



Expanding Coverage and Capacity through Land Mobile Radio Network Interoperability

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AT&T Enhanced Push-to-Talk offers LTE network-optimized solution for IP integration with Land Mobile Radio

Land Mobile Radio (LMR) systems have long been the de-facto communication networks for Push-to-Talk (PTT) voice services across industries such as public safety, transportation, construction, field services and utilities. For nearly a century, LMR systems have provided a simple and efficient solution for private, two-way radio communications that enables field-based industries to collaborate with speed and confidence.

But, the introduction of IP standards has revolutionized LMR, shifting it from proprietary single vendor networks to open interface, multi-vendor environments. IP-based interoperability has shattered the wall between the LMR and PTT over Cellular (PoC) platforms, providing direct communication across both networks and making dispatch and resource coordination easier and more efficient. Bolstered by this revolution of mobile cellular communications technology, LMR system operators are looking for more from their communication systems. In a recent VDC

Research survey of more than 130 industry organizations, 93 percent of respondents indicated that the demand for broadband technology is driving a re-evaluation of their legacy LMR system. Many organizations are considering augmenting their private LMR network with a PoC solution that integrates with today's mobile technology. Notably:

- Half of survey participants cited a need to augment their LMR system due to an increase in the number of users relying on PTT LMR radio communications.
- Nearly 40 percent noted an increase in demand for broadband data applications that can integrate with organization communications, including fleet management, GPS and real-time location services, mobile GIS, among others (see Figure 2 for a complete list of leading broadband data applications).
- More than one-third cited the high costs of maintaining legacy LMR/PMR equipment and infrastructure.

Key factors driving LMR migration to a PoC solution

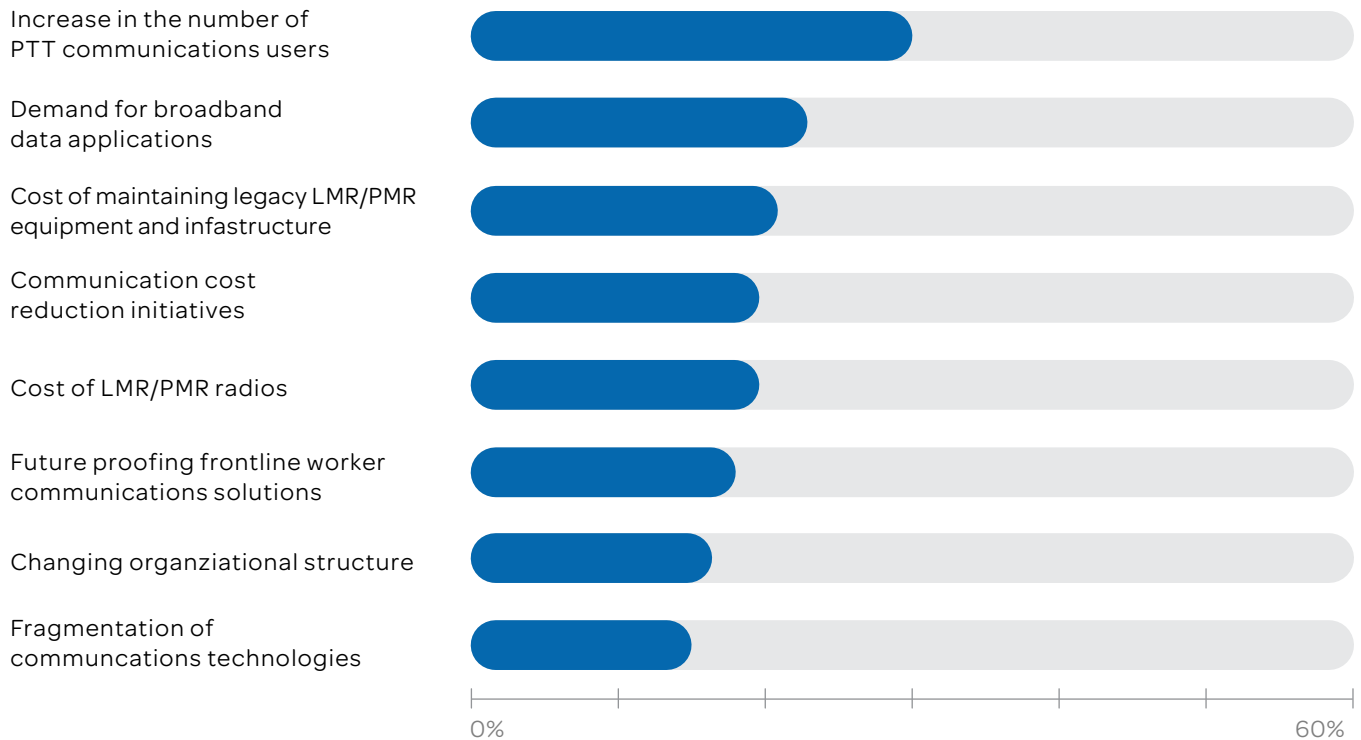


Fig. 1 - Reference: VDC Research 2016 - Survey result of 130 LMR customers

Leading broadband data applications

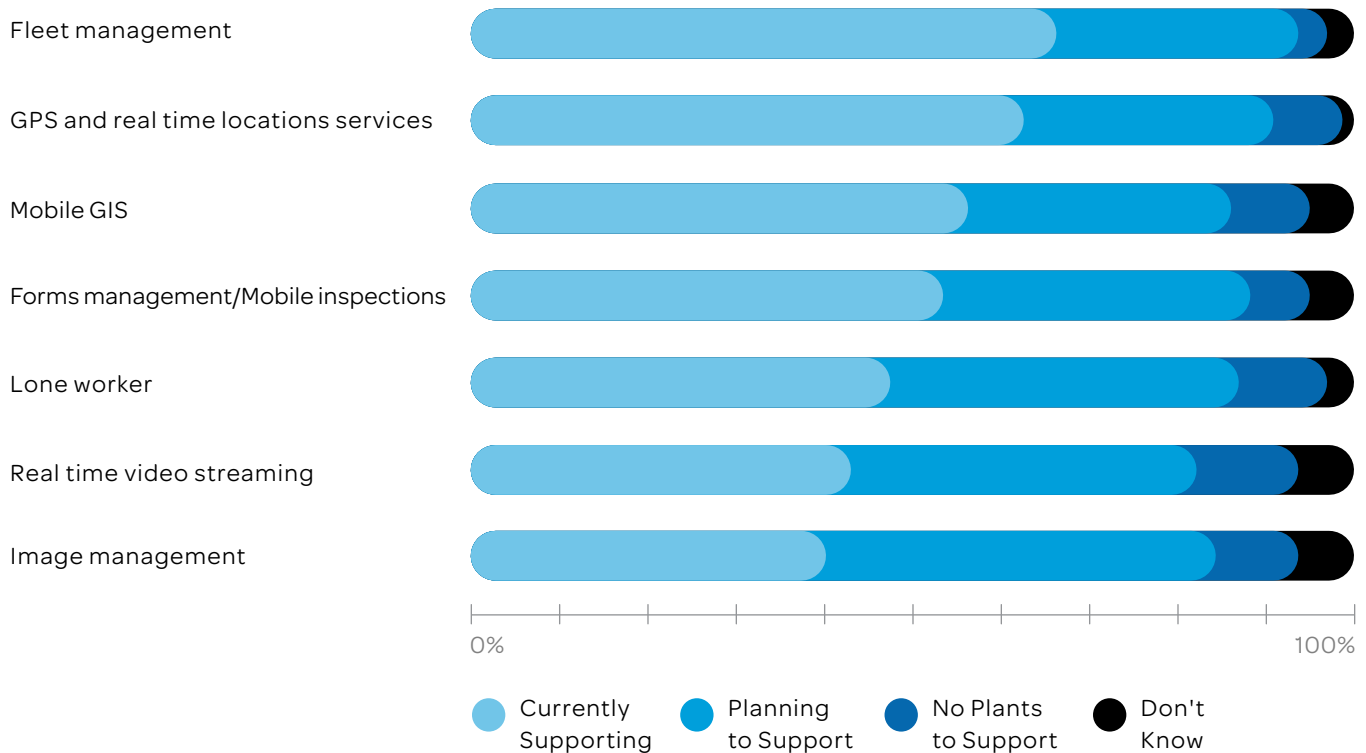


Fig. 2 - Reference: VDC Research 2016 - Survey result of 130 LMR customers



Utilizing both Open Mobile Alliance (OMA) and IP-based standards, AT&T offers a first-of-its-kind PTT solution that provides customers seamless interoperability needed to take LMR augmentation to the next level. AT&T Enhanced Push-to-Talk makes it possible to efficiently offload the LMR network, extend network coverage, and enhance features and functionality without adding new LMR sites or spectrums, as organizations preserve existing investments.

Upgrading LMR Radio Systems in Fairfax County, Virginia

Consider the implementation of AT&T Enhanced Push-to-Talk in Fairfax County, Virginia. Fairfax County has two 800 MHz radio systems, the Public Safety and the Public Service systems. The County recently invested heavily to upgrade the mission-critical Public Safety Radio to new P25 digital/IP technology. However the Public Service Radio system – used by 3,200 county employees including the Fairfax County Community Services Board, Department of Public Works and Environmental

Services, Connector, FASTRAN, and Fairfax County Water Authority – is more than 13 years old. The system also uses proprietary technology developed in the 1990's and based on older circuit-switched analog technology, resulting in high maintenance costs, and a lack of sufficient call processing capacity to meet current end user requirements. Without upgrades, the Public Service Radio system will be decommissioned at the end of 2018 when it is no longer supported by the manufacturer.

After careful analysis of the Public Safety Radio System P25 digital/IP technology capabilities, and commercially based PTT solutions now available for the non-public safety agencies, Fairfax County is implementing the AT&T Enhanced Push-to-Talk solution for non-public safety radio users. By transitioning non-public safety users to broadband wireless IP phones with PTT, Fairfax County's mobile workforce will have a wider set of tools for business communication. And, to ensure reliable communication for the most critical needs, such as incident and disaster management, interoperability links have been established between the County push-to-talk network and the P25 Public Safety radio network.



Return on Investment

By augmenting the current Public Service system with broadband PTT capabilities, Fairfax County has:

- Expanded its communication system capacity and functionality with a future-proof solution by using smartphones and reducing yearly cost associated with a future “fork-lift” system replacement.
- Provided continuing protection and safety through its enhanced radio system for first responders, sanitation workers and other staff that depend on reliable communications.
- Additionally, the upgraded technology provides enhanced mobile capabilities for the entire Fairfax County workforce, improves customer service to County citizens and other County agencies, and supports future County cost avoidance of an estimated \$16 million.

AT&T Enhanced Push-to-Talk: The Next Generation of Mobile Workforce Communications

Backed by the power of the network and the experience of a leading wireless carrier, AT&T Enhanced Push-to-Talk includes in-demand features that support the needs of today’s mobile workforce customers, including integration with third party data applications, interoperability with LMR networks and support for a broad portfolio of devices and accessories.

Benefits of Integrating LMR with AT&T Enhanced Push-to-Talk

Fully-integrated, distributed
(Push-to-talk over Cellular) PoC
solution with the carrier grade
reliability and security

Connectivity with PoC users
beyond LMR network footprint

Nationwide coverage and optional
international roaming for PoC users

QoS and priority call treatment with
AT&T Dynamic Traffic Management

Managed network extended to
the customer premise

Ecosystem of manufacturers, application
developers and system integrators

On premise and cloud-based
dispatch console options to fit
Capex or Opex models

Broad portfolio of AT&T certified,
PoC devices and accessories

AT&T Enhanced Push-to-Talk API

Utilizing both mobile and web Application Programming Interfaces (APIs), customers can leverage existing, third party data applications like mobile resource management (MRM) to work with AT&T Enhanced Push-to-Talk. AT&T Workforce Manager and AT&T Fleet Complete are two such MRM applications that are already integrated through their consoles with AT&T Enhanced Push-to-Talk and now include the ability to make one-to-one and group dispatch calls. These APIs also support deep application linking which enables contextual linking to the PTT client within a mobile application and requires minimal programming from the Android and iOS software developer.

AT&T Virtual Private Network

In combination with the AT&T application aware Virtual Private Network (VPN) Solution, the PTT customer end-to-end experience can be further enhanced with a scalable, agile and flexible IP connection designed on a fully meshed network with built-in disaster recovery mode. AT&T VPN service enables customers to link their radio consoles with AT&T Enhanced Push-to-Talk via a network-based Multi-Protocol Label Switching (MPLS) service to efficiently transmit their push to talk traffic.

Supported by this tightly bound distributed ecosystem, along with real-time presence, supervisory override functionality, and LMR talk group interoperability, AT&T Enhanced Push-to-Talk deliver lightning fast, clear communications and a superior user experience.

AT&T Enhanced Push-to-Talk Ecosystem

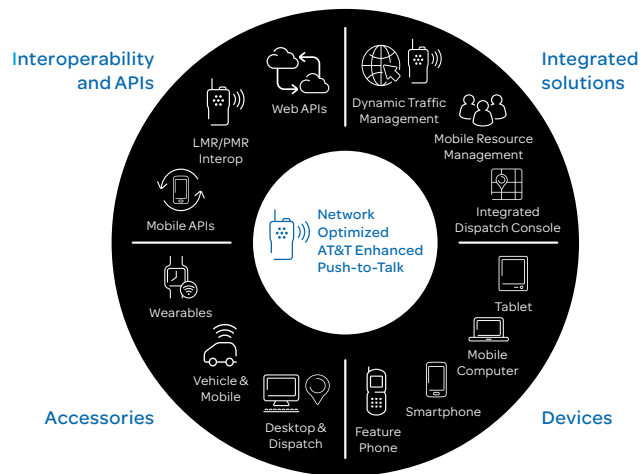


Fig. 3

Standards based interoperability and APIs

- LMR interoperability
- Web APIs
- Mobile APIs

Integrated solutions

- Mobile Resource Management including AT&T Fleet Complete and AT&T Workforce Manager
- AT&T Dynamic Traffic Management
- Integrated Dispatch

Devices and accessories

- Rugged, non-rugged and intrinsically safe
- Feature phones, smartphones, mobile computers and tablets
- Accessories for every device type and work need

IP-based LMR Interoperability

AT&T Enhanced Push-to-Talk provides the seamless IP-based interoperability necessary to augment and extend LMR networks. This capability is critical to empower LMR customers to free capacity, add users, expand coverage and preserve their network investment while reducing the need to add new LMR sites or expensive devices, frequencies or equipment.

IP-based interoperability simplifies the effort required to expand the number of PTT users and dispatchers that can communicate simultaneously and provides a single interface capable of supporting a large number of concurrent sessions. Dispatch communication sessions can now be set-up between the AT&T and LMR networks regardless of whether the dispatch console is located on premise or cloud-based.

AT&T supports both on premise and cloud-based dispatch console solutions, allowing organizations to add new users to the groups, monitor conversations, and interrupt an ongoing call with supervisory override when needed. The AT&T LMR interoperability solution also takes into consideration the quality of the wireless network, the wired network, the PTT voice and data traffic as well as the customer's overall mobile application and device needs.



To learn more about the advantages of the AT&T Enhanced Push-to-Talk and LMR interoperability, visit www.att.com/EPTT.

About the Authors

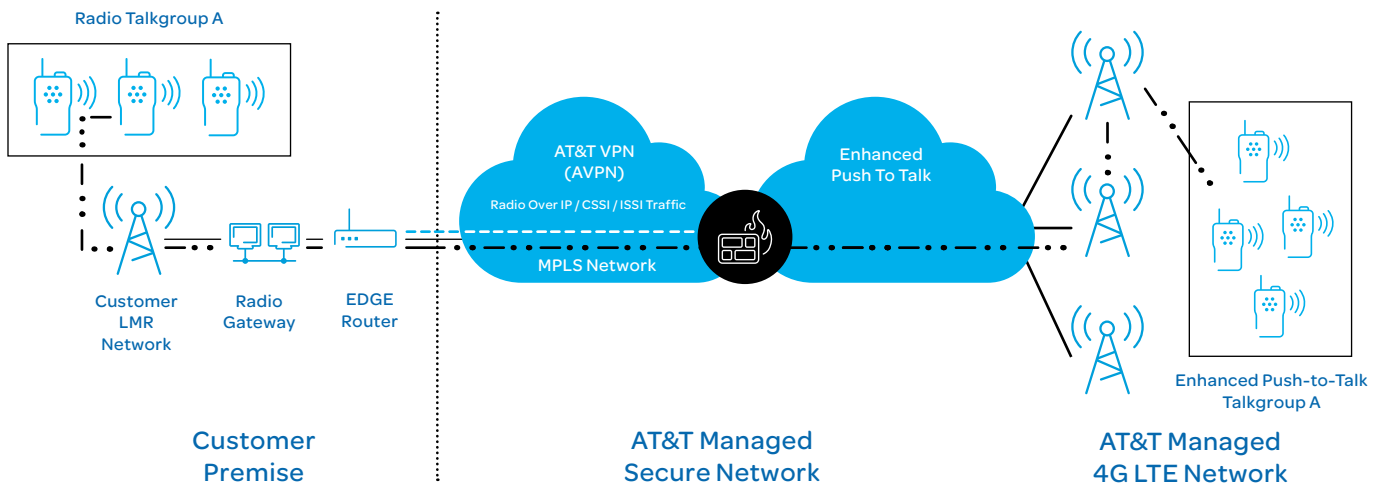
Mike Newburn is currently the Wireless and Radio Solutions Manager and is the senior technical and wireless communications policy expert for Fairfax County, Virginia. He manages the County's critical dedicated wireless communications infrastructure and radio systems serving Fairfax County government, Schools and interoperability with the 23 localities in the National Capital Area. Prior to joining Fairfax County, he was in California working as the Telecommunications Manager for Sacramento County. Prior to that he was a 9-1-1 subject matter expert for Motorola Solutions, serving the western United States. He was the service manager in the San Francisco Bay Area for various Motorola and Harris service shops before joining Motorola Solutions.

Hamlet Sarokhanian has over 33 years of global experience in both private Land Mobile Radio (LMR) and the commercial radio communication industries working for Motorola, Ericsson (USA and Japan), Uniden (Japan), Anritsu, Tait (New Zealand), and AT&T. Hamlet has held various technical and business executive role around the world. He has earned BSEE from Oklahoma St. University, MBA from Fuqua School of Business; Duke University, and Executive Certificate in Business Strategy & Innovation from MIT. He is currently a lead marketing and business development manager for AT&T, based in Dallas TX, responsible for developing strategic alliances and partnership to expand AT&T's Enhanced Push-to-Talk eco-system, including LMR/LTE Integration/ Interoperability and mobile field applications.



Technical Appendix

IP Interoperability delivery via AT&T VPN (AVPN)



AT&T Enhanced Push-to-Talk Optimized Network

Enhanced Push-to-Talk is designed with key, robust network attributes to provide AT&T customers with the ultimate experience:

PCPS (Push-to-Communicate for Public Safety) compliant with the Open Mobile Alliance (OMA) - compliance with the current PCPS v1.0 specification which provides a solid foundation for the rapid development and implementation of the voice, video and data communications capabilities defined in the MCPTT standard. The PCPS standard is the core of the 3GPP requirements for MCPTT (Mission Critical PTT) communications and is the OMA PCPS standard. Licensed by 3GPP for use in defining the MCPTT requirements, the PCPS standard includes critical communication

functions such as multicast PoC, ad-hoc or pre-defined PoC group communications, prioritization and pre-emption, as well as dispatcher functions.

High Availability, Multi-Site Resilient –

delivers five 9s availability, necessary for Public Safety Grade, High Availability and Multi-site resiliency communications. The AT&T Enhanced Push-to-Talk solution is architected based on a distributed geo-redundant (multi-site) design, consistent with that of AT&T carrier private cloud architecture. This network design core dependency, as well as robust network components with site-level redundancy supports the achievement of five 9s availability.

FIPS 140-2 – helps ensure the security of public safety voice and data communications. FIPS 140-2 compliance helps ensure that the broadband PTT solution utilizes cryptographic modules that meet the Security Requirements for Cryptographic Modules issued by the National Institute of Standards and Technology (NIST).

Carrier-Integrated with QoS – prioritizes your critical application traffic during times of high network volume. Using QoS network technology, AT&T

Dynamic Traffic Management for Enterprise solution enables qualified customers to receive a differentiated 4G LTE network experience for EPTT. AT&T Dynamic Traffic Management for public safety users also enables qualified customer to receive a differentiated 4G LTE network experience for EPTT plus the additional benefit of priority access to the domestic 4G LTE network, particularly valuable during times of network congestion.

