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Public Safety and The 700-MHz Band

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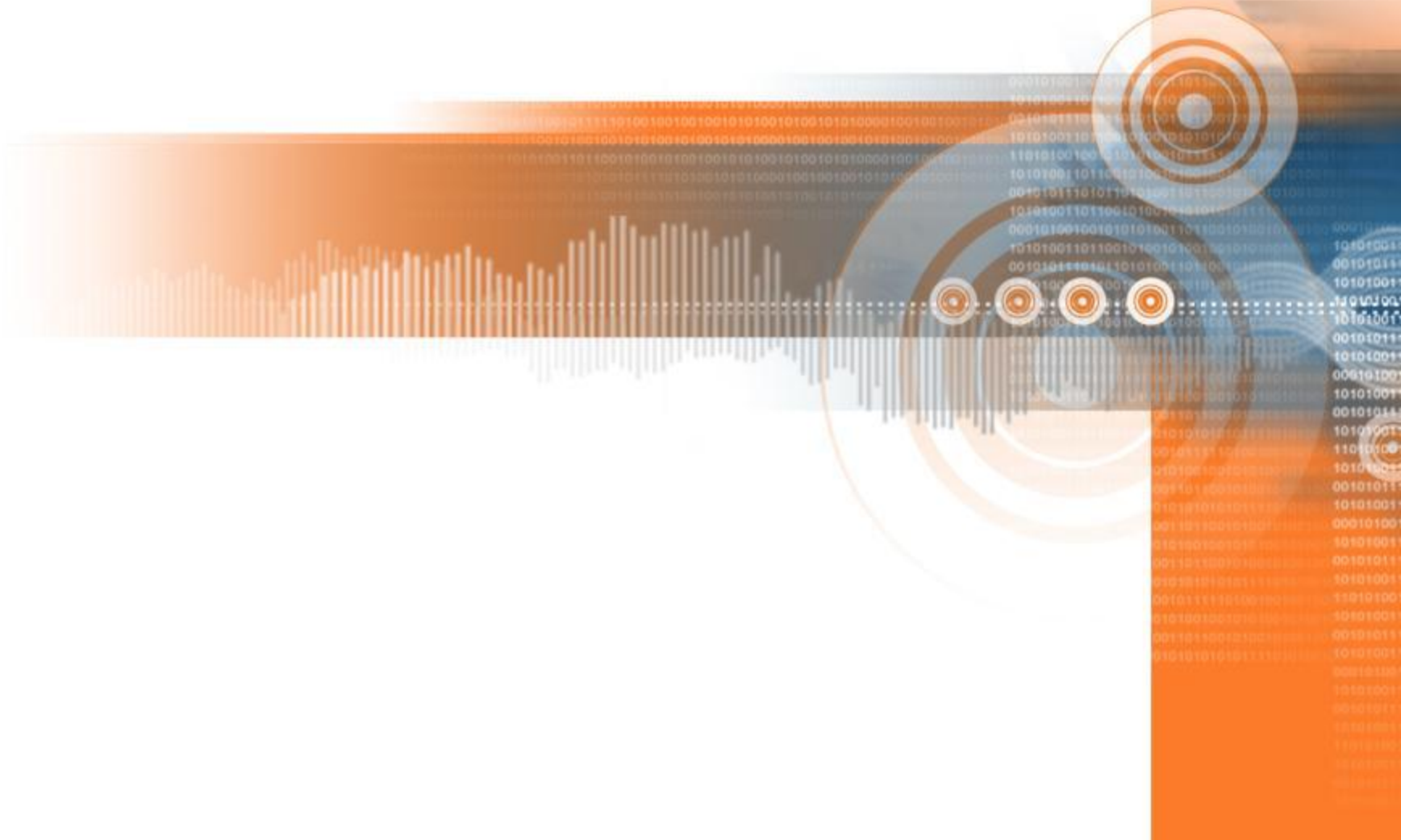
- ➔ 30+ year Commercial Member of APCO
 - Currently CPRA Chapter
- ➔ APCO Broadband Committee: Vice Chairman
- ➔ FCC' s Emergency Response Interoperability Center (ERIC)
 - Representing National Sheriff' s Association on Public Safety Advisory Council (PSAC)
- ➔ Consultant (pro bono)
 - Public Safety Spectrum Trust
 - Public Safety Alliance
 - National Sheriff' s Association
- ➔ Website: andrewseybold.com
 - Public Safety Advocate articles
 - Weekly Public Safety news summary
 - Sign up free to all

Agenda

- Public Safety 700-MHz Spectrum
- Nationwide Interoperable Broadband Network
- The D Block: What It Is and Who Wants It
- Bills in Congress to Help Public Safety
- HR 607 Spectrum Take-Back
- Why Public Safety Needs the D Block
- Broadband and LMR Public Safety Systems
- Meanwhile, Back at the FCC
- 700-MHz Narrowband Spectrum
- 700-MHz Devices
- How Broadband Will Change Public Safety
- Q and A

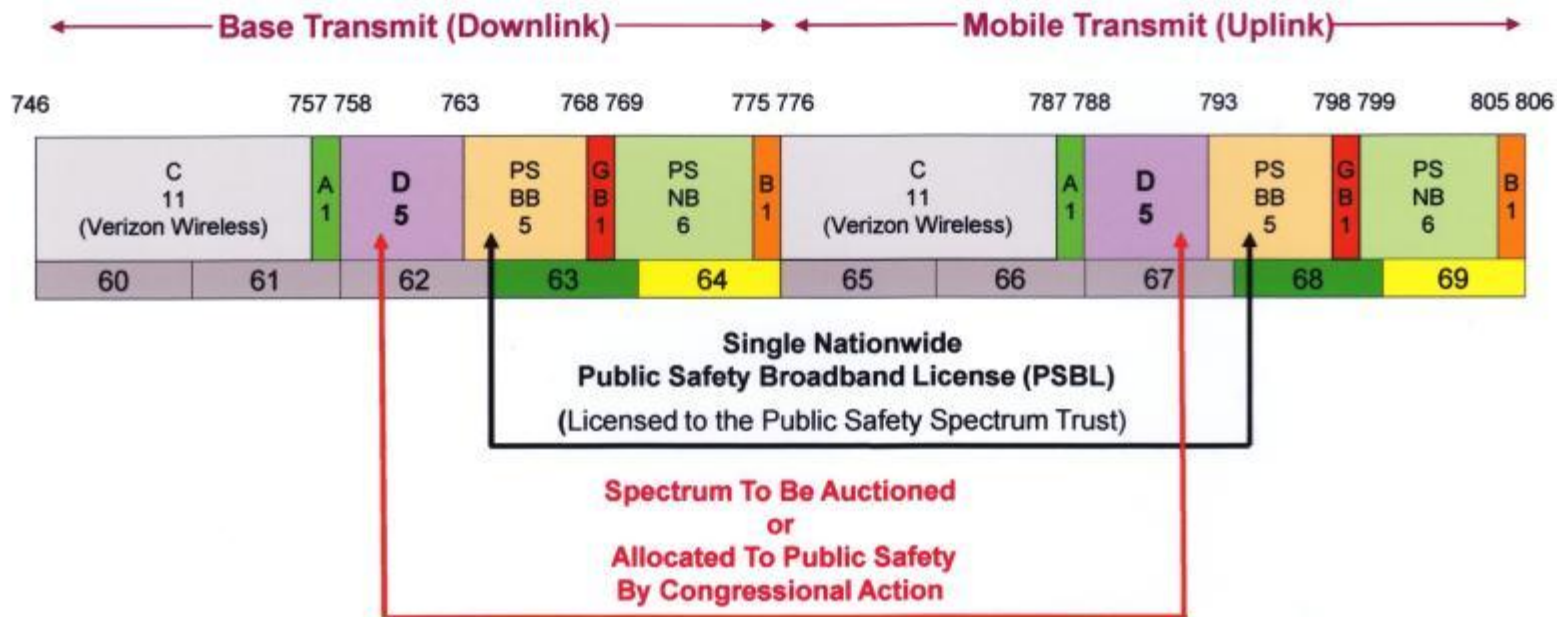
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Public Safety 700-MHz Spectrum



Public Safety Spectrum Holdings: 700 MHz

New Upper 700 MHz Band Plan - Adopted by FCC on July 31, 2007



- Today: Public Safety has 10 MHz of nationwide broadband spectrum
- Asking for additional 10 MHz (known as D Block)
- Requires Congressional action: FCC already authorized to auction this spectrum

Original Vision for Broadband

- ➔ D Block to be auctioned to commercial network operator
- ➔ Would be paired with 10 MHz of spectrum licensed to Public Safety Spectrum Trust
- ➔ Network to be built out to Public Safety specifications nationwide
- ➔ This public/private partnership would provide
 - Shared nationwide spectrum
 - Public Safety would have priority on as-needed basis
- ➔ Combined network would provide
 - Nationwide Public Safety Broadband
 - System would be fully interoperable from coast to coast, border to border
- ➔ Private operator would become full partner

What Happened

- ➔ No commercial network operator bid close to minimum bid
 - Concerned about requirements to build out hardened, mission-critical network
- ➔ AT&T, Verizon won lots of 700-MHz commercial spectrum
 - AT&T bought additional 700-MHz spectrum
 - Neither company wanted to enter into public/private partnership
 - No other bidders emerged to work with Public Safety
- ➔ FCC still controls D Block
 - FCC's 2010 National Broadband Plan to Congress submitted March 2010 recommended D Block be auctioned with no requirements to share with Public Safety
- ➔ Public Safety began campaign to reallocate D Block to Public Safety

Public Safety Comes Together!

- ➔ Public Safety needed Congress to act to reallocate D Block for use by Public Safety and Feds to fund construction and operation of network
- ➔ Public Safety Alliance formed to work with Congress and Executive Branch
 - Nine national Public Safety organizations united for this cause (APCO, IACP, MCC, IAFC, Metro Fire Chiefs, NSA, MCSA, NASEMSO, NEMA)
- ➔ 2009 Public Safety was told
 - You don't have enough clout to get Congress to act
 - The Executive Branch favors D Block auction
 - You will never get it reallocated
- ➔ Today
 - Multiple bills in Congress for reallocation/funding
 - Executive Branch fully supports reallocation and funding

Public Safety Alliance



International Association of Chiefs of Police | International Association of Fire Chiefs
National Sheriffs' Association | Major Cities Chiefs Association
Major County Sheriffs' Association | Metropolitan Fire Chiefs Association
Association of Public-Safety Communications Officials International
National Emergency Management Association | National Association of State EMS Officials

Detractors and Supporters

➔ Public Safety supported by

- AT&T Wireless
- Verizon Wireless
- National Governors
- National Mayors
- Many others

➔ Those who want D Block auctioned

- Number of companies and organizations shrinking
- Connect Public Safety Now
 - Sprint, T-Mobile, Rural Carriers Association (RCA)
- Some of Congress in both houses
 - Because they believe D Block spectrum is worth \$3 billion
 - Want money to help offset national debt
 - FACT: National debt growing \$4.6 billion/day so D Block would not even pay for one day's worth of public debt!

Bills Currently in Congress

➔ U.S. Senate

- S. 28 Public Safety Spectrum and Wireless Innovation Act of 2011
 - Introduced by Senator John D. Rockefeller (D-WV)
 - Co-Sponsored by Senators Lautenberg, Nelson, Klobuchar, Cardin, Harkin
 - Hearings being held
 - Provides for reallocation of D Block and funding for construction and operation of Public Safety broadband network

➔ U.S. House

- H.R. 607 Broadband for First Responders Act of 2011
 - Introduced by Representative King (R-NY 3rd District)
 - Co-Sponsors Thompson, Rogers, Clarte, Miller, Long, Grimm
 - Re-allocates D Block to Public Safety with funding
 - **Calls for Public Safety and amateur spectrum in 420-512 MHz band to be returned to FCC within 8 years for converting to broadband**
 - See following slides

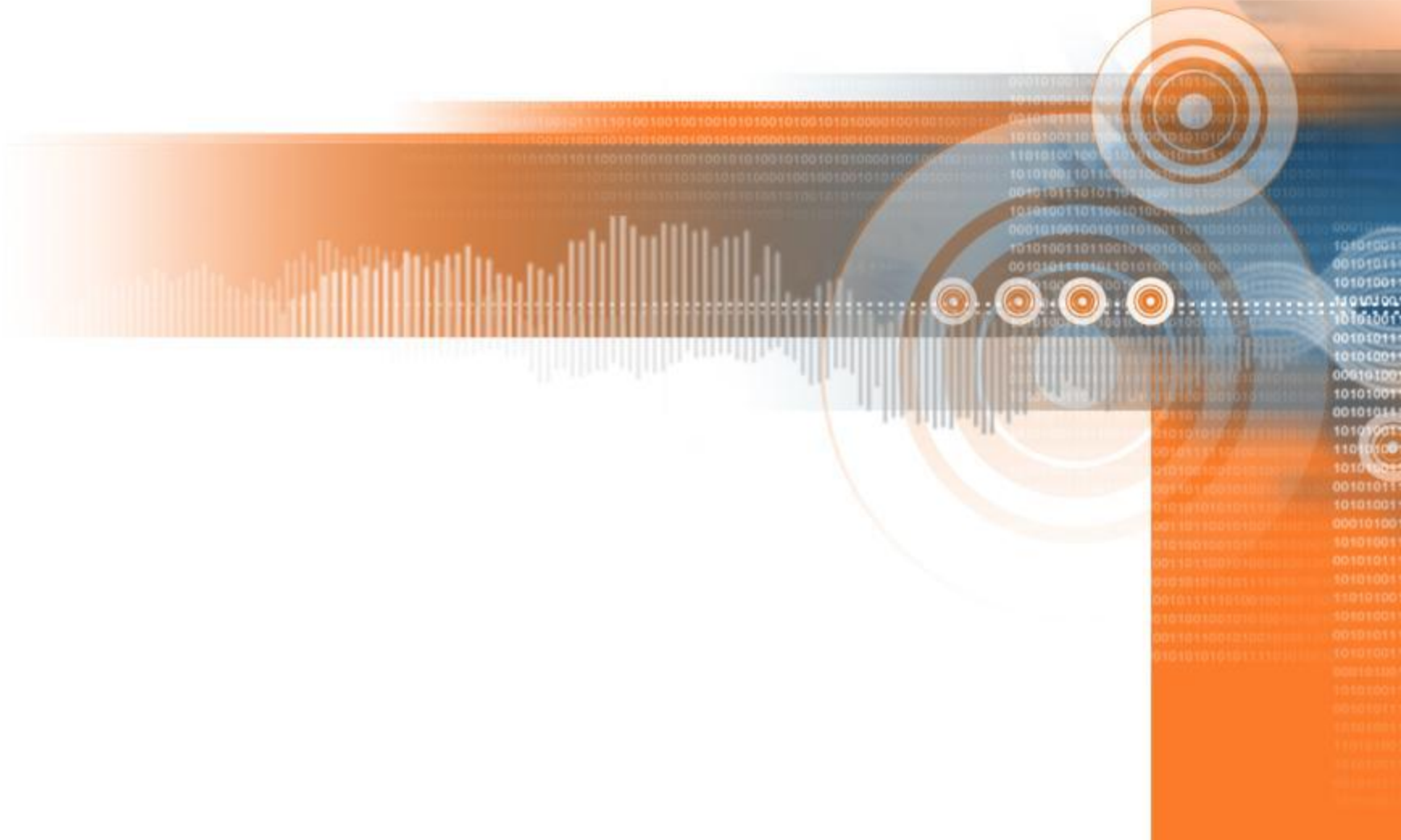
Other Bills Expected Soon

- ➔ McCain/Lieberman reintroduction of bill submitted last year
 - Will call for reallocation of D Block and funding
- ➔ Kay Bailey Hutchinson (R-TX)
 - Bill to include reallocation of D Block and funding for Public Safety
 - A broader bill that also identifies other spectrum that can be auctioned for commercial services
- ➔ Public Safety NEEDS
 - Common bills in both House and Senate
 - For bills to go to floors of both bodies
 - For bills to be voted on and approved
 - For President to sign final bill into law
- ➔ Timing of the Bills and the re-allocation of the D block
 - Should happen been now and 9/11/2011
 - The tenth anniversary of 9/11 tragedy

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H.R. 607: Broadband for First Responders Act of 2011

The First Threat to 420-470 MHz



Bill Calls For

- ➔ Section 207 of the bill
- ➔ REQUIRES MIGRATION BY PUBLIC SAFETY ENTITIES
- ➔ Not later than 8 years after date of enactment of the bill
 - Enactment of the Act, **public safety entities shall end** their use of radio spectrum above 420 megahertz and below 512 megahertz and begin to use alternative radio spectrum licensed to public safety services in the 700 megahertz and 800 megahertz bands.
 - IN GENERAL: Not later than 6 years after the date of enactment of this Act, the Federal Communications Commission, in consultation with the Secretary, the Assistant Secretary, and **Federal, State and local public safety agencies, shall issue a report, detailing the plan for public safety entities to end their use of radio spectrum above 170 megahertz and below 512 megahertz** and move all use to the radio spectrum licensed to public safety services, in the 700 megahertz and 800 megahertz bands.

More from H.R. 607

- ➔ AUCTION: Not later than 10 years after the date of enactment of this Act, the paired electromagnetic spectrum bands of 420–440 megahertz and 450–470 megahertz recovered as a result of the report and order required under subsection (c) shall be auctioned off by the Federal Communications Commission through a system of competitive bidding meeting the requirements of section 309 of the Communications Act of 1934.

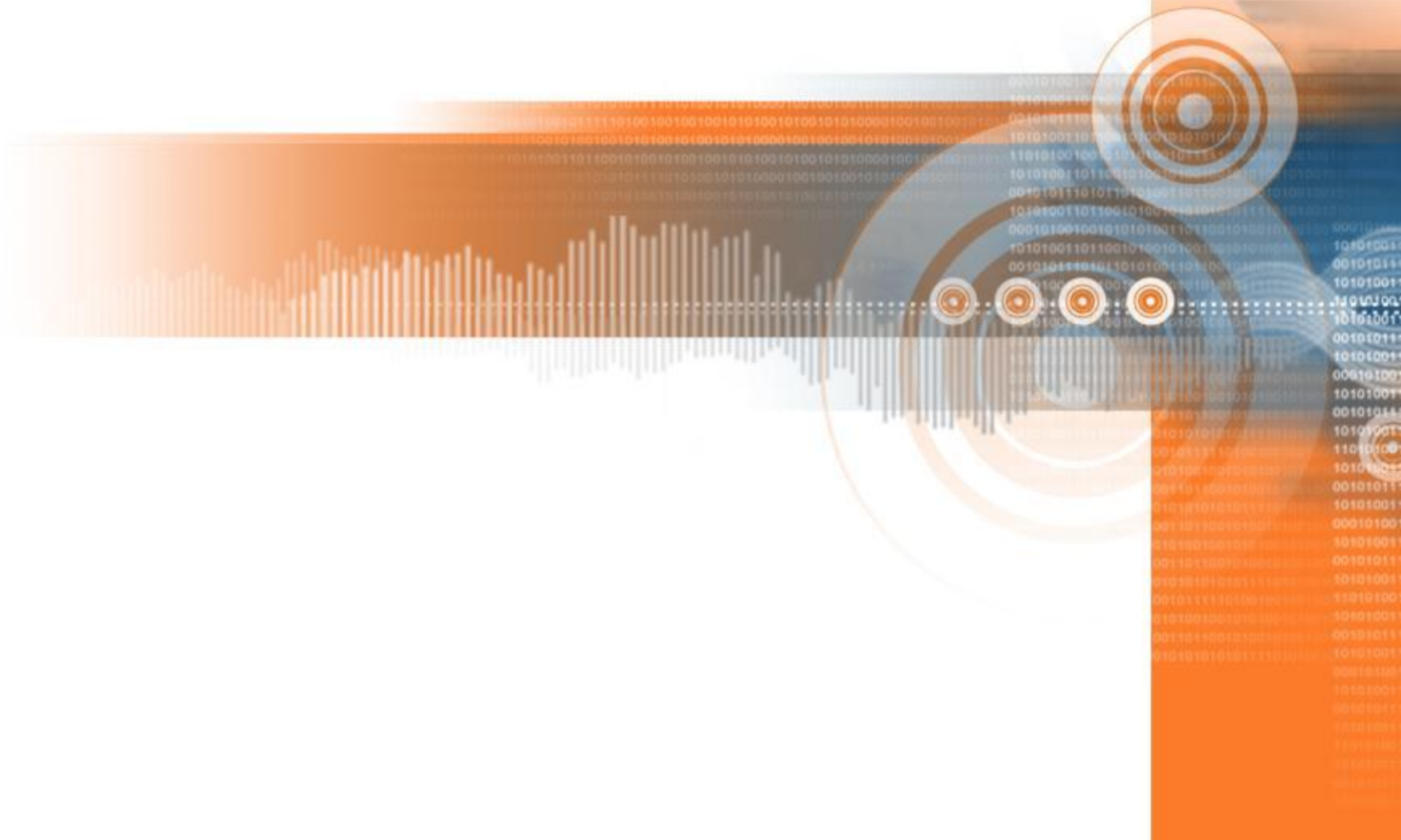
NOTE: 10 years is the maximum permitted by law for any spectrum auction in a bill introduced in Congress

Why This Is In the Bill

- ➔ The staff of Representative King had to have the bill SCORED by the House prior to Introduction on the floor
- ➔ Scoring requires an offset for the loss of auction revenue by reallocating D Block to Public Safety (\$1.8B)
- ➔ When draft was first viewed by us
 - It called for all spectrum above 144 MHz and below 512 MHz on which Public Safety operated to be vacated in 8 years
 - We had 15 minutes to make changes to the bill before it was released
 - New wording was MINE and MINE alone and was done
 - Because this part of the bill is for scoring purposes
 - Staffers do not understand that 450-470 Public Safety channels are intermingled with business and other Land Mobile Radio channels
 - Other two paragraphs basically preclude this spectrum from being repurposed for broadband

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Does Public Safety Need the D Block?



Why Public Safety NEEDS the D Block

➔ FCC's capacity calculations use formula for commercial networks

- 19 cell sites, 57 sectors total
- Assumed interference equal over entire system
- Calculations then performed for total throughput of system

➔ Public Safety is DIFFERENT

- Most incidents will occur within a single cell sector or 2 overlapping
- Most incidents involve multiple services: police, fire, EMS
 - All have broadband requirements

➔ Available capacity and bandwidth

- Today: 5 MHz X 5 MHz
 - Total downlink capacity per cell sector: 2.5 to 6 Mbps
 - Total uplink capacity per cell sector 1 to 2.5 Mbps
- Verizon's 10X10 down 5-12 Mbps, up 2-5 Mbps

All Wireless Bandwidth Is Shared

Cell Sites:

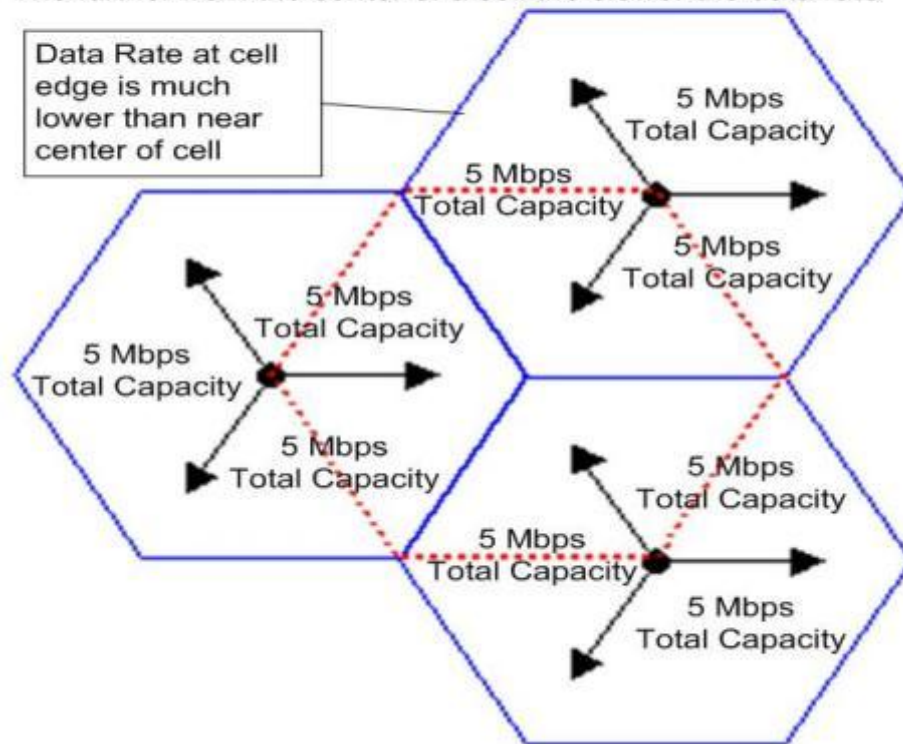
Each Site has 3 sectors

Each Sector offers the same capacity

The more users within a single cell sector the slower the speed

If several users are streaming video the effect is much worse

The further from the center of a cell the slower the data rate



How Much Bandwidth Do We Need?

➔ Hostage Situation

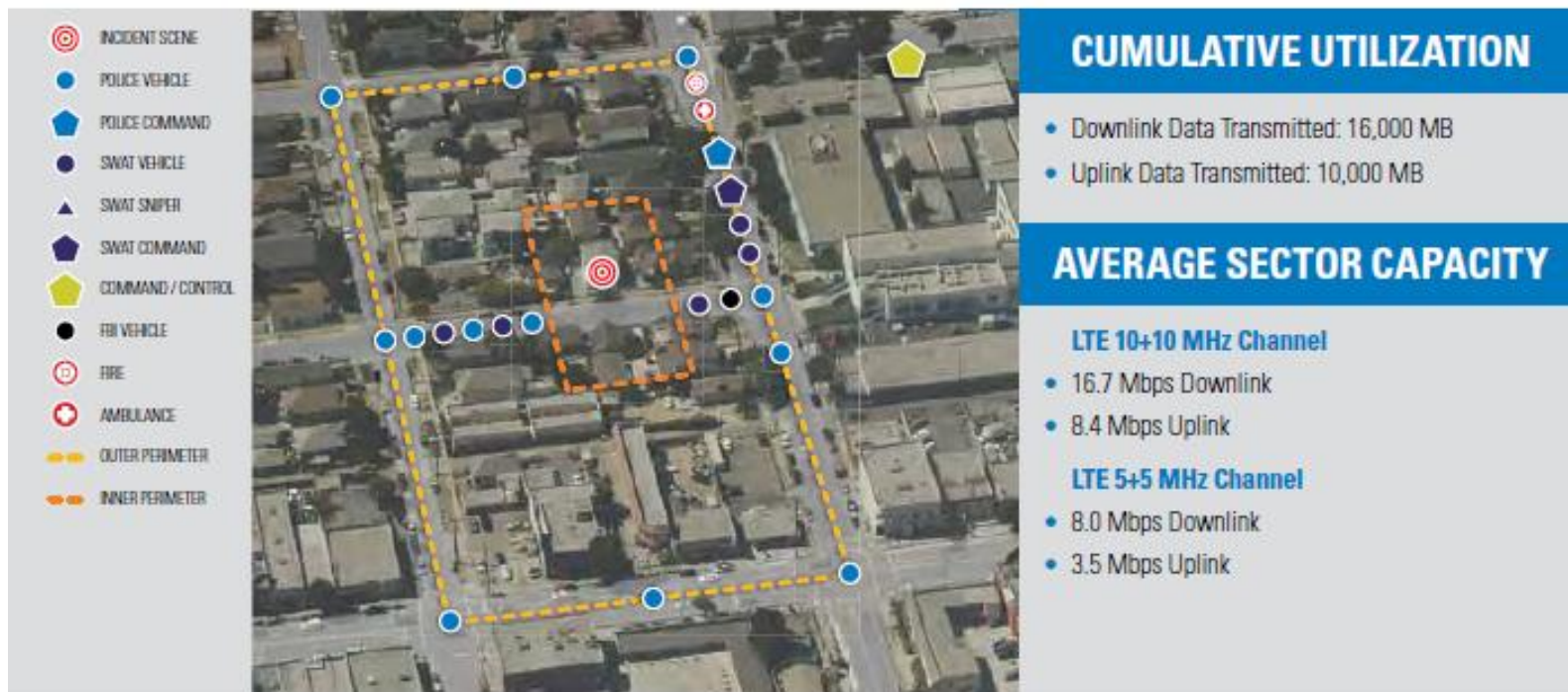
- Confined area, 1 cell sector
- Swat: 4
 - Video from each camera, 1.2 Mbps uplink
 - From command center to IC and Swat commander, 2 feeds 1.2 Mbps each
 - Floor plans of building: 1 file 15 MB of data (short duration download)
 - Other needs: logistics, fire, EMS, estimated 2-3 Mbps up, 2 Mbps down
- Cannot be handled in 5 X 5 frequency allocation

➔ FCC says Public Safety will have priority access to commercial networks to make up the difference

- BUT NOT pre-emptive priority
- In order to obtain priority access, must be able to access signaling channel. If it is loaded, request for priority will never reach the network
- AT&T and Verizon say NO, does not fit business model

An Incident Summary from Motorola

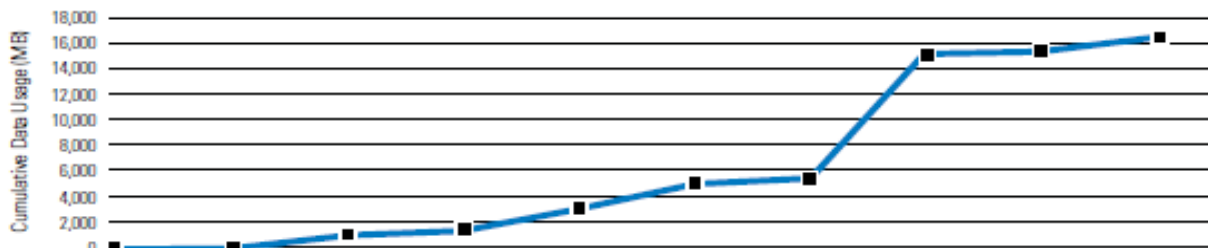
INCIDENT SUMMARY



Courtesy of Motorola Solutions

Broadband Data Usage During Incident

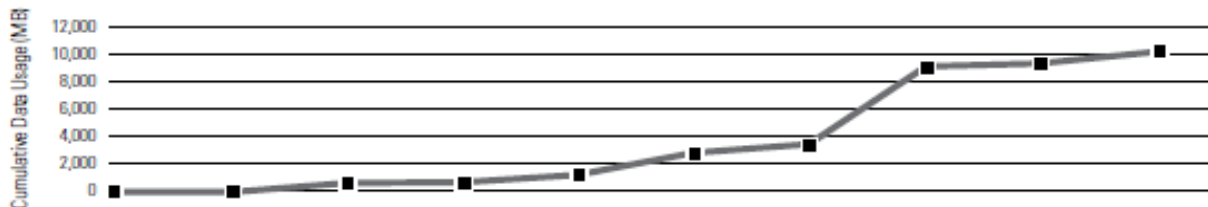
CUMULATIVE BROADBAND CAPACITY UTILIZATION - DOWNLINK



DOWNLINK APPLICATIONS

- SITUATIONAL UPDATES
- AIRCRAFT VIDEO
- THROW PHONE, RECON ROBOT
- SNIPER VIDEO
- LARGE ROBOT
- HELMET VIDEO
- NEGOTIATOR DATA
- COMMAND POST DATA
- COMPUTER AIDED DISPATCH
- AVERAGE BACKGROUND TRAFFIC

CUMULATIVE BROADBAND CAPACITY UTILIZATION - UPLINK



UPLINK APPLICATIONS

- SITUATIONAL UPDATES
- THROW PHONE, RECON ROBOT
- SNIPER VIDEO
- LARGE ROBOT
- HELMET VIDEO
- COMPUTER AIDED DISPATCH
- AVERAGE BACKGROUND TRAFFIC

0	15	60	65	90	120	125	240	245	250
INCIDENT START	SECURE PERIMETER	SPECIAL RESPONSE ARRIVES	SPECIAL RESPONSE DEPLOYS	DEPLOY LARGE ROBOT	DEPLOY THROW PHONE	NEGOTIATE	ENTRY TEAM DEPLOYS	SUSPECT AND BUILDING SECURED	INCIDENT ENDS
INCIDENT RESPONSE TEAM									
4	18	18	18	18	18	18	18	18	18
0	7	7	7	7	7	7	7	7	7
0	1	2	2	2	2	2	2	2	2
0	0	1	1	1	1	1	1	1	1
0	0	30	30	30	30	30	30	30	30
0	0	0	0	0	0	2	2	2	2
0	0	0	0	0	0	2	2	2	2

MINUTES

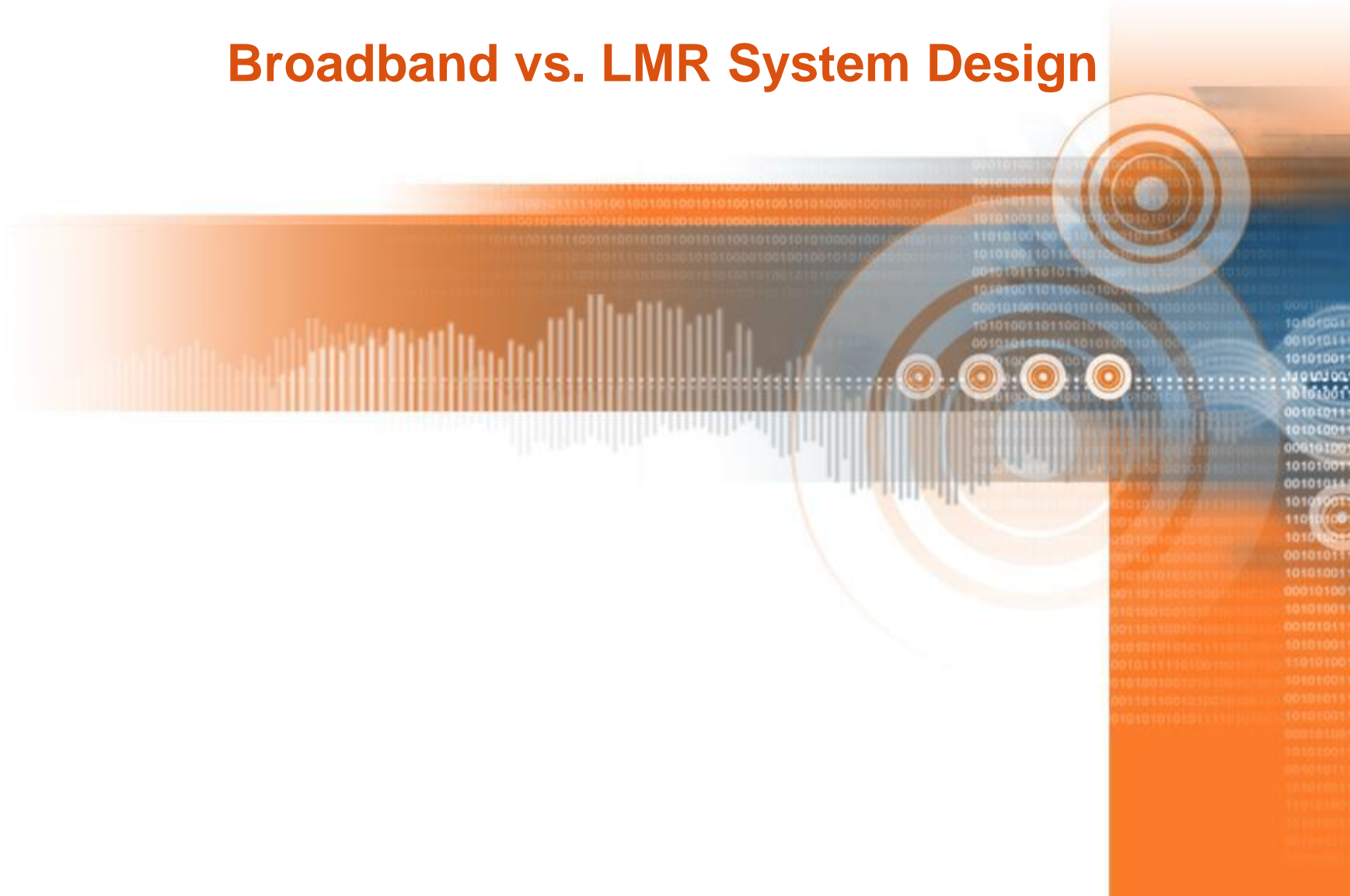
RESOURCE UTILIZATION

- 18 Police
- 7 Fire, EMS
- 2 Commanders
- 1 Command Vehicle
- 30 SWAT
- 2 FBI
- 2 Negotiators

Courtesy of Motorola Solutions

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Broadband vs. LMR System Design



LTE Broadband System Design

- ➔ LMR Systems Base
 - High-level sites
 - High-power transmit
 - Transmit as needed
 - Coverage 20-40 miles
 - Omni antenna

- ➔ LMR Mobile/HT
 - High power (5-100W)
 - External antennas
 - Talk-around simplex

- ➔ LTE Broadband Cell
 - Low-level sites
 - Low-power transmit
 - Transmits 24/7
 - Coverage 1-3 miles
 - Sectorized antennas

- ➔ LTE Devices
 - Low power (600 MW)
 - Built-in antennas
 - MUST use cell site

Other Differences

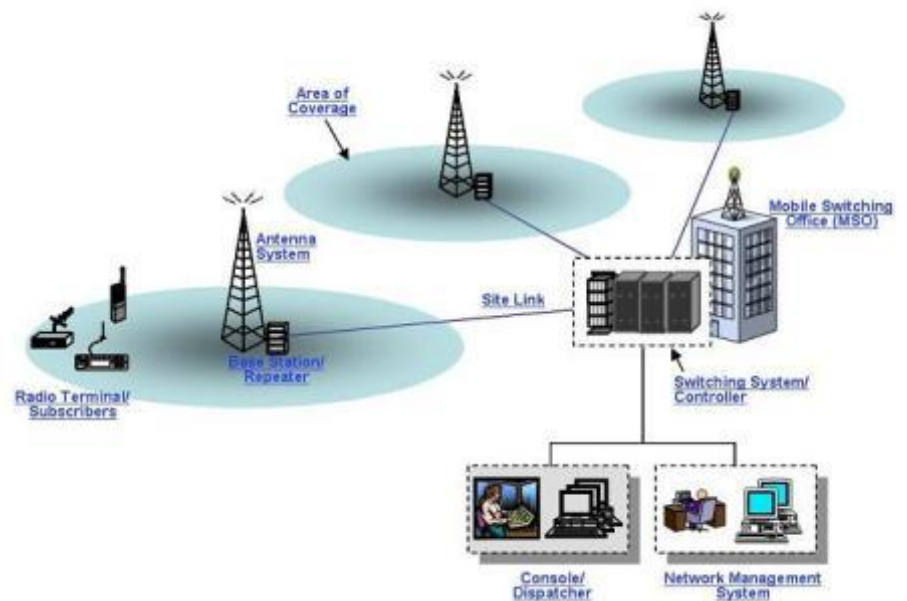
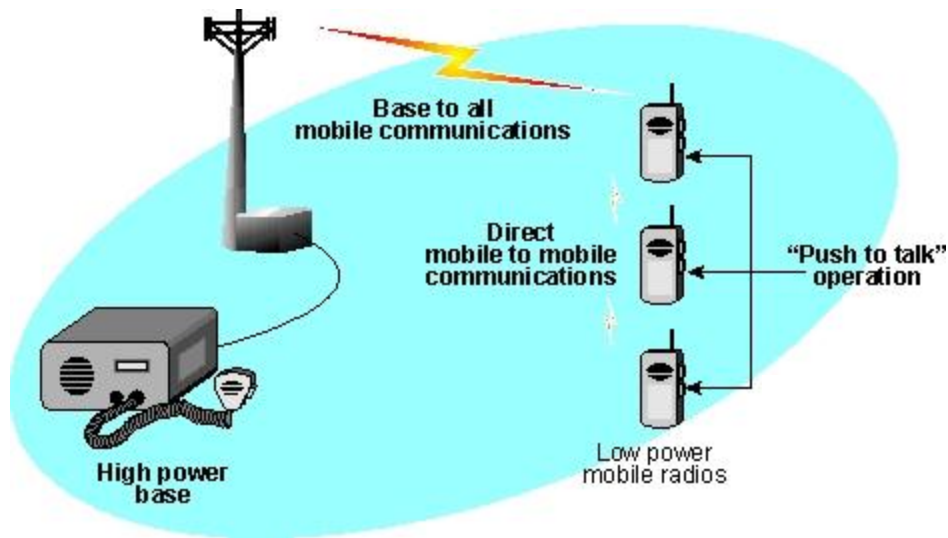
➔ LMR

- Wireline/control station/microwave
- Low capacity requirements
- Dumb networks
 - Trunked as semi-smart
- Set and forget
- External spkr/mic
- Channel change by user

➔ LTE Broadband

- Fiber/microwave
- High capacity
 - 30 Mbps per site
- Smart cell sites
- Requires network core
- Modify perimeters to handle data demand on real-time basis
- Channel change by network

Typical LMR System Diagram



Sites Versus Coverage

➔ Santa Barbara County Fire

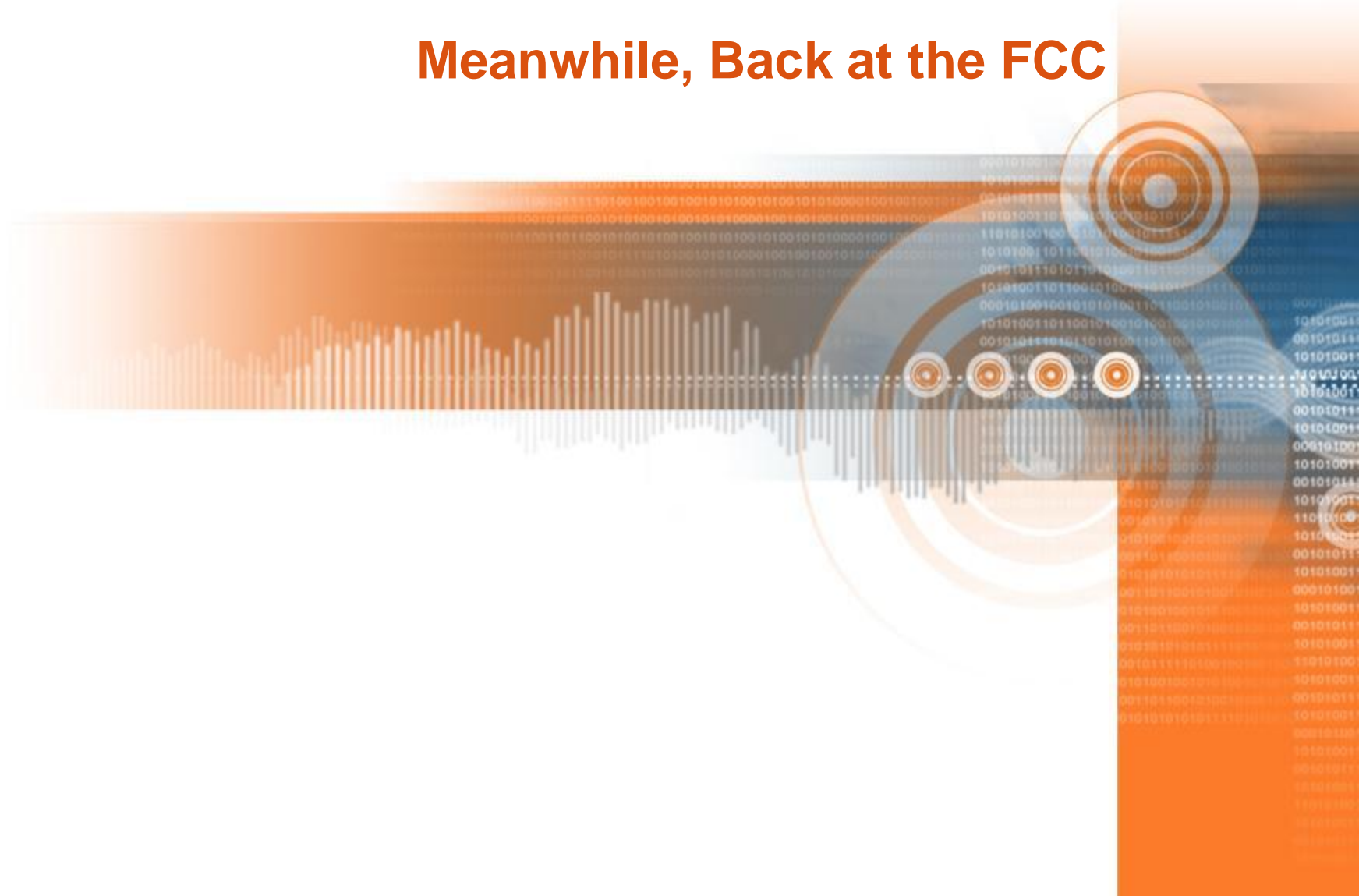
- VHF
- 6 simulcast sites
- Covers 95% of county
- Indoor coverage: good to 5W HT
- Connections
 - Microwave
 - Control stations
- One-to-many: yes

➔ LTE Broadband system (proposed)

- 700 MHz
- 42 sites
- Covers 93% of county
- Indoor coverage will be fair
- Connections
 - Fiber
 - Microwave
- One-to-many: No

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Meanwhile, Back at the FCC



FCC Still Supports D Block Auction

➔ Still following Congressional Mandate

- To auction D Block
- Has not scheduled any action at this point
- Public Safety and Homeland Security Bureau supports auction of D Block
 - Point to belief that 10 MHz of spectrum is enough for Public Safety
 - Want more competitors in 700-MHz band for AT&T and Verizon
- Appears that while Executive Branch and Congress work on re-allocation of D Block, FCC will remain passive
 - NOT a given at this point

➔ FCC is moving ahead on several fronts

- Establishment of ERIC for purposes of interfacing with PS
- Recent request for information about sharing narrowband spectrum with broadband
- New proposed rulemaking

New Notice of Proposed Rulemaking

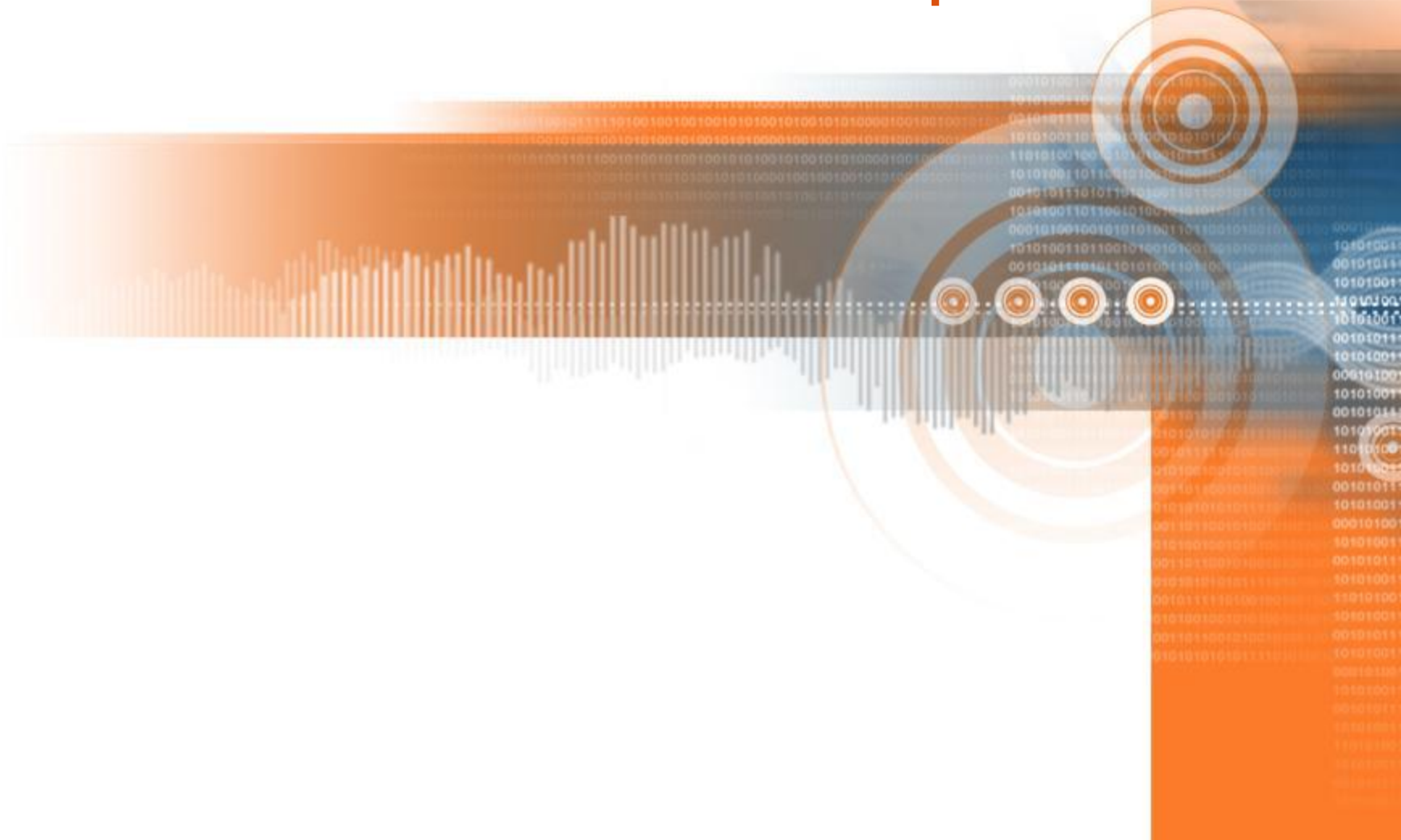
- ➔ Third Report and Order and Fourth Further Notice of Proposed Rulemaking
- ➔ Published January 25, 2011
 - Comments were due April 11
 - Reply comments due May 10
 - APCO, many organizations filing comments
 - APCO broadband committee has made recommendations to APCO executives and board about APCO's response
- ➔ ERIC Public Safety Advisory Council to weigh in with comments by May 24, 2011
 - Next meeting of PSAC in Washington, DC
- ➔ Rulemaking about only the 10 MHz of existing Public Safety spectrum

My Response to FNPRM

- ➔ FCC trying to impose too many rules
 - Some sections should be mandated by FCC
 - LTE release 8 as required technology
 - Many sections should be left to standards bodies
 - Future enhancements to LTE, even 5th-generation technologies
 - Voice over LTE as mission-critical component of network
 - LTE does NOT support simplex, talk-around, etc.
 - Many sections should be purview of PSBL or Public Safety governance organization
 - Public Safety working with Executive Branch to define this organization
- ➔ Many suggested rules need to wait until governance organization in place
- ➔ Appears most other comments are along same lines

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700-MHz Narrowband Spectrum



FCC' s View

- ➔ FCC believes is ONLY type of wireless needed going forward
 - Therefore, 700-MHz narrowband spectrum should be
 - Permitted to be used for broadband by some agencies
- ➔ What FCC doesn't understand
 - LTE will ONLY support push-to-talk if MultiMedia Broadcast Services (MMBS) are added to network
 - VERY expensive, will add significant cost network
 - LTE today will not support
 - One-to-many communications (either voice or data)
 - Off-network: simplex, tactical, talk-around
 - Multiple “channels” for major incidents: wild land fires, etc.
 - Commercial network operators DO NOT WANT talk-around capabilities, want network to be sole method of communications between devices

Broadband Voice Capabilities

➔ Broadband: LTE (Long Term Evolution)

- Won't support voice for several more years
- Requires cell site connection to provide voice services
- One-to-many may be possible
 - BUT very limited in capabilities, will not permit multiple one-to-many voice channels within the same area
- 3GPP, LTE standards body
 - Has nothing in roadmap to add off-network voice capabilities
 - Network operators do not want off-network voice communications between devices
 - Therefore, only way to achieve off-network voice (simplex) is to
 - Develop sub-set of LTE that will provide this feature
 - » Would mean Public Safety broadband will be on-off LTE deployment
 - Use peer-to-peer Wi-Fi, low power will not provide range
 - » Probably will not support multiple simplex “channels”
 - Use existing narrowband spectrum for voice communications
 - » Makes the most sense for Public Safety

Capacity

➔ Voice communications for Public Safety

- Need off-network, one-to-many communications
- Many channels for major incidents
- Many fire departments use simplex
 - As incident evolves, more agencies respond, more simplex channels needed
 - Recent Santa Barbara fire channel utilization
 - » 18 command and control channels (using networks)
 - » 78 off-network channels for incident control
 - » Does *NOT* include channels used by law-enforcement or EMS teams
- One-to-many communications a requirement for Public Safety
 - Dispatch, so all units can hear calls
 - Day-to-day operations
 - In emergencies so those requesting help can be heard by others
- Need narrowband spectrum for nationwide voice interoperability
- Need broadband and voice interoperability - not one or the other

Interference Between Broadband, Narrowband Systems

- ➔ Where narrowband and broadband systems overlap or touch each other
 - Systems would interfere with each other making both useless
 - Cannot mix broadband and narrowband in same spectrum
 - Would mean additional sites, higher cost, less effective use of spectrum
- ➔ Devices
 - Device costs higher for both narrowband and broadband systems, quantities smaller for each
 - Broadband using narrowband spectrum *AND* compatible with nationwide broadband system would cost more, fewer device choices
- ➔ Use of spectrum
 - This would not be efficient use of the spectrum
 - Voice will continue to be most important type of Public Safety communications.

Existing Licenses (as of Nov. 1, 2010)

- ➔ According to FCC's ULS database
 - Conventional licenses (SG): 127 issued
 - Trunked licenses (SY): 282 issued
 - In process
 - Conventional (SG): 382 pending
 - Trunked (SY): 860 pending
 - Total number of licenses: 1651
 - Does *NOT* include applications pending at RPCs awaiting frequency coordination
- ➔ FCC reports following status for regional plans
 - States and regions with FCC approved plans: 33
 - States and regions with FCC approval pending: 4
 - States and regions with no plans in progress: 13
- ➔ There is pent-up demand for these channels!

700-MHz Narrowband Plan (snapshot)

Narrowband Base Channels				
Channel Number	Center Frequency			Allocation
	6.25 kHz	12.5 kHz	25 kHz	
1	789.003125	789.00625	789.01250	low power
2	789.009375			low power
3	789.015625	789.01875		low power
4	789.021875			low power
5	789.028125	789.03125	789.03750	low power
6	789.034375			low power
7	789.040625	789.04375		low power
8	789.046875			low power
9	789.053125	789.05625	789.06250	low power
10	789.059375			low power
11	789.065625	789.06875		low power
12	789.071875			low power
13	789.078125	789.08125	789.08750	General Use
14	789.084375			General Use
15	789.090625	789.09375		General Use
16	789.096875			General Use
17	789.103125	789.10625	789.11250	General Use
18	789.109375			General Use
19	789.115625	789.11875		General Use
20	789.121875			General Use
21	789.128125	789.13125	789.13750	Secondary Trunking
22	789.134375			Secondary Trunking
23	789.140625	789.14375		Interoperability
24	789.146875			Interoperability
25	789.153125	789.15625	789.16250	State license
26	789.159375			State license
27	789.165625	789.16875		State license
28	789.171875			State license
29	789.178125	789.18125	789.18750	State license
30	789.184375			State license
31	789.190625	789.19375		State license
32	789.196875			State license
33	789.203125	789.20625	789.21250	State license
34	789.209375			State license
35	789.215625	789.21875		State license
36	789.221875			State license
37	789.228125	789.23125	789.23750	Reserve
38	789.234375			Reserve
39	789.240625	789.24375		VO Nationwide Call
40	789.246875			VO Nationwide Call

Narrowband Mobile Channels				
Channel Number	Center Frequency			Allocation
	6.25 kHz	12.5 kHz	25 kHz	
961	799.0031250	799.00625	799.01250	low power
962	799.0093750			low power
963	799.0156250	799.01875		low power
964	799.0218750			low power
965	799.0281250	799.03125	799.03750	low power
966	799.0343750			low power
967	799.0406250	799.04375		low power
968	799.0468750			low power
969	799.0531250	799.05625	799.06250	low power
970	799.0593750			low power
971	799.0656250	799.06875		low power
972	799.0718750			General Use
973	799.0781250	799.08125	799.08750	General Use
974	799.0843750			General Use
975	799.0906250	799.09375		General Use
976	799.0968750			General Use
977	799.1031250	799.10625	799.11250	General Use
978	799.1093750			General Use
979	799.1156250	799.11875		General Use
980	799.1218750			General Use
981	799.1281250	799.13125	799.13750	Secondary Trunking
982	799.1343750			Secondary Trunking
983	799.1406250	799.14375		Interoperability
984	799.1468750			Interoperability
985	799.1531250	799.15625	799.16250	State license
986	799.1593750			State license
987	799.1656250	799.16875		State license
988	799.1718750			State license
989	799.1781250	799.18125	799.18750	State license
990	799.1843750			State license
991	799.1906250	799.19375		State license
992	799.1968750			State license
993	799.2031250	799.20625	799.21250	State license
994	799.2093750			State license
995	799.2156250	799.21875		State license
996	799.2218750			State license
997	799.2281250	799.23125	799.23750	Reserve
998	799.2343750			Reserve
999	799.2406250	799.24375		VO Nationwide Call
1000	799.2468750			VO Nationwide Call

- Low Power
- General Use
- Trunking
- Interoperability
- State
- Reserve
- Nwide Call

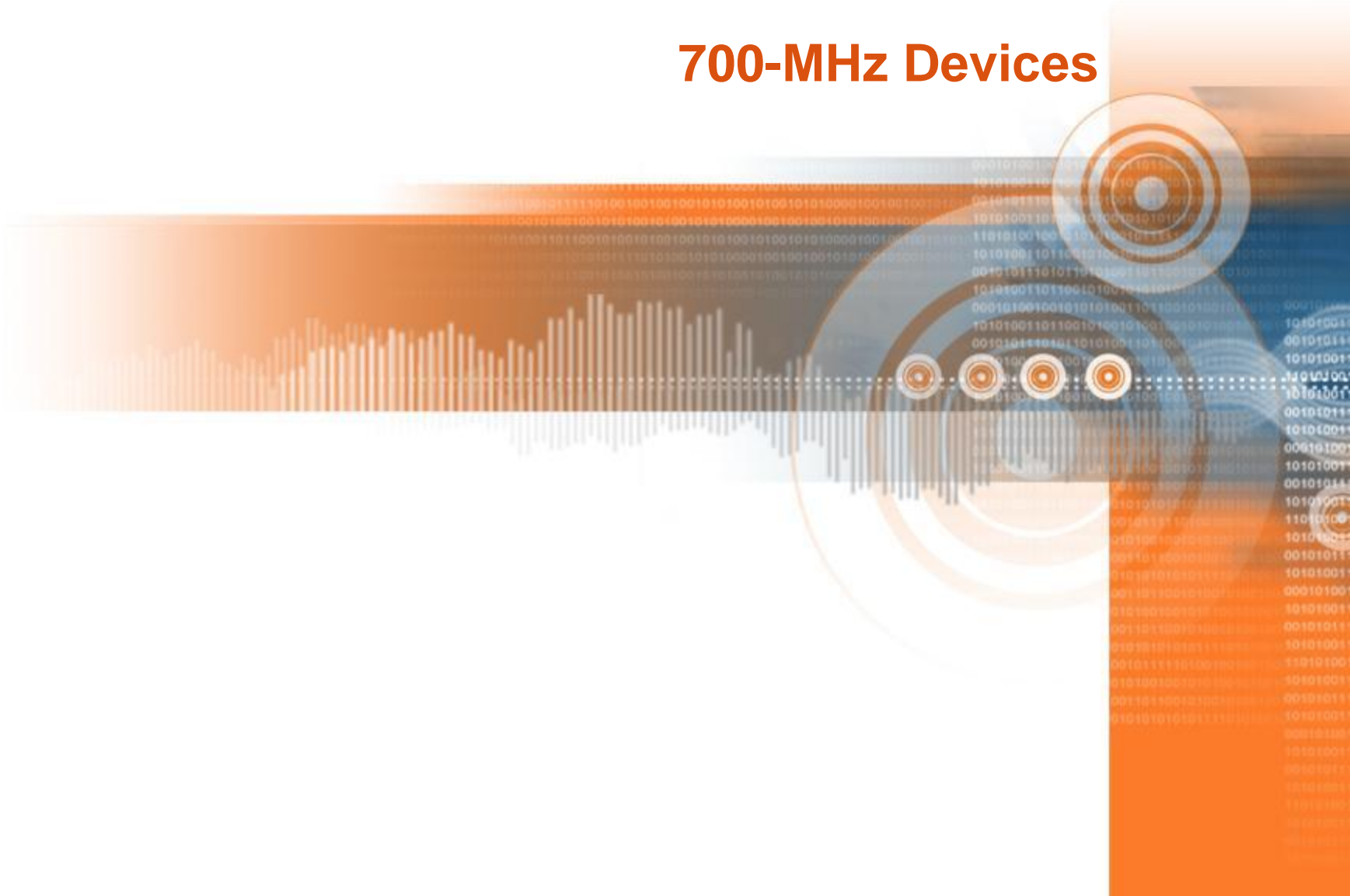
Total of 960 6.25 MHz Channels (480 12.5 KHz)

FCC Has Asked

- ➔ How widely are state licensed, general use narrowband RPC-controlled frequencies, interoperability frequencies being used?
- ➔ What are plans for future deployments in narrowband spectrum? What are timeframes? Has funding been allocated?
- ➔ Are agencies planning both narrowband and broadband deployments in same area?
- ➔ Will systems share infrastructure or other resources? What are cost differentials?
- ➔ Would flexibility to deploy broadband in narrowband and/or guard band be a more efficient use of 700-MHz spectrum? Could this flexibility help meet demand for broadband spectrum? Could it help meet demand for narrowband capacity over time?
- ➔ Response from Public Safety
 - 700-MHz narrowband channels needed NOW and well into the future
 - Should NOT be mixed with broadband systems

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700-MHz Devices



Generation One

➔ Narrowband mobile and handheld

- Conventional and trunked
- 700/800-MHz coverage
- Analog and P25
- Multi-channel
- Mobile and portable
- Power 1 to 25 watts



➔ LTE broadband

- USB modem 600 MW
- LTE for Public Safety only
- LTE and 3G capable
- Data only



Generations Two and Three

→ LMR

- Same as generation one

→ LTE

- Embedded LTE modem in notebook computers
- Trunk-mount standalone modem for use with laptops
- First handheld devices (LTE data-only)



Generation Four (3 Years from Now)

- ➔ Single mobile and handheld devices
 - 700/800-MHz conventional/trunked/analog/P25 voice
 - LTE 700-MHz Public Safety broadband data

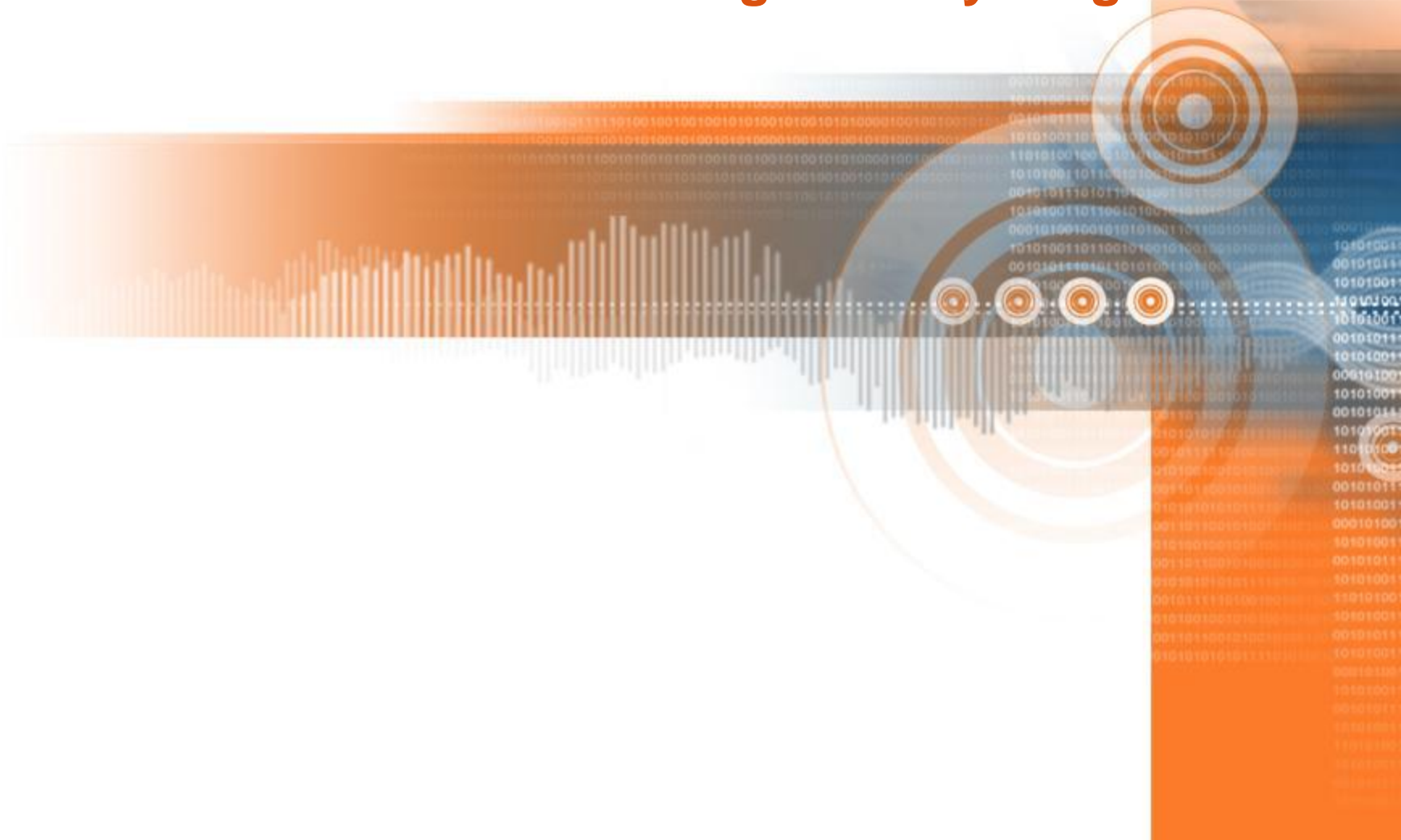
THEN

- ➔ Single mobile and handheld devices
 - 700/800-MHz conventional/trunked/analog/P25 voice
 - LTE 700-MHz Public Safety broadband data
 - Commercial LTE 700-MHz network support
 - Commercial 3G network support

- Price: Unknown

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Public Safety Broadband Changes Everything!



Public Safety Broadband

- ➔ Nationwide
- ➔ Interoperable
- ➔ Adds data, streaming audio, and video to Public Safety in the field
- ➔ Permits operations center, incident commander to see in real time
- ➔ Dispatch will include video from nearest camera
 - Incoming units will be able to see what they are heading into
- ➔ IC and Swat commanders will be able to see what sniper sees through his scope
- ➔ Real-time full motion video (within reason) will change Public Safety forever
- ➔ Other applications will make life on the street easier!

Broadband Will Change a LOT!

- ➔ Dispatch and incident command vehicles will resemble video control centers at TV stations and in ESPN vans parked outside a sports stadium
- ➔ New type of hire
 - Video control operators who will
 - Monitor all incoming video feeds
 - Adjust resolution and bandwidth so most important video is at highest resolution
 - Send chosen video out to those in the field who need to see it
 - Change outgoing video depending on what is needed, most relevant
- ➔ Caveat: Wireless broadband capacity will be limited; Public Safety will have to make video changes on the fly and instrumentation resolutions in real time
- ➔ NARROWBAND VOICE will still be of vital importance!

Command Centers Today



Command Centers Tomorrow



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Mobile Command Center Today



Mobile Command Center Tomorrow





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