

# MCPTT and Voice over LTE Equipment Needs

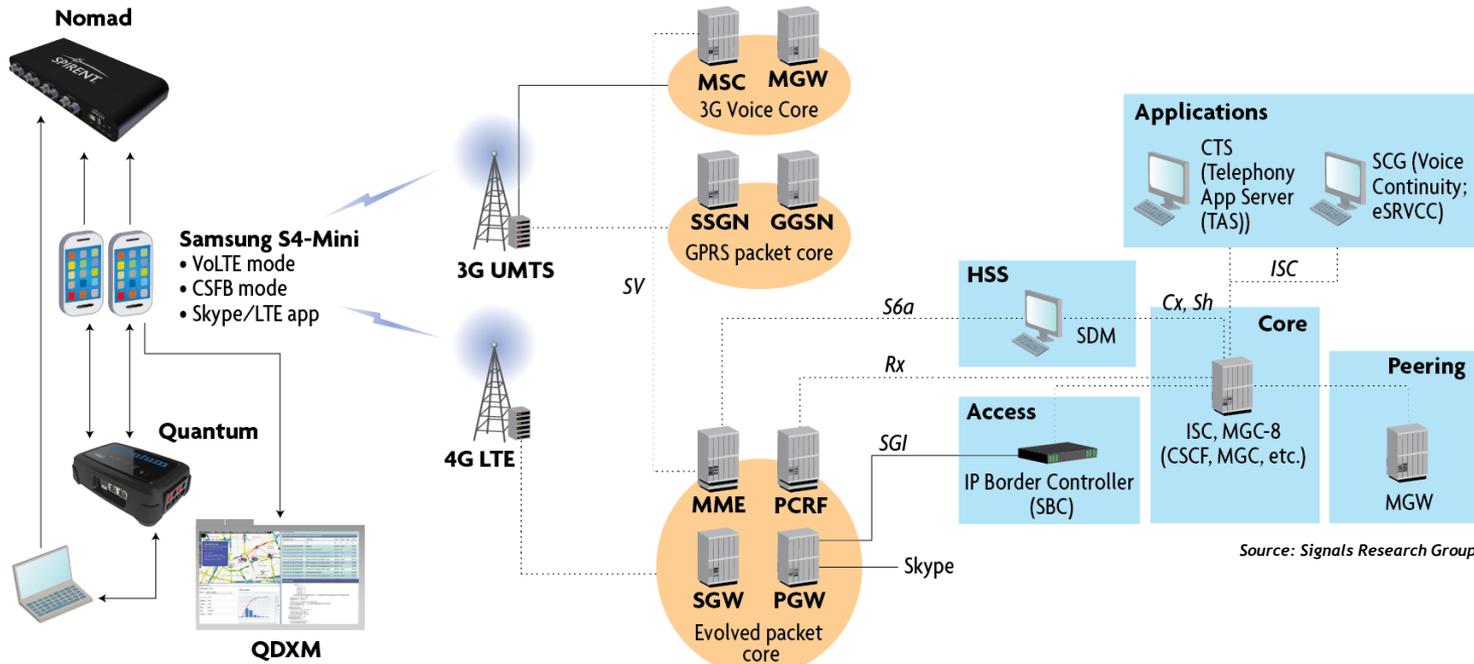
The logo for IWCE's Online Conference. It features the text "IWCE's" in a bold, black, sans-serif font, with a stylized signal icon above the "E". To the right of "IWCE's" is a dark blue rectangular box containing the text "Online Conference" in a white, sans-serif font. The entire logo is set against a background of overlapping light blue and white geometric shapes.

2016

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# VoLTE...table stakes



- ▶ As of this month, VoLTE has been in commercial operation 4 years
  - ▶ 82 operators in 43 countries
  - ▶ US has 5 networks on air with another 4 in deployment

*Enhancements with IR.94 & EVS happening now*



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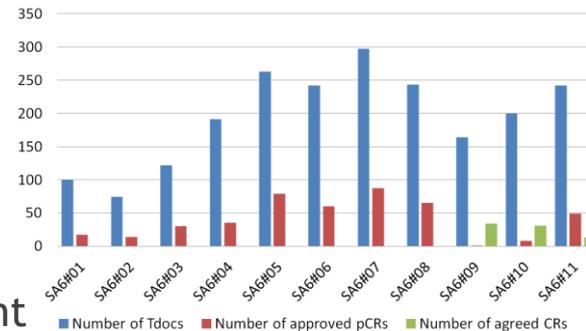
# What is MCPTT ?

- ▶ Mission Critical Push To Talk or MCPTT is a group communication service with fast setup times, ability to handle large groups, strong security and priority handling. *Per 3GPP TS 22.179*
  - ▶ For this presentation MCPTT will refer to 3GPP Release 13 & 14 LTE systems
  - ▶ MCPTT also builds upon features such as
    - ▶ Group Communication System Enablers for LTE - GCSE
    - ▶ Isolated E-UTRAN Operation for Public Safety (IOPS)
    - ▶ Proximity Services a.k.a ProSe, LTE-D, Direct Mode, D2D
    - ▶ Enhanced Bearer Assignment (QCI values)
- ▶ **MCPTT reuses all of the LTE network elements e.g. IMS**



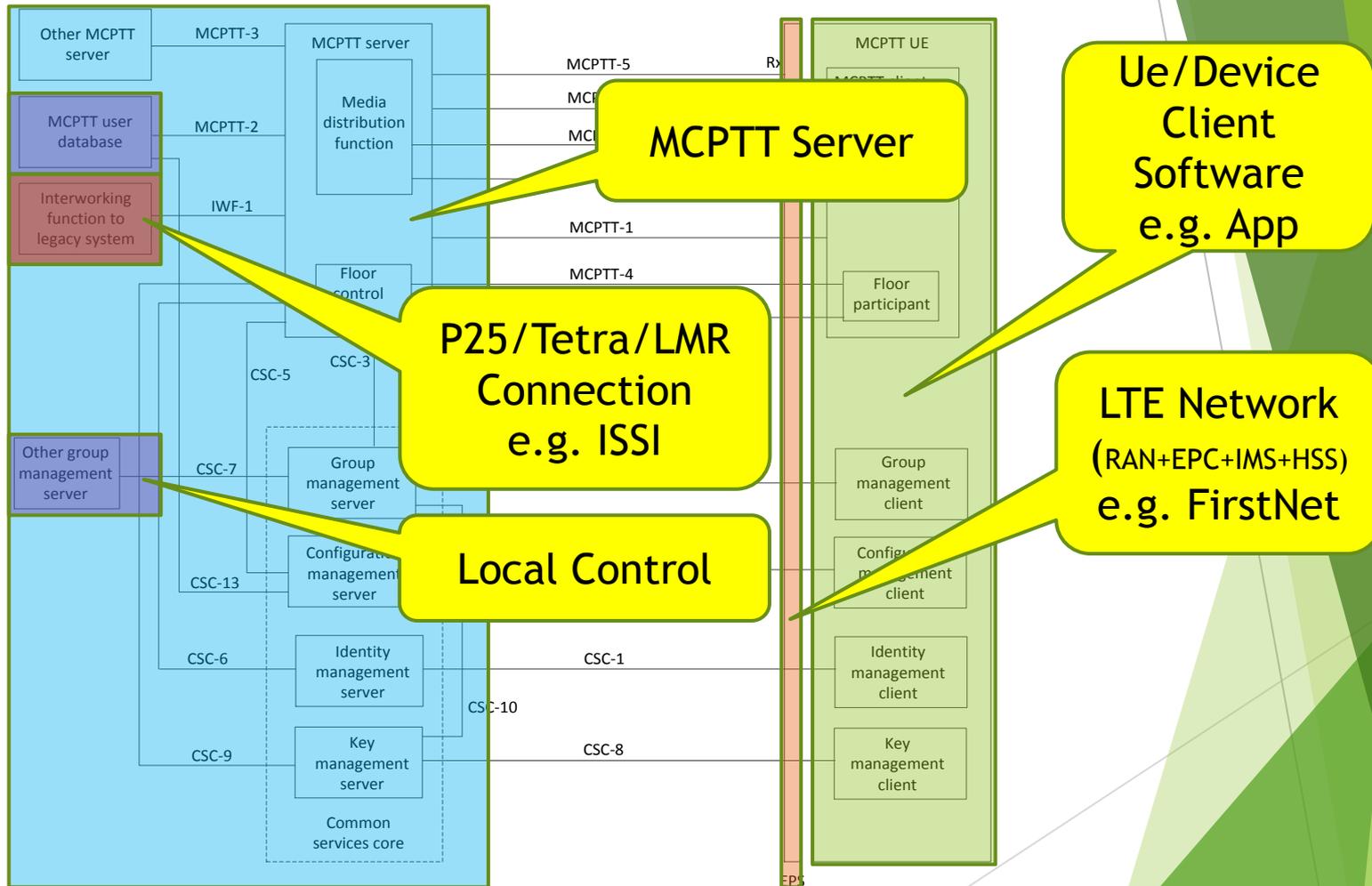
# Qwik MCPTT R13 Standards Update

- ▶ 39 new CRs introduced to address
  - ▶ Floor Control
  - ▶ MBMS Support
  - ▶ Group Calls and Group Management
- ▶ 12 new issues introduced i.e. service continuity, transfer of MCPTT calls between unicast and broadcast, reception reporting, service announcement, QoS, FEC
- ▶ New Study Item (SP-160341) on interconnect between MCPTT systems (just started about 5% complete)
  - ▶ Address interconnect of MC PTT, Video and Data to non-LTE mission Critical Systems
  - ▶ Group and Private calls



Source: 3GPP

# MCPTT Architecture



Source: 3GPP

# What has changed ?

- ▶ PTT services offered now on LTE networks and devices are systems that can be instantiated, operated and maintained in software as a virtualized function (VNF)
  - ▶ Virtualized PTT systems are now operating in cloud hosting infrastructure (e.g. Kodiak serving AT&T and VZW and SKTelecom using virtualized Samsung core)
  - ▶ Offers an *extensible network architecture* that can be:
    - ▶ Upgraded to 3GPP R13 MCPTT compliance with minimal user impact and zero hardware upgrades
    - ▶ Integrated with multiple LTE networks on a common platform
    - ▶ LMR integration easily accomplished via secure MPLS VPN connection
- ▶ Current Android and iOS devices and Apps can be updated remotely to support feature enhancements



# Device Choices

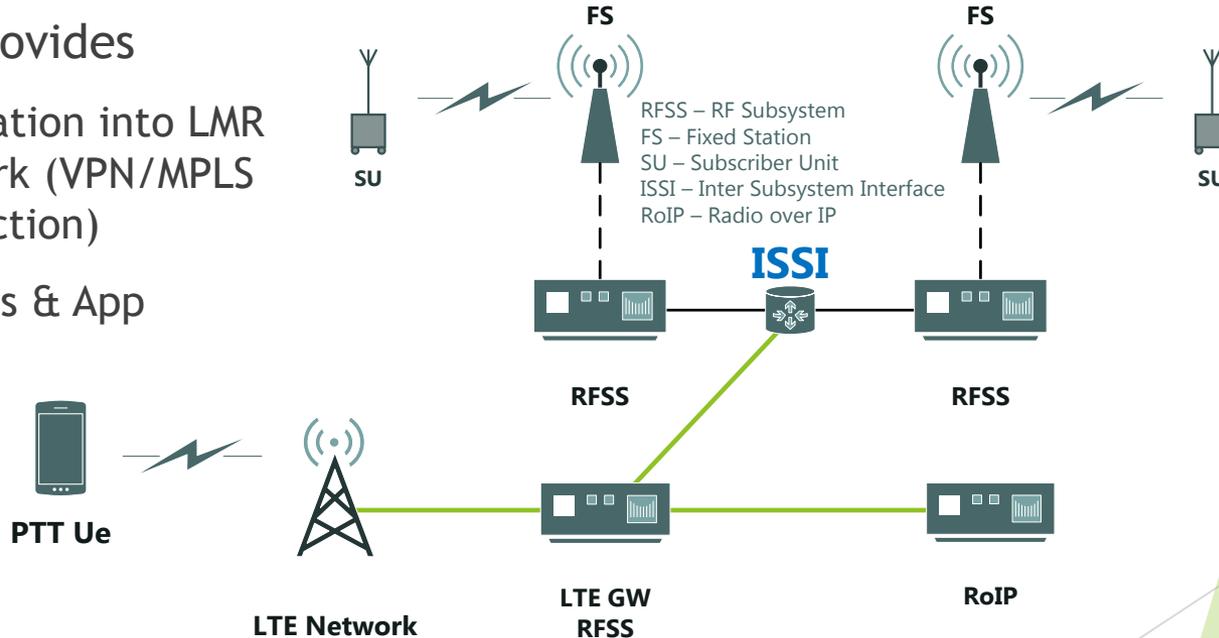
- ▶ Application SDK released to phone OEMs for integration into dedicated smartphone devices
- ▶ Highly integrated and optimized
  - ▶ Call Setup
  - ▶ Battery Life
  - ▶ Dedicated buttons
- ▶ PTT app is available for nearly all Android, iOS and RTOS based devices on Play and Apple for multiple carriers e.g. ePTT



Source: Samsung, Kodiak

# What do need to have?

- ▶ IP interface into LMR network e.g. ISSI
- ▶ Carrier provides
  - ▶ Integration into LMR network (VPN/MPLS connection)
  - ▶ Devices & App



# What is available today ?

- ▶ PTT services offered on wireless networks have *radically evolved in the past year* far beyond what has been offered previously
- ▶ Carrier integration support for PTT services is beyond what stand alone platforms can offer in terms of Quality of Service
- ▶ Several vendors have pushed the development of PTT services over LTE to offer platforms capable of MCPTT services

# Carrier integration

- ▶ Priority Access and Quality of Service implemented across the LTE RAN and EPC for PTT calls
  - ▶ NOTE: this requires significant network and RF engineering to implement
- ▶ Carriers have adopted different QoS profiles that offer higher level QoS than best effort traffic but *it is still less than what VoLTE calls are implemented with e.g.*
  - ▶ Access Priority with preferred ARP and QCI values for PTT
  - ▶ QoS Priority with a GBR bearer and preferred QCI for PTT
- ▶ MCPTT R13 QoS not available yet - coming early 2017

QCI	Resource Type	Priority Level	Packet Delay Budget	Packet Error Loss Rate (NOTE 2)	Example Services
65 (NOTE 3, NOTE 9)	GBR	0.7	75 ms (NOTE 7, NOTE 8)	10 <sup>-2</sup>	Mission Critical user plane Push To Talk voice (e.g., MCPTT)
66 (NOTE 3)		2	100 ms (NOTE 1, NOTE 10)	10 <sup>-2</sup>	Non-Mission-Critical user plane Push To Talk voice
69 (NOTE 3, NOTE 9)	Non-GBR	0.5	60 ms (NOTE 7, NOTE 8)	10 <sup>-6</sup>	Mission Critical delay sensitive signalling (e.g., MC-PTT signalling)
70 (NOTE 4)		5.5	200 ms (NOTE 7, NOTE 10)	10 <sup>-6</sup>	Mission Critical Data (e.g. example services are the same as QCI 6/8/9)

Updates to the QCI Table in 23.203 for MCPTT, non-Mission-Critical PTT, MC-Data



# Interfaces & Codecs

- ▶ Availability of ISSI, CSSI And RoIP interfaces for PTT services including QoS<sup>1</sup>
  - ▶ Allows integration into Public Safety dispatch counsels and disparate LMR networks
- ▶ Web portal interfaces for device and user management
- ▶ Current PTT systems support NB-AMR & WB-AMR implementation specific to carrier requirements
- ▶ Voice packets are encrypted
- ▶ P25 AMBE/IMBE Codecs supported via transcoding in PTT server
  - ▶ This also allows for CALEA/Lawful Intercept support of voice in the clear

<sup>1</sup> <http://www.prnewswire.com/news-releases/att-enhances-interoperability-for-public-sector-and-public-safety-networks-300313388.html>

# Current Carrier Integrated PTT Features

- ▶ Cloud based system that can also be deployed within a commercial or private carrier network
  - ▶ High availability COTs servers
  - ▶ Multiple data centers with redundant MPLS connections to carrier P-GW located in geo-redundant facilities
  - ▶ VNF implementation allows for elastic scalability for incident and planned event capacity
- ▶ Carrier Integrated
  - ▶ Dynamic QoS for prioritized access to network resource
  - ▶ Network integration for RAN optimization
  - ▶ eMBMS based broadcast group call (voice/video) with priority group scanning and supervisory preemption
  - ▶ Location services to enable geographic dispatching
- ▶ OMA PoC 2.1 based Private/Group PTT Call (voice/video)
- ▶ Full duplex Private/Group Call (voice/video)
- ▶ Data Service(SMS, file transfer)
- ▶ Late Entry
- ▶ Ambient Listening
- ▶ LMR interoperability for seamless communication with LMR users
- ▶ APIs to “MCPTT-enable” productivity and collaboration applications
- ▶ End-to-end security for multi-level protection against unauthorized access and monitoring
- ▶ Support over different air interfaces (LTE, 3G, WiFi)

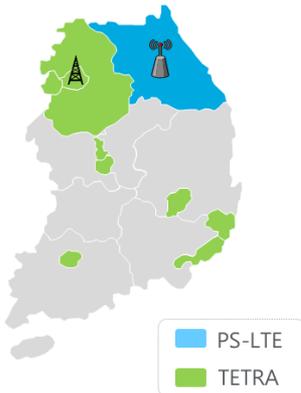
***MCPTT compliant at the application level  
FirstNet IOC2 Compliant***



# MCPTT is here

## Phase 1 (2015~)

Initial stage



- Target : PS-LTE Commencement
- Area : Pyeongchang 2018 Winter Olympics areas

## Now in Progress

## Phase 2 (2016~)

Expansion stage



- Target : Expanding PS-LTE network  
※ Including transform VHF/UHF
- Area : 1 city + 8 major provinces

## Phase 3 (2017~)

Completion



- Target : Completing nationwide network  
※ Including transform TETRA and Integrating ship/railroad network
- Area : Seoul metropolitan + 6 Large cities

Source: Samsung

# What will MCPTT bring ?

- ▶ Network Integration
- ▶ R13 MCPTT Features
  - ▶ Private/Group MCPTT Call(voice)
  - ▶ Emergency Private/Group PTT(voice)
  - ▶ Imminent Peril Group PTT Call(voice)
  - ▶ Emergency Alert
  - ▶ MCPTT QCI support
  - ▶ MCPTT QoS Handling
- ▶ Push to X (available now)
  - ▶ Location Sharing
  - ▶ Voice Message Sending
  - ▶ Picture & Video Stream
  - ▶ File x-fer

**MCPTT features are available now. The PTT Systems highlighted will be able to implement R13 updates with a standard software update.**



# Thank You

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**PrimeLime**  
Wireless Solution Experts

# The Fairfax County LMR to LTE Broadband Integrated Push To Talk Solution

Michael Newburn  
Wireless Manager Fairfax County

# The Fairfax County LMR to LTE Broadband Integrated Push To Talk Solution



# Fairfax County Virginia

- Michael Newburn – Wireless/Radio Solutions Manager for Fairfax County

- Responsible for overseeing all of the county's wireless communications including radio/LMR infrastructure, government broadband and commercial capabilities.
- 35 years experience in wireless communications industry
- Introduced an out of the box wireless strategy migrating non-public safety radio users over to broadband push to talk service resulting in a \$16 million savings for Fairfax County
- Incorporated RoIP, CSSI and ISSI interoperability interfaces between the Fairfax County P25 public safety radio network and commercial LTE network, expanding the interoperability capabilities for first responders.



# LTE Applications

- Push to Talk - cornerstone application
- Situation Awareness
- Workforce Management
  - Electronic forms
  - Time & Attendance
  - Fleet Management
    - GPS services

# Challenges for LMR Vendors

P25 Standards for CSSI & ISSI must be improved beyond basic voice calling to improve both LMR and LTE Interoperability

For Example:

- Console patching on Trunked Radio Systems
- Location Services

# Challenges for Municipalities

Most states hands free laws need to be amended for school buses by adding language allowing Push-to-Talk like services and not just two-way radios

# Push to Talk Services

- Network adapting PTT apps
  - 3G, LTE and Wi-Fi
- End to End Security
  - FIPS 140-2
  - AES 256
- Contact & Group Administration Tool
- IoT and API Integration

# LMR Interoperability

- P25 Interop – On premise CSSI Console
- P25 Interop – ISSI
- Analog, MotoTRBO Interop – ROIP
- DMR, Nexedge Interop – AIS, NXDN

# Equipment changes with the LTE network

## Devices

Intelligent sensors – Biometrics,  
Enhanced Location

Situational Awareness Apps

Unified Communication API's

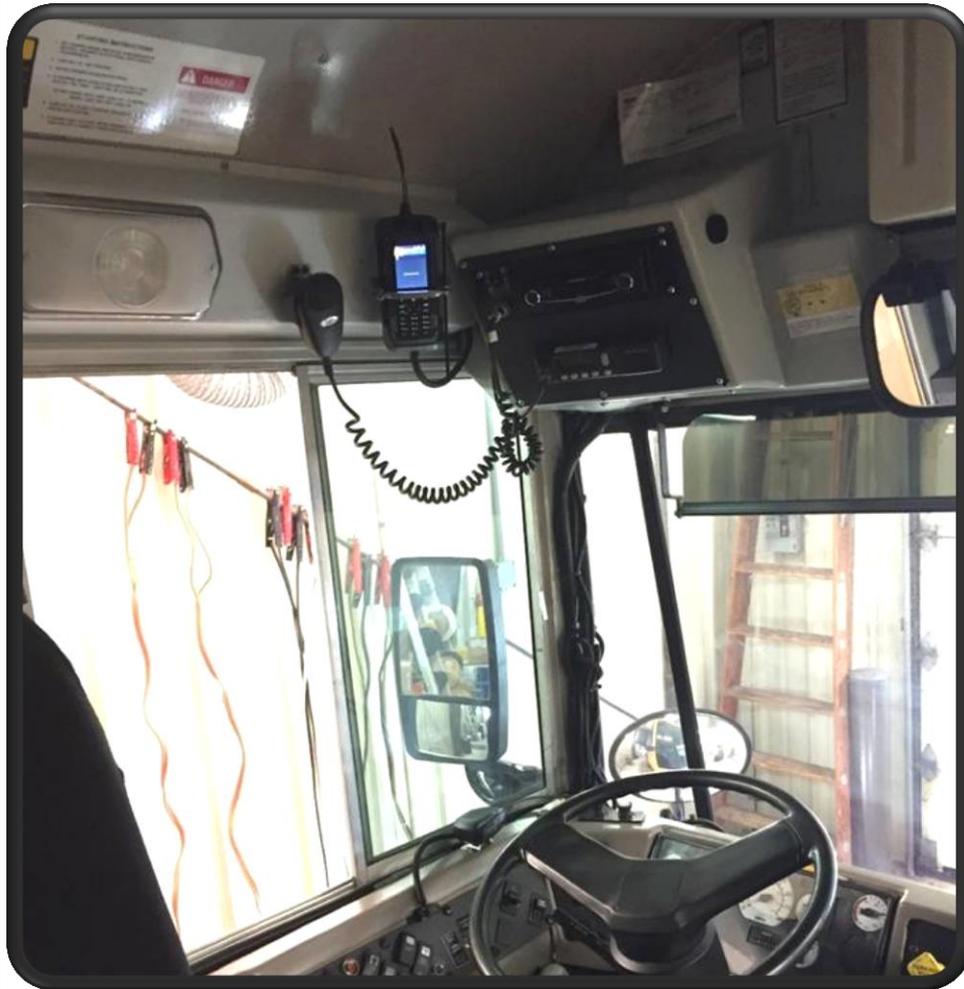
# Impacts on handheld devices, command centers, in-vehicle equipment and accessories

- Purpose built handsets designed for the industry
  - Rugged, waterproof, louder speakers, drop proof, designed to operate in hazmat environments, longer lasting batteries
  - Lone worker APIs
- Hands Free Accessories
  - Both wired and wireless
  - Low Energy Bluetooth
- Vehicle Car kits offer hands free operation
  - Lowering the noise floor by eliminating unnecessary radio traffic
- Integrated Dispatch apps run on enterprise computers



## Hands Free Car Kit

- Locking phone cradle
- Palm mic
- Hands-free visor mic and PTT button
- External speaker

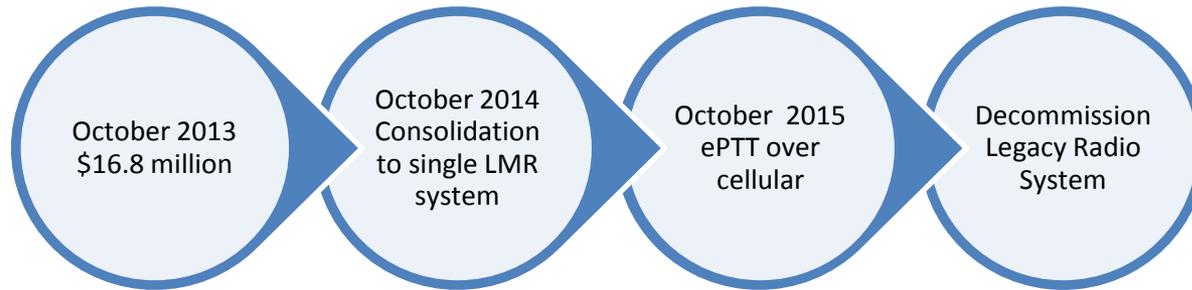


## School bus kit

- Locking phone cradle
- Palm mic
- Hands-free visor mic and PTT button
- External speaker

# Fairfax County Push-to-Talk Use Cases

# How We Got Here...



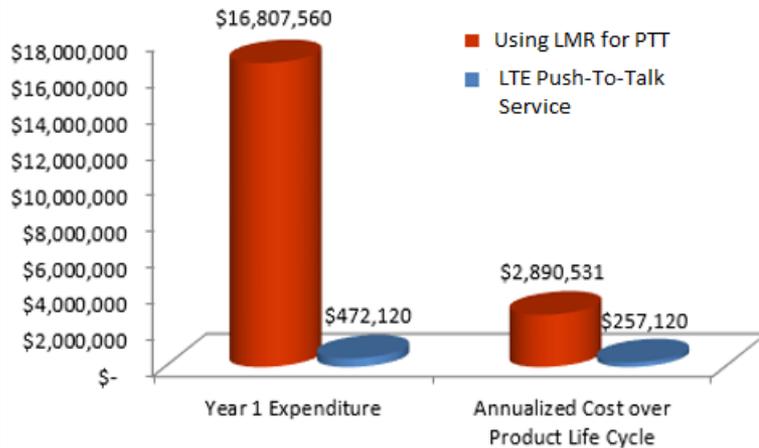
- General County LMR Infrastructure Forklift
- New mobile and portable radios for General County & Schools

- FCPS \$7.5 million, \$5.4 million for subscriber radios



# Upgrading the General County Land Mobile Radio System did not address:

- Capacity – Average wait time 2 to 4.5 seconds today
- Coverage – 7 LMR towers vs. almost 200 broadband towers
- Future-proofing – Lifecycle of subscribers is 5 to 7 years



Save Money

+ More

Simplify Management

+ More

Improve Productivity

+ More

Consolidate Devices

+ More

Increase Coverage

+ More

Expand Number of PTT Users

+ More



YOUR LMR SYSTEM WITH INTEROPERABILITY



## More Productivity. One Device.

### Integrated PTT, Mobile broadband data, and enterprise productivity applications

#### Productivity Apps

Experience improved productivity and cost savings with a single PTT-enabled device that supports numerous enterprise productivity applications developed for mobile workers, including: fleet management, asset management work order management, dispatch applications, paperless forms, and more. Add a productivity app that's needed when needed – its just a download away.

#### Mobile Broadband

LMR-data-rate limitations are easily overcome by the data rates available with cellular and Wi-Fi. With access to mobile broadband networks, you can have a PTT-enabled cell phone, GPS device, navigation, Bluetooth, camera, and a data-driven productivity tool integrated onto one smart device.

#### Integrated Convenience

The devices themselves keep their talk-group lists and individual contacts updated and auto-synced, over-the-air. With integrated contact administration, PTT makes it easy to setup multiple, special-purpose talk groups using its web-based tool. PTT users conveniently stay connected with colleagues automatically and immediately.

#### Multi-modal Communications

Along with the convenience, reliability, and efficiency of PTT, smart devices empowered an organization's workforce with more communications options. Email, text messaging, and phone calls possible on the same device used for PTT.



#### Wi-Fi Networking

Wi-Fi networking may be a common feature for a smartphone, but it allows for an advanced PTT capability – PTT over Wi-Fi. Now, organizations can economically extend their own coverage using standard Wi-Fi equipment inside of buildings, down in basements, or to the far reaches of a sprawling facility.

#### Location Awareness

Smartphones and devices incorporate GPS capability as a standard feature – allowing for location awareness of field workers, Push-to-Talk, includes location-based Dispatch Console software as an available component of its PTT solution. This enables dispatchers to see PTT users' locations on a map and make PTT calls to one or a group quickly and easily.

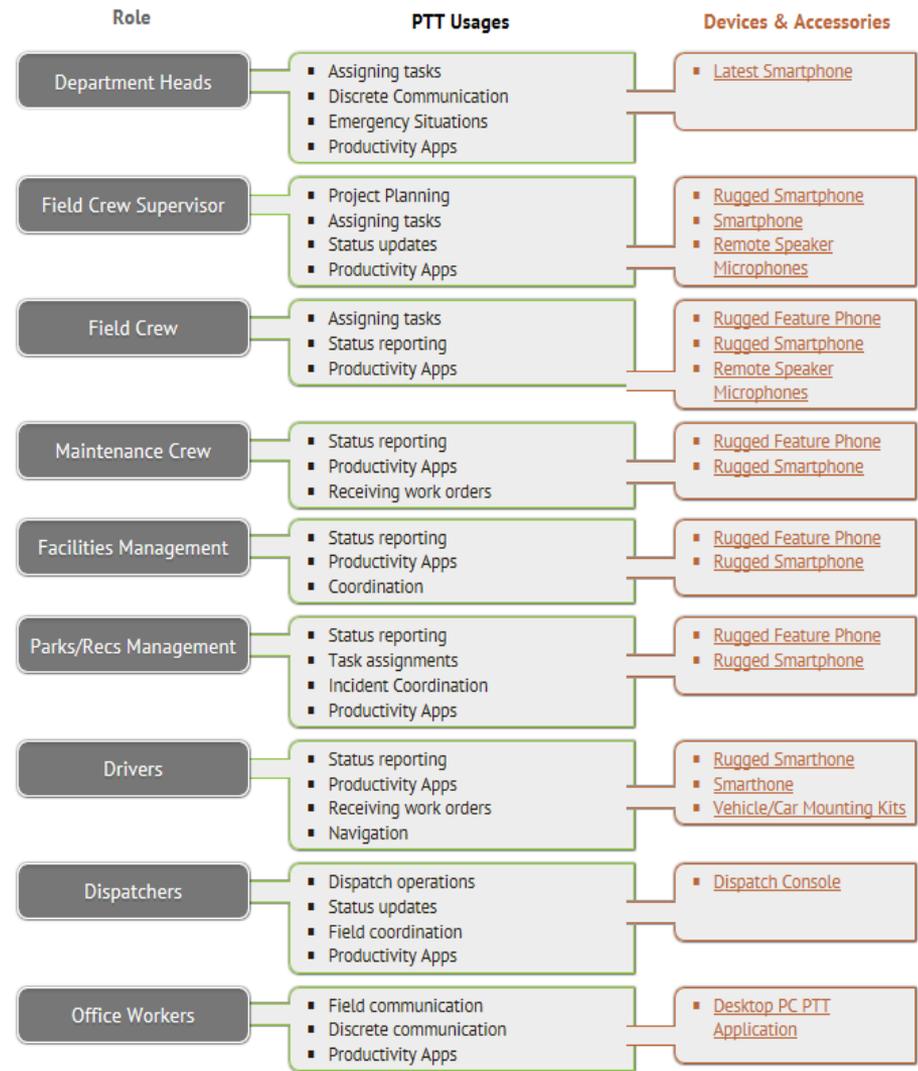
#### Two-way radios just do this.

Standard two-way radios are single-purpose communication devices that don't scale to meet the demands of today's mobile data user's needs. With PTT, a device used for PTT communications becomes a full-featured productivity tool.

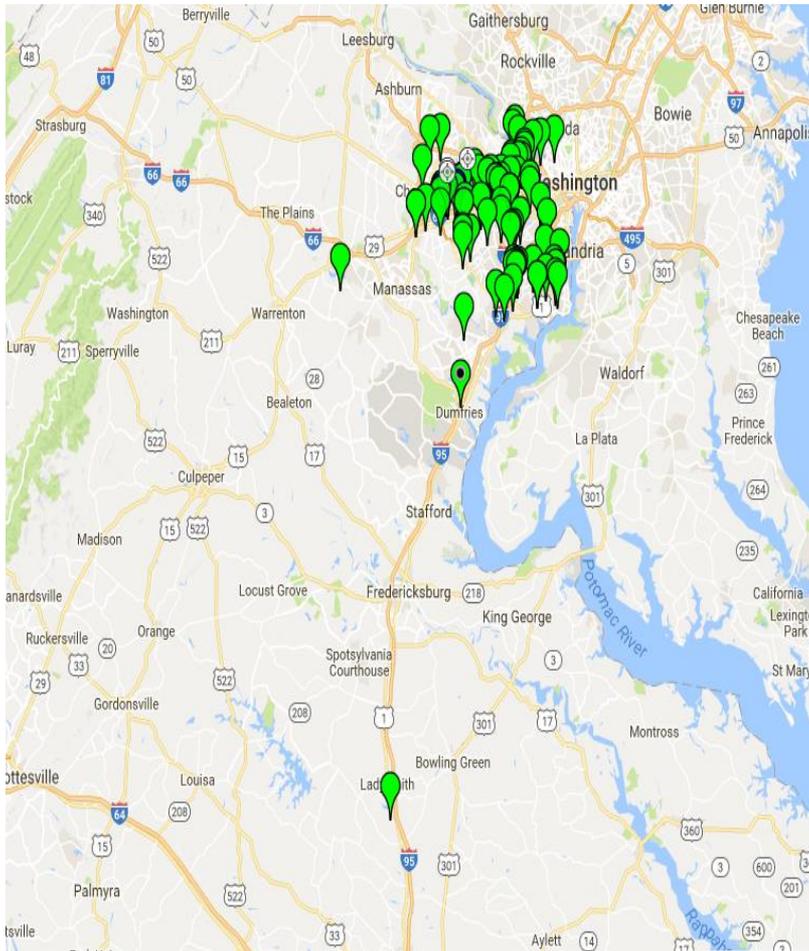
# Transforming Mobile Communications

The Fairfax County project is to move non-public safety users off its analog trunked radio system to commercial cellular enhanced Push-To-Talk (ePTT) service.

Fairfax County public safety has utilized the same commercial network as its primary wireless mobile data provider for over 8-years



# Improved Interoperability, Expanded Coverage with GPS



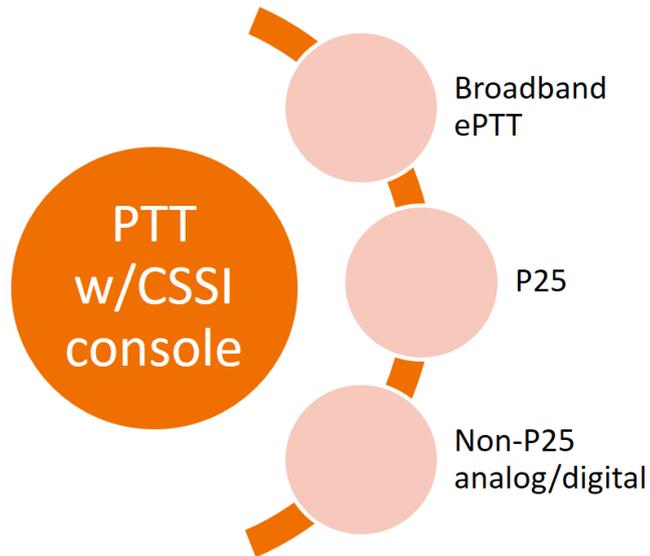
- Fairfax County Mental Health Services interoperability with area hospital mental health staff, building security and public safety
- ePTT talkgroup updates are pushed out instantly
- Outside responder's smartphones can be added to Fairfax County's P25 talkgroups
- Paratransit (Fastran), Foster Care and Head Start Transportation provide services outside the County now are in constant communications with GPS location information

# Enhanced Push To Talk (ePTT) ROIP Use Cases

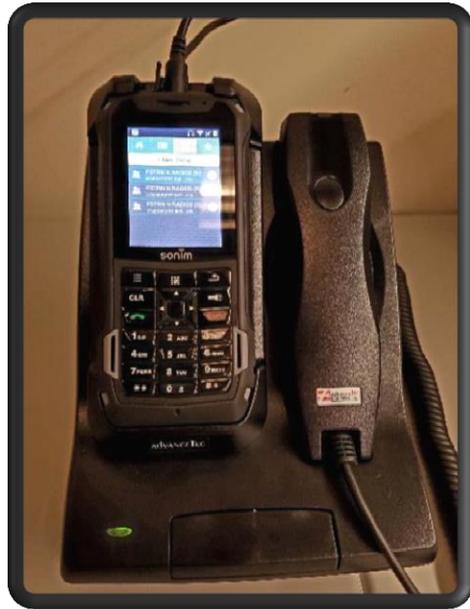
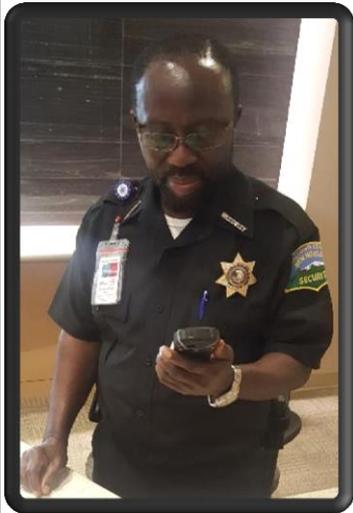


- Interface to analog Smartnet radio system to bridge analog radio users to ePTT users during transition period
- Ad hoc LMR interoperability to LTE ePTT
- LMR encrypted interface to LTE ePTT for agency special encryption keys
- Non-P25 dispatch console interface to LTE ePTT

# Enhanced Push To Talk (ePTT) CSSI Use Cases



- Dispatcher controlled patching between LTE ePTT and LMR talkgroups
  - Short term or semi-permanent
- Allows dispatcher communications between LTE ePTT and LMR users
  - School security operating on P25 radio network communicating with school transportation and others using LTE ePTT
- LMR encryption point between LMR & LTE ePTT talkgroups



## Enhanced Push To Talk (ePTT) ISSI Use Cases

- Permanent LMR to LTE ePTT talkgroup interface
  - Fire Chief has situational awareness of his agency by having primary LMR talkgroups on his iPhone
  - Shopping mall security office using a ePTT desk set on a Fairfax Police P25 patrol talkgroup to address no LMR coverage
  - Undercover, detectives, special assignments have P25 talkgroups on smartphones
  - Administrative public safety personnel maintain situational awareness with P25 talkgroups using a county issued phone freeing up expensive public safety radios for first responders