GUIDE TO BROADBAND PUSH-TO-TALK

MOTOROLA SOLUTIONS

WHEN WORKERS COMMUNICATE, THEY CAN COLLABORATE TO DELIVER SERVICES MORE EFFECTIVELY, BOOST PRODUCTIVITY AND ENHANCE SAFETY AND SECURITY

If workers are in noisy environments, need to talk to multiple team members at the same time, or are remote from each other, communicating efficiently can be difficult. Since the beginning of the industrial revolution, people have sought to overcome these issues: from telegrams to radio, land-line telephones to email and smartphones, technologies have been developed to connect people and share information. For several decades, push-to-talk (PTT) two-way radios (also known as "walkie-talkies") have been the communications choice for companies who want to connect teams of workers. These devices allow instant voice communication between individuals or groups of people at the push of a button. More recently, the wide availability of internet access has enabled new broadband push-to-talk communications to emerge offering greater data capabilities.

1790s
Semphore developed to allow remote messaging

1844
First Morse code message transmitted between between Washington, D.C., and Baltimore, Maryland

1900
HMS Hector first British warship to have wireless telegraphy installed

1800

1900

1830s TO 1840s
The Electric Telegraph developed to transmit text messages through wires

LATE 19TH / EARLY 20TH CENTURY
Wireless communication first demonstrated and developed

1900
First wireless transmission of audio

1940s
Handheld radio transceivers developed

1973
First handheld mobile phone developed

2001
First 3G mobile network launched in Japan introducing higher data rates

2006
Digital DMR radio developed for commercial users

2000

1923
First mobile two-way radio developed in Australia for Victorian Police

1969
Radio communication with astronauts on the moon

1995
Digital TETRA radio developed for public safety

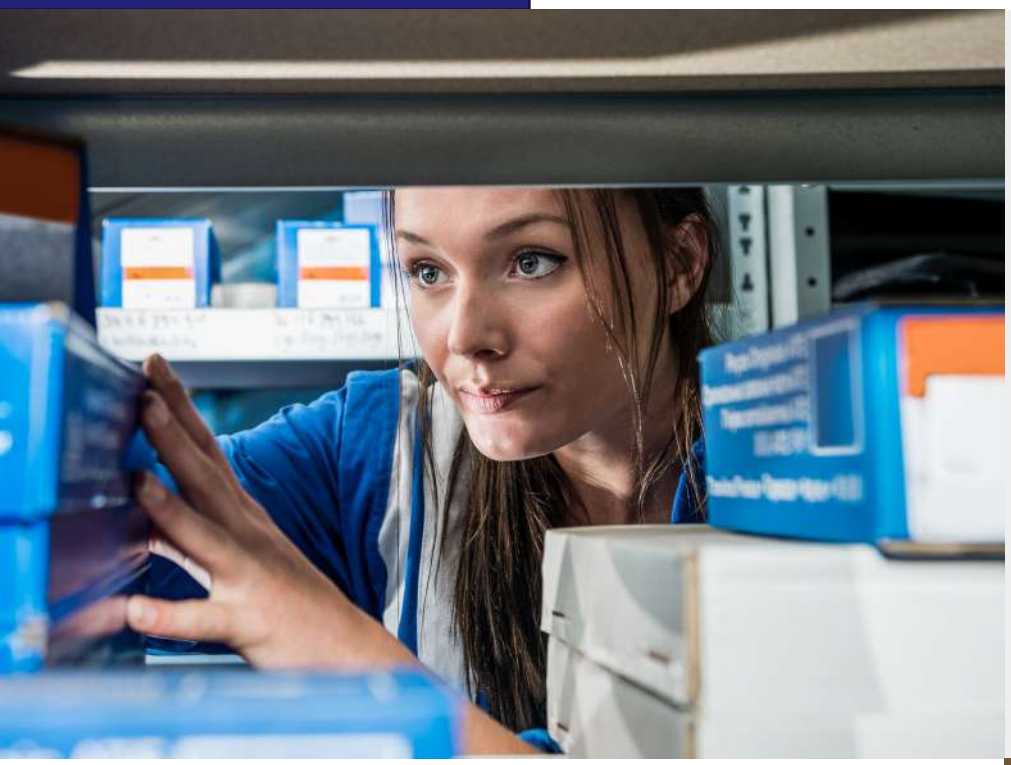
2000s
PoC developed utilising mobile phone networks

2009
First 4G mobile networks introduced in Norway and Sweden

ADVANTAGES OF BETTER COMMUNICATION

- IMPROVED COLLABORATION
- ENHANCED SAFETY
- ELEVATED CLIENT SATISFACTION
- BOOSTED PERFORMANCE
- INCREASED PRODUCTIVITY
- DELIVERED SERVICES
- REDUCED MISTAKES
- DECREASED RISK
- LESSENED CONFLICTS
- EASED BOTTLENECKS
- ELIMINATED INEFFICIENCIES
- LOWERED CUSTOMER FRUSTRATION

WHAT IS PUSH-TO-TALK (PTT)?



INSTANT

PTT is a communication technology that provides instantaneous call set up. Unlike with telephones, calls are connected immediately with no need to dial a number or wait for the person being called to pick up: the user just presses a button on their device and their voice will be output on the device of the person or group they are calling. Traditional PTT technology, called Land Mobile Radio (LMR) systems, use two-way radio devices to allow users to make and receive calls and send text messages.

VERSATILE

Push-to-talk calls can be one-to-one (individual), one-to-many (group) or one-to-all (broadcast). This makes PTT ideal for managing teams as calls can be made to individuals, for example between two managers, to a group, for example to all maintenance engineers, or to everyone on the system, for example to provide warnings in an emergency. These groups are pre-defined, so the user simply selects the contact or group they want to call (normally through on-screen menus, or using a rotary knob on their device) and press the button to make the call: they don't need to set up a conference call or wait for others to join the call.

EFFECTIVE

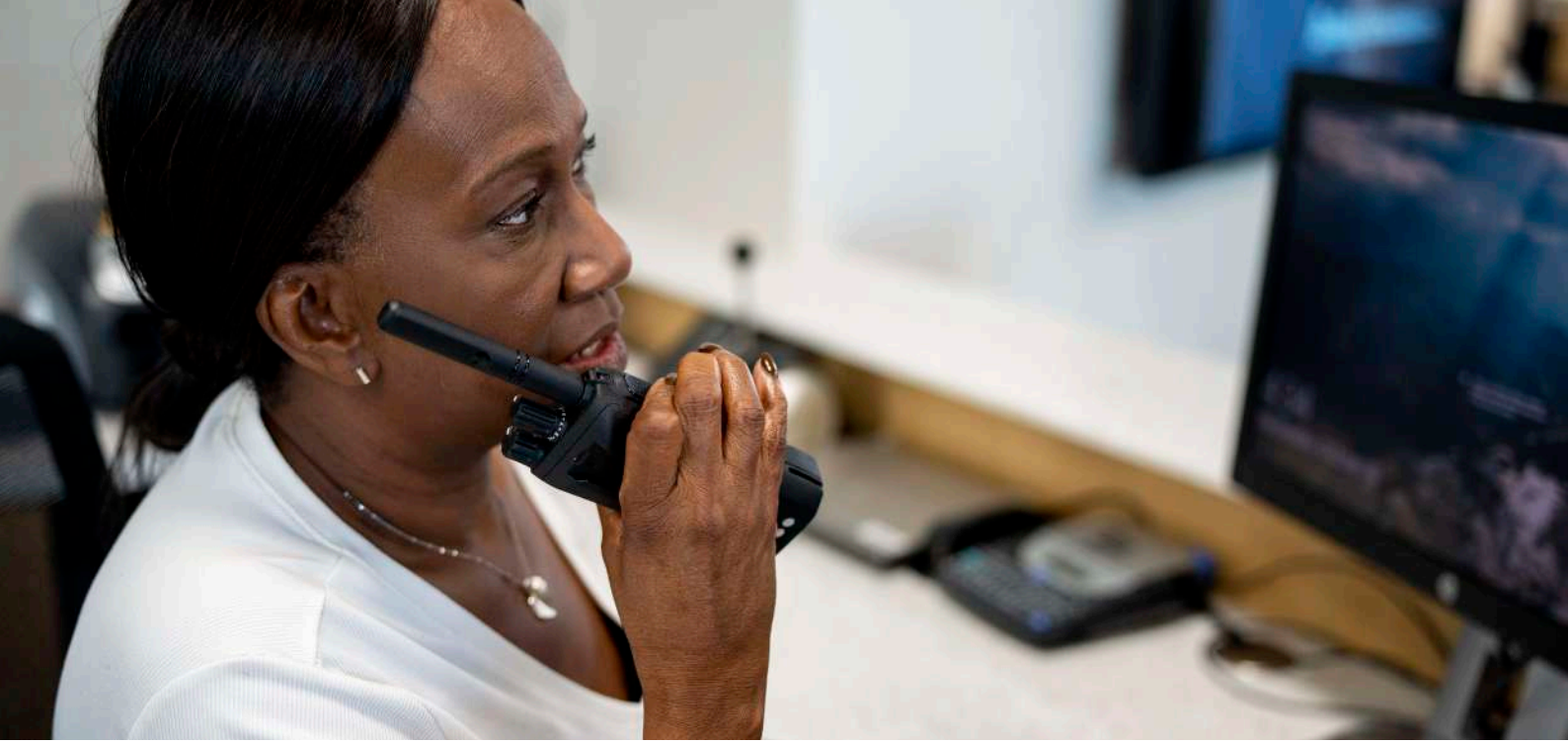
PTT communications are normally "half-duplex", meaning that only one person can speak at a time. They press the button on their device to begin transmit mode when they want to speak, then release the button to switch to receive mode to listen. This is ideal for workforce coordination as it prevents people talking over each other and eliminates background noise from anyone who is not speaking.

CUSTOM-BUILT

PTT systems are typically owned and managed by the organisation using them: this gives full control over the network coverage area, capacity and capabilities. It also makes costs more controllable: there are no call charges to pay so capital and operating expenses are predictable from the outset. Since the system is dedicated to the organisation and not shared with others, it can be designed to perform as needed to support business-critical and mission-critical operations.

CAPABLE

Two-way radio PTT systems have been evolving for several decades, improving performance and developing a wide range of devices including light, compact and rugged handhelds and high-power in-vehicle models. The introduction of digital PTT technology around the turn of the 21st century has enabled advanced features that improve communication and enhance safety. Some systems even allow high priority calls to "pre-empt" lower priority messages. So if there's an emergency and a worker needs to be contacted straight away but they are on another call, their first call can be terminated by the system to ensure the emergency call gets through.



COMPARISON OF PTT AND MOBILE PHONE COMMUNICATION

	PUSH-TO-TALK	MOBILE PHONE
Instantaneous calling	✓	✗
Individual calls	✓	✓
Group calls	✓	✗[1]
Coverage	Local or region-wide	National or international
Priority calls can interrupt lower calls (eg in an emergency)	✓	✗
No dialling	✓	✗
No waiting for user to pick up call	✓	✗
Secure encrypted communications	✓	✗[1]
Direct device- to-device operation	✓	✗
Data capability	Narrowband (low data rate)	Broadband (higher data rate)
Network	Private, dedicated system	Shared commercial system

[1]Not supported for standard telephony calls, but may be possible using broadband applications.

WHAT IS PUSH-TO-TALK OVER CELLULAR?

PUSH-TO-TALK OVER CELLULAR (POC OR PTToC), ALSO KNOWN AS BROADBAND PUSH-TO-TALK, PROVIDES PTT CALLING USING MOBILE PHONE NETWORKS RATHER THAN THE DEDICATED SYSTEMS USED BY TWO-WAY RADIOS. BASIC POC SYSTEMS HAVE BEEN AVAILABLE SINCE THE EARLY 2000s, BUT WITH LIMITED CAPABILITIES. IN MORE RECENT TIMES, THE WIDESPREAD AVAILABILITY OF 4G LTE NETWORKS HAS ALLOWED DEVELOPERS TO ENHANCE POC CAPABILITIES AND PERFORMANCE. NEWER POC SYSTEMS CAN ALSO WORK OVER Wi-Fi IN ADDITION TO 3G/4G/5G MOBILE PHONE CONNECTIONS.

Depending on the system, users install an app on their smartphone or use a dedicated device similar to a two-way radio (or a combination of the two). They can push a soft button on-screen or a dedicated hardware button to make instantaneous individual and group calls, and some PoC systems even allow multimedia files or video to be sent in addition to the voice and text messages possible with traditional PTT. The higher data speeds of broadband mean that richer sound quality can be delivered compared with two-way radios.

Using commercial mobile phone networks means there is no infrastructure set-up cost for the PoC user, and it also provides them with much greater coverage than a two-way radio system: nationwide or even multi-country coverage is possible with PoC.

LMR systems provide unrivalled system control and capabilities for critical communications, including the unique ability to operate in direct device-to-device mode. Whilst PoC systems do not replicate all of the specialised functionality of an LMR system, they offer an excellent solution for many organisations looking to connect workers over wide areas that are not feasible with two-way radio, especially when they need to share large files or video as well as voice messaging.

Some suppliers provide interconnectivity between LMR and PoC systems to allow users to operate on whichever is most relevant for them. For example, a security team guarding a large facility could use two-way radios to benefit from the advanced availability and safety features, but the remote control room or manager would be able to connect to them through the PoC system.

COMPARISON OF LMR AND POC

	LMR	POC
Instantaneous communication	✓	✓
Individual calls	✓	✓
Group calls	✓	✓
Coverage	Local or region-wide	National or international
Customisable network	✓	✗
Presence reporting	✗	✓
Reuse existing devices	✗	✓
Direct device- to-device operation	✓	✗
Multi-media file sharing	✗	✓
Video streaming	✗	✓
Network	Private, dedicated system	Shared commercial system

Organisations have relied on two-way radios for years to connect workers using voice and more recently with text and location tracking. Now, by utilising broadband push-to-talk, they can extend coverage and add multimedia capabilities for users that need them to carry out their tasks as efficiently as possible.

GLOSSARY OF COMMUNICATIONS JARGON

DMR
Digital Mobile Radio (DMR) is an international Standard, maintained by ETSI, that defines technology protocols for two-way radios. DMR systems were originally developed for use by commercial organisations but are now also used by some public safety agencies such as firefighters for incident management. The DMR Standard is less rigidly defined than TETRA, but compliance ensures interoperation of multiple suppliers' equipment for basic operation.

DMO (DIRECT MODE OPERATION)
Also known as device-to-device operation. The ability for devices to communicate directly with each other, without the need for any supporting network infrastructure.

ETSI
The European Telecommunications Standards Institute (ETSI) is an independent, not-for-profit standards organisation in information and communications.

FULL DUPLEX
A system that allows signals to be simultaneously transmitted and received. Also see half duplex.

HALF DUPLEX
A system that allows signals to be both transmitted and received, but not simultaneously. Also see full duplex.

LMR (LAND MOBILE RADIO)
Also known as PMR or two-way radio, these traditional systems deliver PTT communications over dedicated systems using specialised devices.

LMR AUGMENTATION
Communication system that connects a two-way radio network to a PoC service to provide additional coverage or functionality for a wider group of users.

MOBILE TWO-WAY RADIO
Similar functionality to portables, but designed to be used in vehicles. Since vehicles typically cover larger areas than individuals, mobiles have higher power ratings and so are physically larger than portables.

POC (PUSH-TO-TALK OVER CELLULAR)
PTT systems delivered over commercial mobile phone networks.

PTTOC
See PTT.

PMR (PROFESSIONAL OR PRIVATE MOBILE RADIO)
See LMR.

PORTABLE TWO-WAY RADIO
A handheld device used to make and receive calls. Portables come in a range of form factors to meet the needs to different users, eg small and light, ruggedised or ATEX certified.

PTT (PUSH-TO-TALK / PRESS-TO-TRANSMIT)
Communications systems that provide instantaneous calling at the push of a button without the need to dial a number or wait for the receiver to pick up.

TETRA
TErrestrial Trunked RAdio (TETRA) is a radio Standard, maintained by ETSI, that defines technology protocols for two-way radios. TETRA systems were originally developed for use by public safety agencies but are now also used by many commercial organisations. Compliance to the TETRA Standard ensures that equipment from multiple suppliers will interoperate for the majority of features.

TWO-WAY RADIO
Communications systems that allow users to both transmit (make) and receive calls. Normally, these systems are "half duplex" so only one person can speak at a time, but more sophisticated radio systems allow "full duplex" where more than one person can speak simultaneously.

WALKIE-TALKIE
Another term for two-way radios. "Walkie-talkie" is often used to describe consumer-grade devices rather than operations-critical devices used by business and public safety organisations.

Better communication between workers helps businesses boost productivity, enhance safety and improve efficiency. Motorola Solutions is the world leading supplier of LMR and PoC PTT systems that can enable that better communication.

For more information on two-way radio systems, visit **motorolasolutions.com/MOTOTRBO**
Or to learn more about broadband push-to-talk, visit **motorolasolutions.com/WAVEPTX**

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