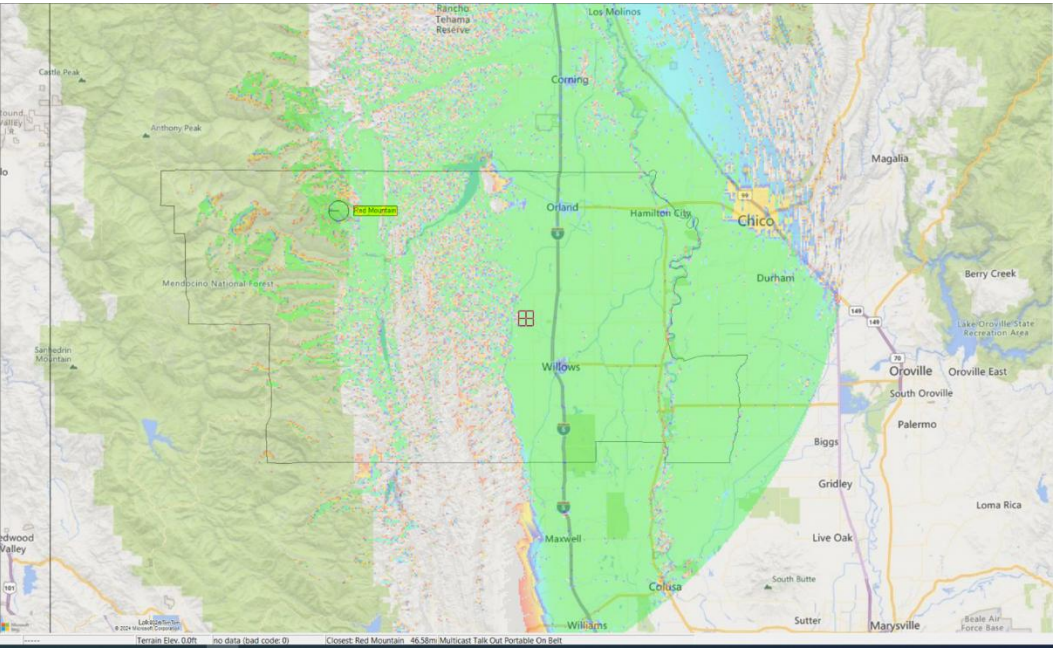
Example Coverage Map

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Example



October 2, 2024
Version: 1.0
VHF P25 Single Site
Mobile Radio (Talk-in)
95% Tile Reliability
Map Reference: 01
For Information Only
System Level Map



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

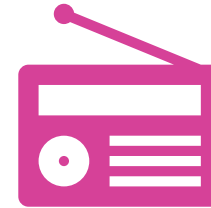
Talk Groups

Other resources



Computer Aided Dispatch (CAD)

Radio system interfaced

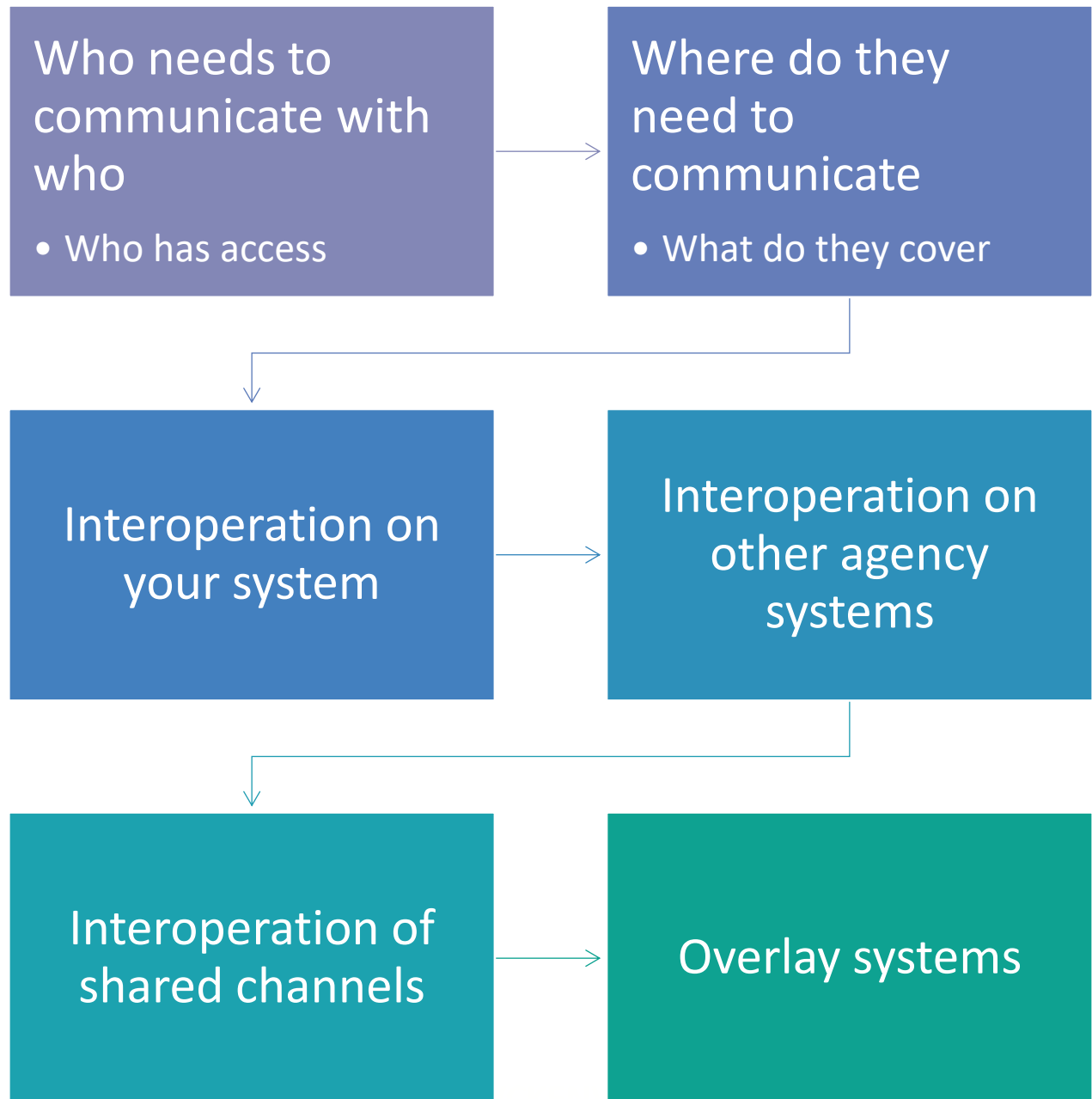


Other functions

Some radio related

Some are not

Interoperability



Paging

Personal pagers

Mobile alerting

Type of signaling

- Tone and Voice
- Digital

Station Alerting

Siren activation

System Specific Technologies



Location



CAD interfaces

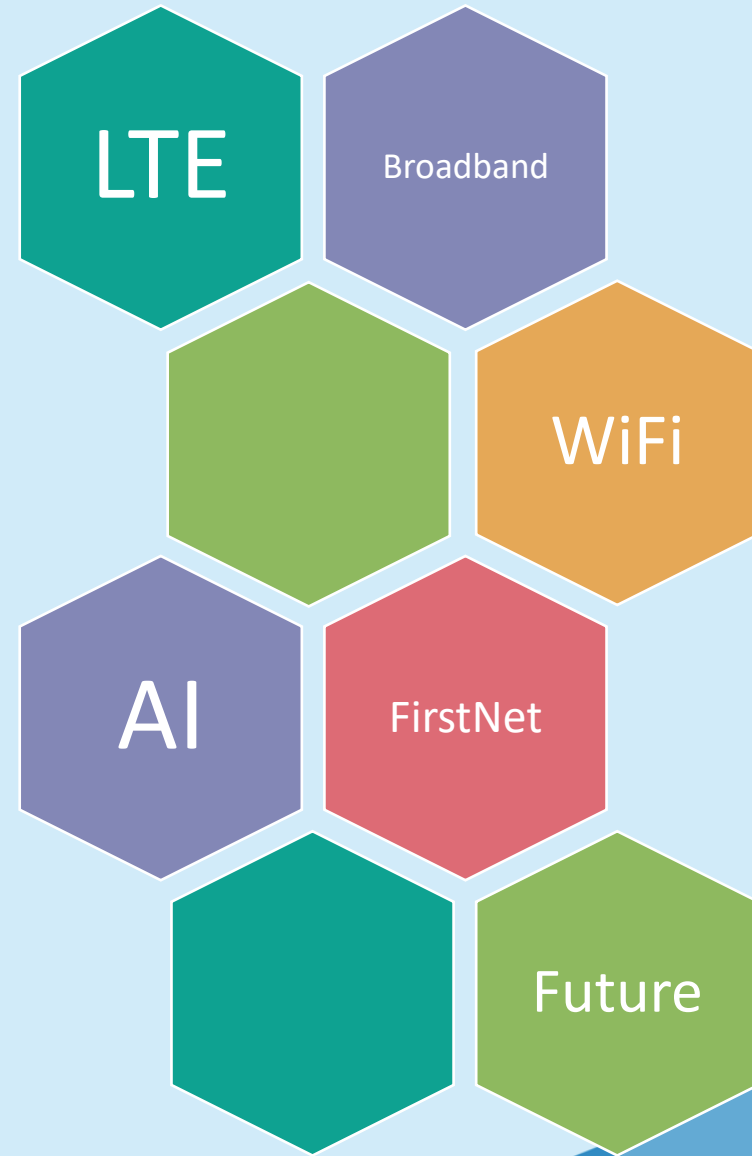


Logging Recorder



AI Voice Assistant

The Rest of the Story



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Q&A - DISCUSSION



Thank You

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