

# LAND MOBILE RADIO SYSTEM NARROWBANDING (IMPACT ON TRANSIT "ITS")

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## Questions to be *Discussed*...

- Why is this important to you?
- Am I affected? (We still use radios?!)
- What's the difference between "Rebanding" and "Narrowbanding"?
  - ...or, more importantly, who pays?
- Is anything else affected?

# Why should the Transit CIO Care?

- Radio systems (still) play a critical communications resource for many/most public transit operations (all modes)
  - Voice dispatch
  - Conduit for ITS functions
- Radio systems are increasingly within IT's area of responsibility
- Complying with federal law might be far more costly, disruptive, and time-consuming than you thought

# Recent FCC actions on LMR Spectrum

- 800 MHz “Rebanding” (mid. 2000)
  - Purpose: alleviate interference on public safety channels by Nextel (Sprint)
  - Sprint paid for (most) cost impacts incurred by public safety **and transit** licensees
  - All but last phase (IV) complete; awaiting border frequency coordination treaties between USA/Mexico and USA/Canada

Most transit agencies have not incurred any significant cost by 800 MHz rebanding

# Recent FCC actions on LMR Spectrum (cont.)

- 700 MHz Spectrum Allocation (mid. 2000)
  - Open new spectrum resulting from moving TV broadcasters from analog to DTV standard
- VHF/UHF “Narrowbanding” (1991)
  - Double (or quadruple) overall spectrum utilization efficiency through deployment of more modern radio technologies

# Recent FCC actions on LMR Spectrum (cont.)

- 25 MHz “wideband” channels must be relicensed to 12.5 MHz “narrowband” operation by January 2013, **and/or...**
- Achieve an “efficiency standard” of 9.6kbps per 12.5 MHz channel for data applications
  - Impact on older CAD/AVL systems?
- Quarter (6.25) channel is FCC’s ultimate goal, but deadline is TBD

# What is this "Spectrum" and Where does "Narrowbanding" fit?

## UNITED STATES FREQUENCY ALLOCATIONS THE RADIO SPECTRUM

### RADIO SERVICES COLOR LEGEND

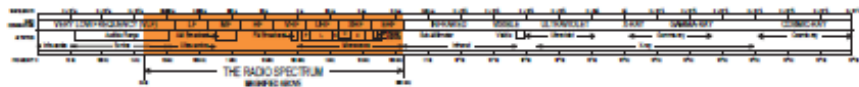
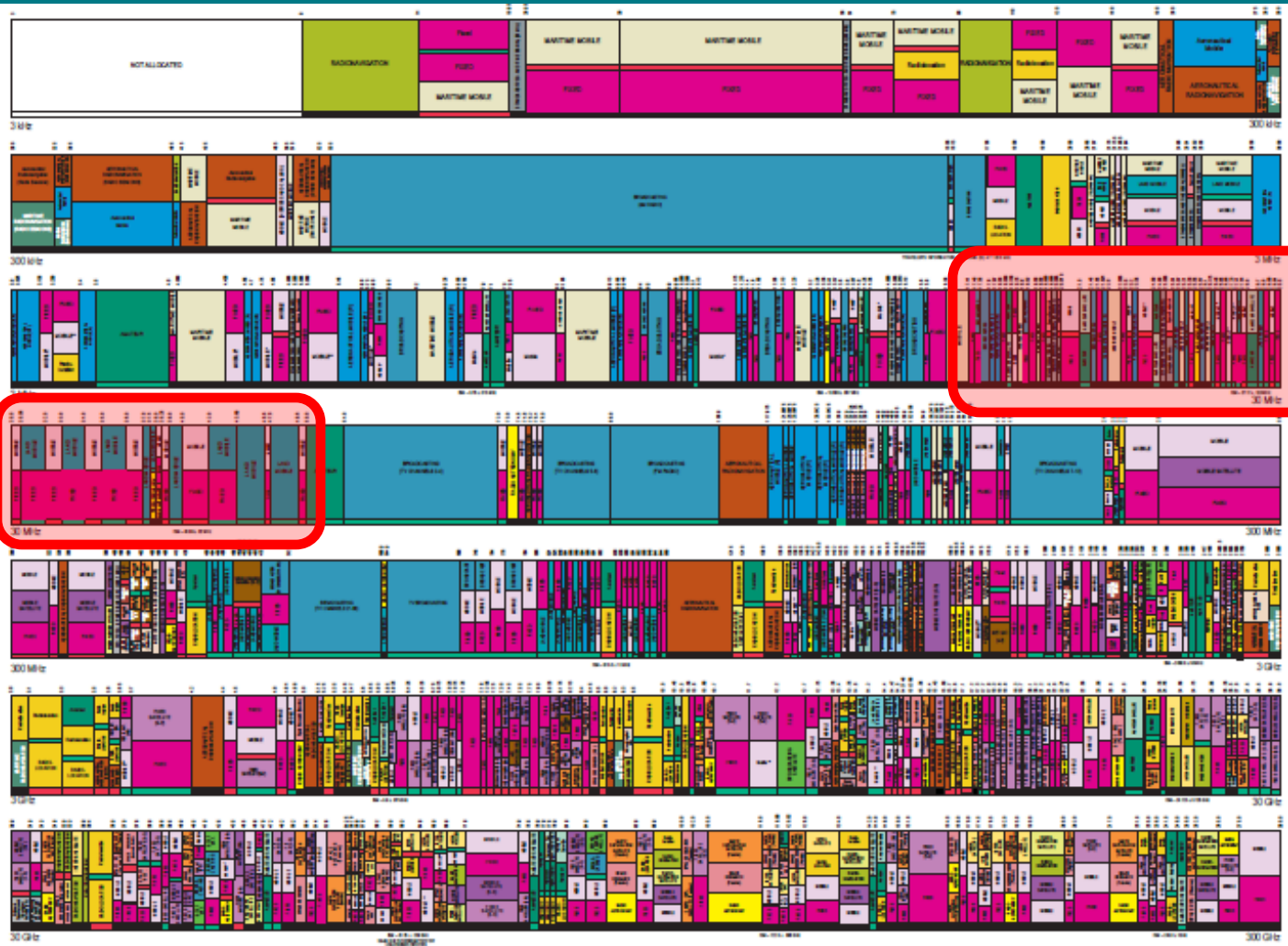
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### ACTIVITY CODE

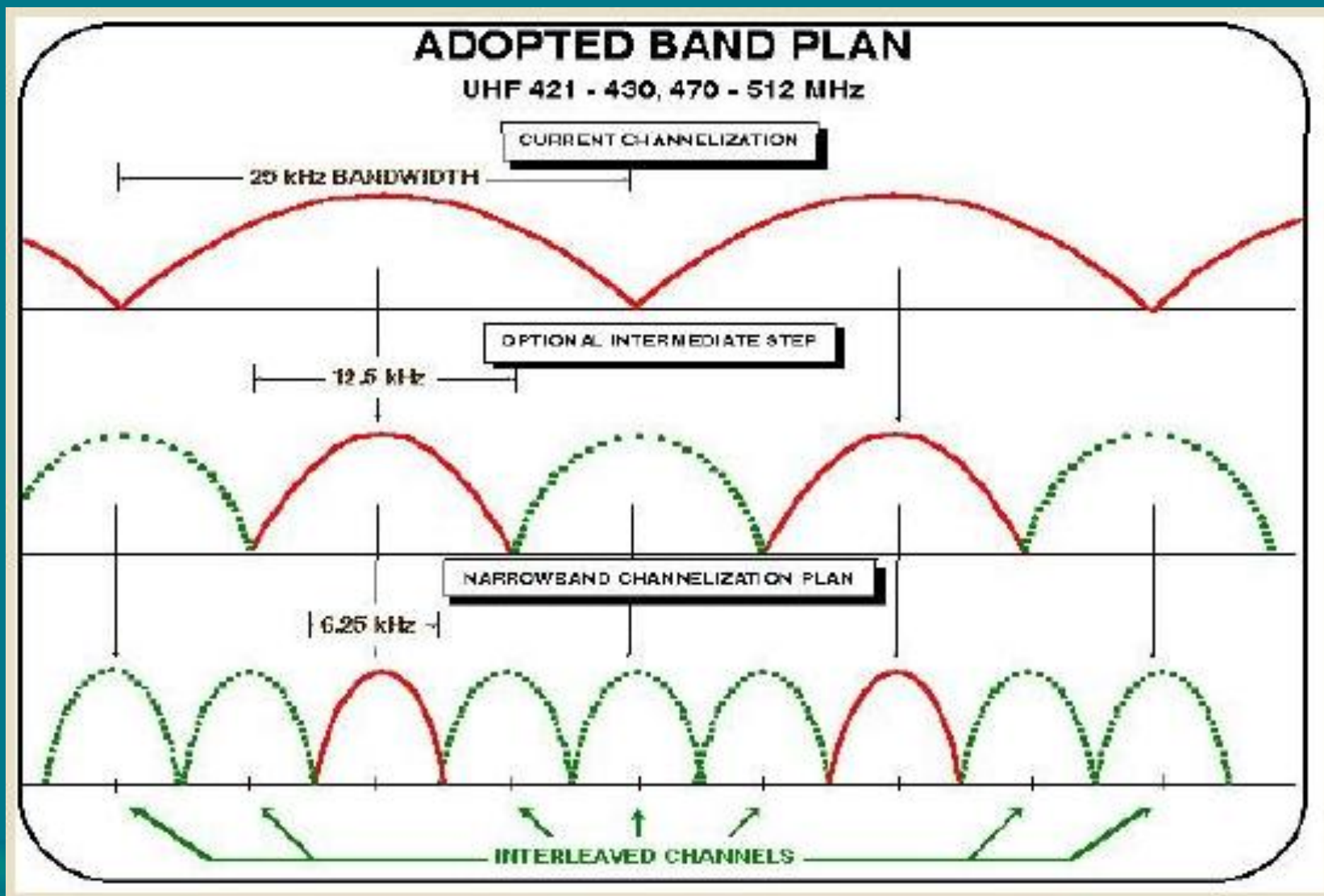
COMMERCIAL	COMMERCIAL
NON-COMMERCIAL	

### ALLOCATION USAGE DESIGNATION

Primary	Secondary	Co-primary	Co-secondary



# What's Narrowbanding Look Like (UHF)?





# A Little History – Transit Fleet Communications and ITS



- In the beginning...
- Conventional LMR
  - Most appropriate (at the time)
  - Mostly UHF
  - Open channel
  - No access control
  - Voice only

# A Little History – Transit Fleet Communications and ITS (con't)

- Solution?
  - Metrocomm™
    - Introduced by Motorola ~1960s
    - First “RTT” oriented product
    - Dedicated “data” channel
      - Dispatcher-controlled access
    - Obsolete (phased out ~mid. 1980s)
      - ***Still in use by some transit agencies today!***

# A Little History – Transit Fleet Communications and ITS (con't)

- Metrocomm Replacement?
- Computer Aided Dispatch
  - Early 90's
  - Leverage emerging computer technologies
  - Originally designed around conventional LMR with dedicated data channel
  - Replicated *and expanded* Metrocomm's functionality...

The screenshot displays the Fleet.mxd CAD software interface. It features a menu bar (File, Control, Data, Admin, View, Window, Help) and a toolbar. The main window is divided into two panes. The left pane, titled 'Incident Status', contains a table with columns: Type, Time, VID, Route/Block, Oper, Status, Priority, and Message. The right pane, titled 'Work Assignment Status', contains a table with columns: Route/Block, Status, Dev, VID, Oper, Dir, Last TP, and Time. Below the tables are several status fields for 'Desc', 'Vehicle Id', 'Operator', 'Route', 'Block', 'Last TP', 'Time', 'Int', 'Call Status', 'Vehicle Status', 'Dev', 'Date/Time', 'Next TP', and 'Call Status'. The status fields show values such as 'Priority: Req To Talk', 'Date/Time: 8/6/98 16:46:12', 'Controller Id: 1111', 'Vehicle Id: 0021', 'Operator: JARNEY, J', 'Route: 0', 'Block: 0', 'Last TP: ', 'Time: 00:00', 'Int: ', 'Call Status: NO CALL', 'Vehicle Status: LOGOFF', 'Dev: 0', 'Date/Time: 8/7/98 13:51', 'Vehicle Id: 0052', 'Operator: JARNEY, J', 'Route: 24', 'Block: 1', 'Last TP: Hen-Holly', 'Next TP: MSM', 'Call Status: NO CALL', and 'Dir: IN'.



# A Little History – Transit Fleet Communications and ITS (con't)

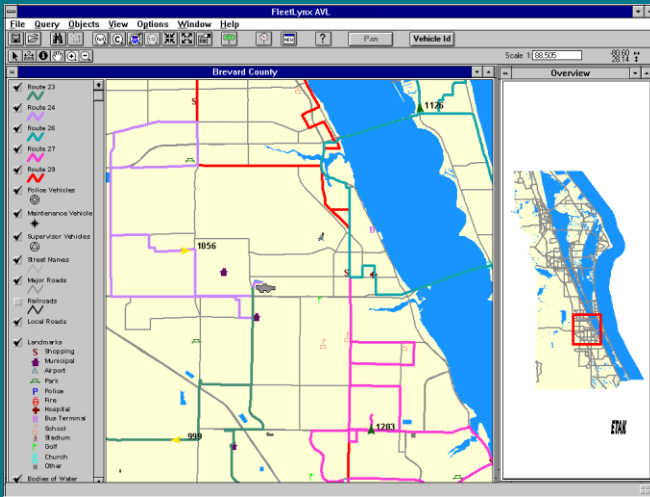
- Metrocomm

- Access Control via...
  - Request-to-Talk (RTT)
  - “Priority” RTT
- Emergency/Silent Alarm
- Fleet-wide calls

- CAD

- Access Control via...
  - Request-to-Talk (RTT)
  - “Priority” RTT
- Emergency/Silent Alarm
- Fleet-wide calls
- *Group calls*
- *Text messaging*
- *Online Records Mgt*
- *Incident Reports*
- *...and, with GPS, opened the door to...*

# A Little History – Transit Fleet Communications and ITS (con't)



- Automatic Vehicle Location
  - *Near* real-time
    - 1-5 min "polling"
  - Route/Schedule adherence
    - QoS reports
  - Headway management
  - Transfer protection
  - Paratransit pick-up/drop-off



# So, Why Has Transit Stuck with LMR Thus Far?

- Legacy capital investment
- Familiar technology
- Pre-existing support structure
- FTA capital grant rules
- Predictable coverage
- Long life cycle
- *Early* ITS was designed around it

# But Transit's Technology Vision Has Recently Evolved...



- Web presence
- Accurate real-time service information (e.g. bus arrival)
- Interoperable Communications
- New Payment Technologies
- On-board Wi-Fi
- Live, in-vehicle, CCTV
- Automated Incident Mgt
- TODSS

# So, Can Today's LMR Systems Support This New Transit Vision?



- Interoperability?
  - Absolutely!
- ITS functions that require *high speed* wireless data?
  - No, or...
  - Not very well

*One way to achieve “interoperability”*



# Does Transit Have Other Technologies Available?

	Advantages	Drawbacks
Public Cellular (2G/3G)	<ul style="list-style-type: none"><li>• High speed (40 - 600 kbps)</li><li>• Proven, stable access</li><li>• Affordable deployment</li><li>• Wide coverage</li><li>• Push-to-Talk functionality</li></ul>	<ul style="list-style-type: none"><li>• Shared access</li><li>• Unpredictable coverage</li><li>• Unpredictable access</li><li>• Recurring fees</li></ul>
Public Broadband (4G)	<ul style="list-style-type: none"><li>• Emerging technology (WiMax vs. LTE?)</li><li>• Broadband (2 - 20Mbps)</li></ul>	<ul style="list-style-type: none"><li>• Slow rollout/coverage</li><li>• Data-centric</li><li>• <i>Premium</i> recurring fees</li></ul>
Private Wi-Fi ("MESH")	<ul style="list-style-type: none"><li>• Standard networking</li><li>• Easily expandable and reconfigurable</li><li>• Low LCC</li></ul>	<ul style="list-style-type: none"><li>• Costly rollout</li><li>• Can be prone to interference (wireless phones)</li></ul>
IP Radio	<ul style="list-style-type: none"><li>• Common Voice &amp; Data</li><li>• Mission critical performance</li><li>• Interoperable</li></ul>	<ul style="list-style-type: none"><li>• Expensive</li><li>• Low-speed data</li></ul>

# Narrowbanding?...Decision Time Is Now!

What Do I Have?

*But when it comes to your legacy UHF or VHF radio system...*

What Must I Do?

Available Solutions?

What Can I Afford?

When Must I Decide?

What Do I Need?

*Applies to any decision-making:  
Cars...Houses...Dating  
...Divorcing...*

# What Are Transit's Options?

- Narrowband current radio system
  - Relicense current UHF/VHF channels
  - *Possibly* replace mobile and portable radios, repeaters...
- Legacy CAD/AVL?
  - Possibly replace or redesign data channel modems and interfaces
  - Or, possibly...*replace the entire ITS system*

## What Are Transit's Options? (con't)

- Migrate to a "shared" system
  - Surrender current VHF/UHF channels
  - *Possibly* replace mobile and portable radios, repeaters...
  - Legacy CAD/AVL?
    - Add new data channels for transit
    - Possibly replace or redesign data channel modems and interfaces
    - Or...replace the entire ITS system

## What Are Transit's Options? (con't)

- 100% public cellular (2G/3G/4G)
  - Surrender current VHF/UHF channels
  - Dismantle radio system
  - Legacy CAD/AVL?
    - Replace or redesign data channel modems and interfaces
    - Or, *more likely*...replace the entire ITS system

# What Are Transit's Options? (con't)

- “Hybrid” system
  - Unhinge CAD/AVL voice and data functionality
    - Voice remains on radio system
    - Move data to cellular

## Summary/Take-Aways

- It's only *20 months* until the January 2013 UHF/VHF Narrowbanding deadline
  - APCO stat (Dec. 2010): only ~25% of UHF licenses fully narrowbanded
- Narrowbanding *will likely* affect your legacy CAD/AVL radio system
- It could be (very) costly, time-consuming, and demanding on already meager, overworked, staff

## Summary/Takeaways (cont.)

- Consider other wireless communication system options depending on...
  - Where your transit agency is today
  - Your service and technology visions for the future
  - What you can afford
- **In all cases, if your agency operates an old VHF/UHF radio system, you likely *will* have to do something about it...and soon!**



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