

Push-to-Talk Over Cellular (PoC)

WHITE PAPER



Understanding Nationwide calling on PoC Services, Systems, and Devices

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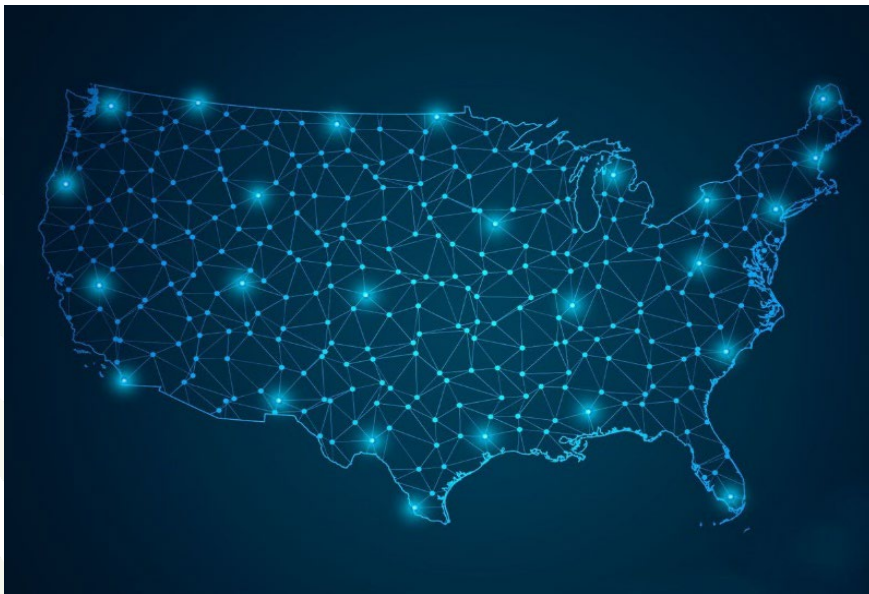
Push-to-Talk Over Cellular (PoC) Overview

What is PoC?

PoC provides group communication services over both Wi-Fi, 4G, 5G, and Long Term Evolution (LTE) technology, creating a nationwide radio network that utilizes the cellular infrastructure of Mobile Network Operators. This enables radio networks with very wide coverage areas. Radio users are untethered by the range of repeaters and base stations used in traditional radio networks.

PoC utilizes cellular LTE and Wi-Fi network infrastructure to create a wide-area radio network that provides national coverage for voice and multimedia communications

The concept of Push-to-Talk over Cellular was introduced by Nextel in 1987 as an alternative to two-way radios. Nextel revolutionized business communication when it started to pass small voice packets across their iDEN network. Prior to PoC, business communication was dominated by two-way radios on peer-to-peer and local radio networks. Nextel was acquired by Sprint, and in 2013 Sprint decommissioned the Nextel iDEN network.

The Nextel logo is displayed in a bold, black, sans-serif font. The letters are closely spaced, and the 'X' is particularly prominent. The logo is set against a solid yellow rectangular background.

Today, PoC provides the best of both narrowband digital radios and broadband 4G/5G/LTE networks. PoC radios support the advanced features of Digital Mobile Radios (DMR), including messaging, instant group calling, GPS location tracking, and emergency notifications. Combining this functionality with Wi-Fi and 4G/5G/LTE cellular networks provides the national coverage area and bandwidth required for modern data and video applications.

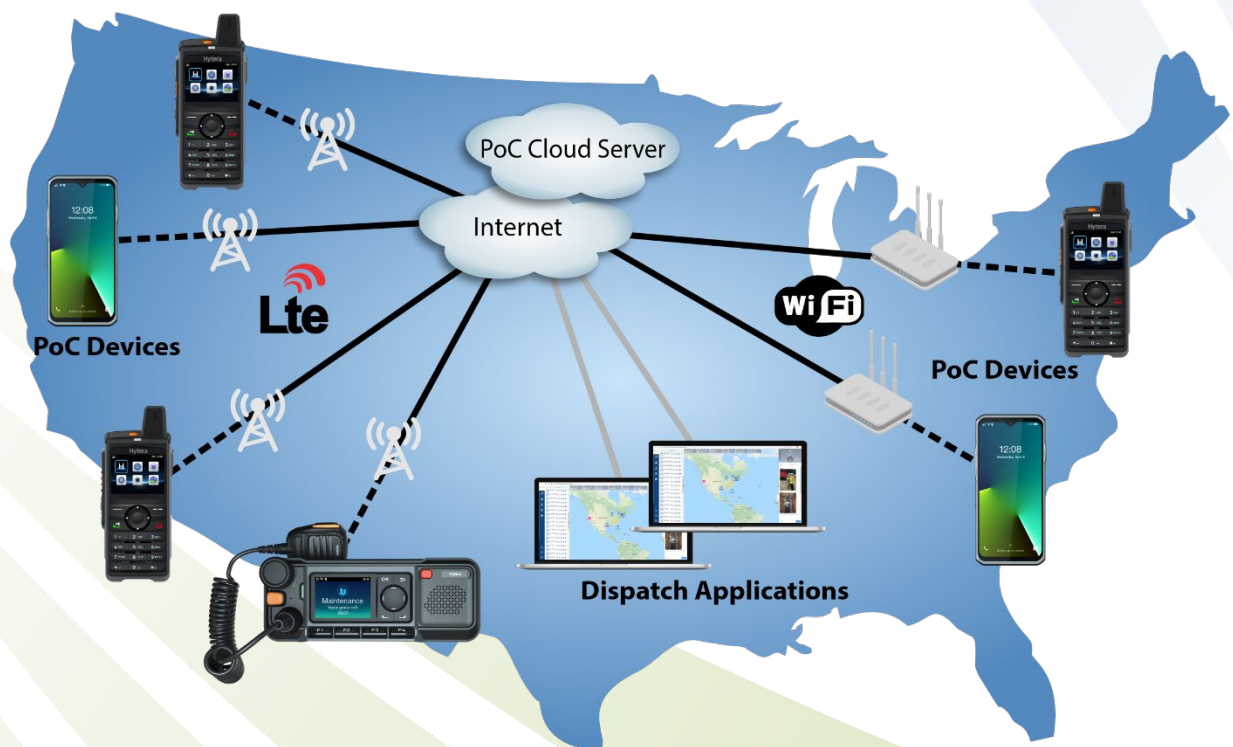
How PoC Works

PoC is also referred to as Radio over IP (RoIP). Similar to Voice over IP (VoIP), RoIP devices are handheld two-way radios that access cloud based PoC services via the internet for voice calling. A data plan SIM card (similar to those used in cell phones) is installed in the PoC device to enable access to the internet using the 4G/5G/LTE cellular infrastructure of Mobile Network Operators like AT&T, T-Mobile, and Verizon.

PoC radios are also known as Internet of Things (IoT) devices that access the internet for data communications and can also access the internet via Wi-Fi networks like any other mobile device.

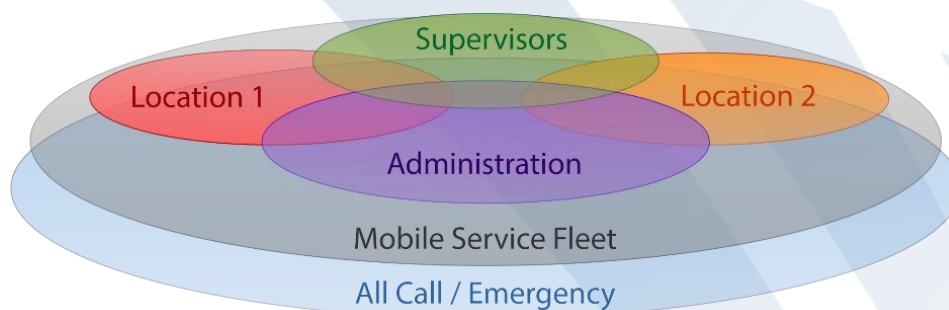
This alphabet soup of terminology gets confusing, but simply put, PoC devices access the internet through 4G/5G/LTE cellular networks and Wi-Fi networks for wide-area radio communications. The result is access to existing and reliable networks that require no maintenance or operational expenses. An app on the PoC device (typically an Android operating system) provides simple and convenient access to PoC services.

PoC network services are typically hosted on the cloud using PoC cloud servers (also known as controllers or network appliances) that are operated by a PoC platform service provider. PoC servers can also be privately owned and operated by the customer. Gateway routers provide connectivity between the 4G/5G/LTE network and the cloud hosted PoC server. Dispatch Applications are connected to the PoC cloud server through the internet.



PoC Group Calling

PoC provides the same group calling capabilities as traditional two-way radio systems to enable instant group calls to multiple users with the press of a PTT button on a radio or from a dispatching application.



Call groups are set up based on all call and emergency calls, types of employees (supervisors, administrators, etc.), remote employees and mobile service fleets, employee locations, type of projects, etc. Radio users can belong to multiple groups as shown in the overlapping areas.

PoC Features and Benefits

Flexible Single-Site, Multi-Site, and Nationwide Coverage

PoC devices connect to nationwide cellular 4G/5G/LTE networks with the installation of a SIM card. PoC devices can also connect to Wi-Fi networks for single-site deployments, or multiple Wi-Fi sites can be connected over an IP Network.

No Radio Infrastructure or FCC Frequencies Required

Since the network infrastructure for PoC is existing cellular 4G/5G/LTE and Wi-Fi networks, there is no need to purchase, operate and maintain any traditional two-way radio network equipment. This reduces capital equipment costs and day-to-day operation and maintenance costs. PoC also eliminates the need for FCC radio frequency licenses, and in high-density urban areas there may be no frequency spectrum available.

Rapid Deployments

PoC systems can be deployed very quickly over existing cellular and W-Fi networks. PoC radios can be pre-configured with specific functions and call groups and work out-of-the-box with SIM cards pre-installed.

Instant Push-to-Talk Group Calling

PoC technology enables subscribers to make one-to-one (individual) calls or one-to-many (group) calls to separate groups of people at the same time. One press of a button on a rugged handheld device and you are talking to a predefined group or an individual. PoC devices also support group text messaging.

Encrypted Communications

PoC systems support the ARC4 (Alleged RC4) and AES (Advanced Encryption Standard) encryption algorithms to encrypt digital voice and data transmitted over the radio network. This digital encryption provides secure and private end-to-end communications, and if AES encryption is enabled, an AES cryptographic key is generated that enables the device access to the network, so only PoC radios with encryption enabled can be heard on the PoC system.

GPS Location Tracking and Dispatching

PoC devices with integrated GPS enable location tracking via a dispatcher application. This is an essential tool for managing, scheduling, and tracking vehicle fleets and remote teams in real time. PoC dispatch applications that support Geo Fencing enable alarm triggers when employees enter or exit the virtually defined territories. Dispatchers are typically web-based applications allowing for easy deployments and minimal start-up costs.

Scalable for Small Businesses and Large Enterprises

PoC systems enable adding many users quickly to any size deployment, so they are scalable for small/medium sized businesses and large enterprises with thousands of users. Large Enterprises can have access to a PoC Systems Operations Management and can run their own PoC system to:

- Define geographic segmentation for multiple locations so users only call other users at the same location
- Remotely manage and update call groups across the system
- Program radios in bulk, and add or remove users
- Generate network traffic reports for optimizing system configuration
- Enable privacy encryption levels
- Create a privately branded system with company logos on device and dispatch application screens

PoC Market Growth

Growth in PoC services is being driven not just by the 4G/5G/LTE technology, but also by the increase in the global mobile workforces, and the global adoption of the Internet of Things (IoT). At its peak, Nextel had over twenty million subscribers, proving the demand for wide-area voice and data workforce communications. The following market growth projections from leading technology research firms show strong growth in the Push-to-Talk over Cellular market over the next several years.



Markets and Markets – Markets and Markets predicted that the push-to-talk over cellular market will grow at a 10.5% a Compound Annual Growth Rate (CAGR) over the next four years, with the greatest growth taking part in the Commercial sector.



Allied Market Research – The push-to-talk over cellular market size was valued at \$3.43 billion in 2019, and is projected to reach \$6.95 billion by 2027, growing at a Compound Annual Growth Rate (CAGR) of 9.4% from 2020 to 2027



Persistence Market Research – Push-to-talk over cellular market revenue totaled \$3.9 billion in 2020, and is expected to reach \$12.4 billion by 2031, increasing at a CAGR of over 11% through 2031.

Who Uses PoC?

Enterprises and organizations which use PoC services are looking for wide-area workforce communications with low start-up and operational costs. PoC is particularly useful for businesses with multiple locations, mobile workforces, and vehicle fleets. PoC also provides a cost-effective solution for organizations where traditional Land Mobile Radio (LMR) solutions do not support broadband applications, and the availability of licensed radio frequency spectrum is limited or unavailable.

- Security Professionals
- Facility Managers
- Teachers and Educators
- Fleet Managers and Drivers
- Occupational Health Managers
- General Managers
- Logistics Managers
- Maintenance Crews
- Custodial Staff



PoC is also an excellent option for any organization that is currently using traditional two-way radios. Since LTE has excellent nationwide coverage, and Wi-Fi is nearly ubiquitous in all buildings and facilities, PoC provides a reliable and cost-effective radio communications solution.

- Schools and Universities
- Hospitals
- Waste Management
- Convention Centers
- Factories and Warehouses
- Office Buildings
- Hotels and Resorts
- Agriculture
- Transportation and Logistics



PoC Compared to Traditional DMR Radio Systems

Traditional private DMR radio networks require up-front Capital Expenditures (CAPEX), that include FCC licensing, and the cost of radio equipment infrastructure. Wide area coverage is available by leasing access to a Specialized Mobile Radio (SMR) network, defined by the FCC “to provide land mobile communications on a commercial basis. A traditional SMR system consists of one or more base station transmitters, one or more antennas, and end user radio equipment that usually consists of a mobile radio unit either provided by the end user or obtained from the SMR operator for a fee.”

PoC systems can be deployed from an Operational Expenditures (OPEX) budget as a low-cost, subscription-based service, or as a customer-owned CAPEX system – typically at a lower cost than DMR radio systems.

DMR Systems have limited range based on the system infrastructure and number of antennae. PoC systems have a nationwide range based on the mobile network operator’s LTE coverage map.

PoC Devices vs. Smartphones

Organizations may choose to have employees use personal smartphones or company-issued smartphones for internal company business communication. BYOD smartphones can be used as PoC devices with an Android app installed on the device.

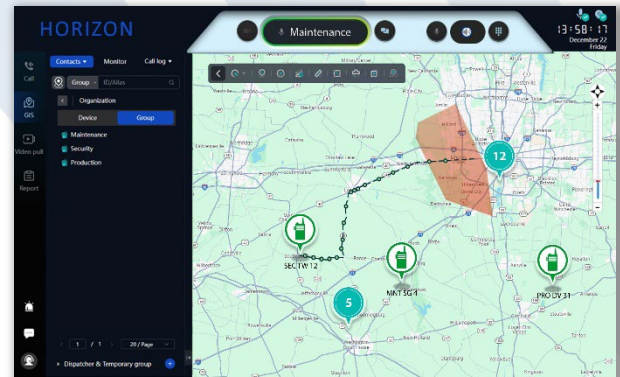
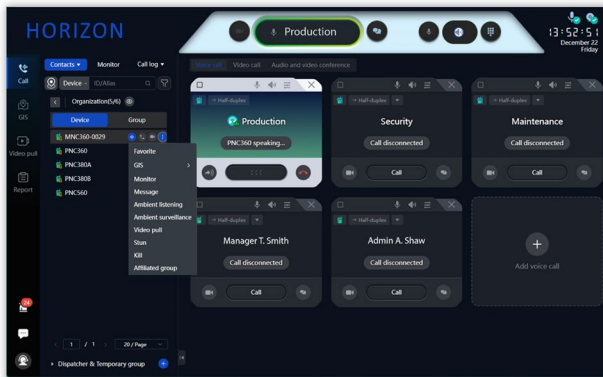
Companies may have employees using smartphones as push-to-talk devices for group communications, but there are several advantages to providing employees with dedicated PoC devices.



- PoC mobile radios and handheld radios with car docking kits are safe and legal to use while driving
- PoC devices and service plans are much less expensive than smartphones and cellular plans
- PoC devices ensure employees use the devices exclusively for business-related communications and reduces the distractions of personal smartphones
- Instant Push-to-Talk group and individual calls without launching apps, looking up contacts, or waiting for users to answer the phone
- PoC mobile computers are compact handheld devices that run Android business apps
- PoC devices provide features typically not supported on smartphones:
 - Rugged devices that withstand high impact (dropping), water submersion, and dust
 - High volume speakers and noise cancelling technology for use in loud environments
 - High power batteries that guarantee calling availability for the entire work shift
 - One touch emergency alarms for worker safety

PoC Dispatching Applications

PoC systems include web-based dispatching applications that can be run on a web browser. Dispatch applications provide a comprehensive fleet dispatching and group calling interface for instant nationwide voice calling and GPS location tracking. Group calls can be made to pre-programmed groups, or dynamic call groups can be built by selecting users from a list or within an area on the dispatch map.



Dispatch applications can track multiple user locations and travel routes with job site time stamps to manage and dispatch vehicle fleets and remote workers. Dispatchers can draw geofences on the map to define boundaries for territories and service areas. Alarms can be generated when users enter or leave geofenced areas.

PoC Subscription Services

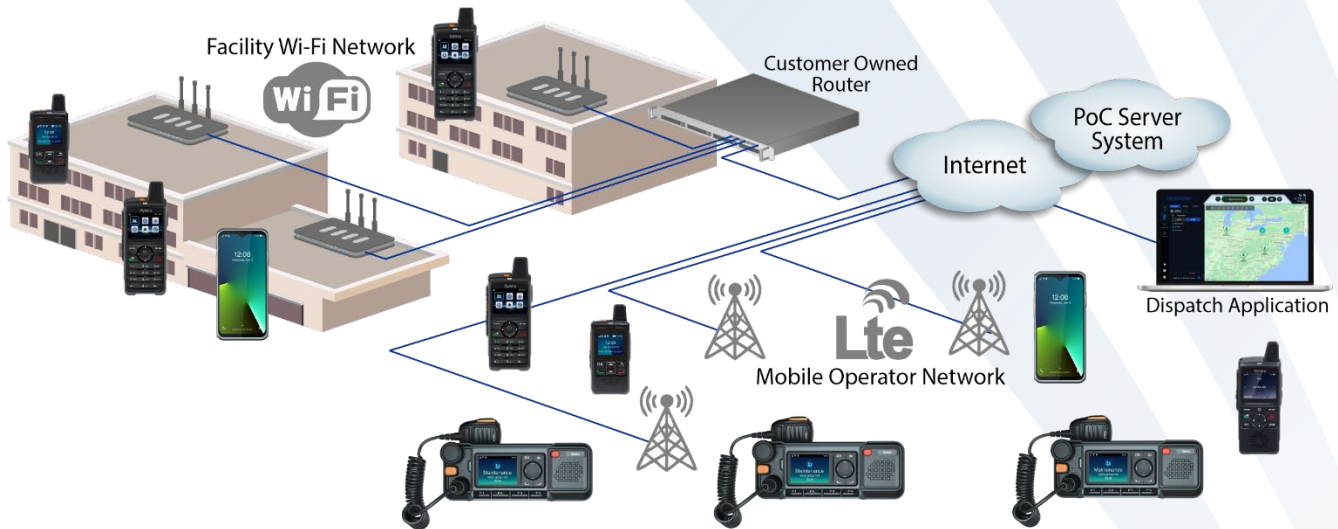
PoC radio services are typically purchased on a subscription basis. The subscriptions are typically available low-cost annual plans that can include the PoC devices, or the PoC devices can be purchased and owned by the subscriber. The subscription costs include the SIM card which has a monthly service fee from the mobile cellular operator (AT&T or T-Mobile for example) to access the LTE network through the SIM data plan.

The Benefits of PoC Subscription Services

- PoC subscription plans are very inexpensive and cost-effective
- OPEX cost model with minimal up-front costs and low monthly or annual payments
- The easiest and fastest way to get reliable wide-area radio communications
- No investment in depreciating radio network infrastructure
- No equipment to house, power, and maintain
- No FCC frequency licenses required
- Scalable with unlimited subscribers so the system can easily grow with the needs of the organization
- Flexible deployment options with Wi-Fi and LTE networks

PoC Subscription Application Example

This diagram illustrates how PoC devices on subscription plans access a cloud based PoC system using Wi-Fi and cellular 4G/5G/LTE networks. The PoC devices on the Wi-Fi network (upper left of the diagram) are utilizing the existing wireless network infrastructure of the facility to access the cloud based PoC server. These devices include PoC radios, PoC smartphones, and PoC bodycams. It is important to note that a Wi-Fi coverage survey should be conducted to ensure there is sufficient coverage for the devices to access the cloud based PoC server anywhere in the facility. Wi-Fi connectivity is optional and 4G/5G/LTE coverage can be used if there is no high-quality Wi-Fi network available.



The PoC devices on the nationwide 4G/5G/LTE network (lower right of the diagram) use SIM cards to access the mobile operator's cellular network with an Access Point Name (APN) that routes the data traffic to the mobile operator's internet gateway. The PoC devices on the 4G/5G/LTE network include mobile PoC radios installed in vehicles, in addition to the same devices as on the Wi-Fi network. The PoC devices on the Wi-Fi network access internet and the PoC server through the customer's network router.

PoC subscriptions can also include a web-browser based dispatch application that accesses all the PoC devices on the system via the internet. This access can be on-site or any remote location with internet access. The dispatch application provides a fleet dispatching and group calling interface for nationwide voice calling and GPS location tracking.

Customer Owned PoC Systems

PoC radio systems can also be owned by the customer as a Capital Expenditure (CAPEX) purchase. This allows the customer to make a single purchase payment for the PoC system without any recurring subscription costs. Customer owned systems still require subscriptions for the SIM cards from the mobile cellular operator to access the LTE network through the SIM data plan.

Customer owned PoC systems have a maximum number of users, which is typically around 200 devices that can access the PoC server (or controller). This is due to the use of a single, cost-effective PoC server; compared to PoC servers on the cloud used for subscription services that utilize several high-performance servers in a carrier grade data center that can scale to an unlimited number of users.

The Benefits of Customer Owned PoC Systems

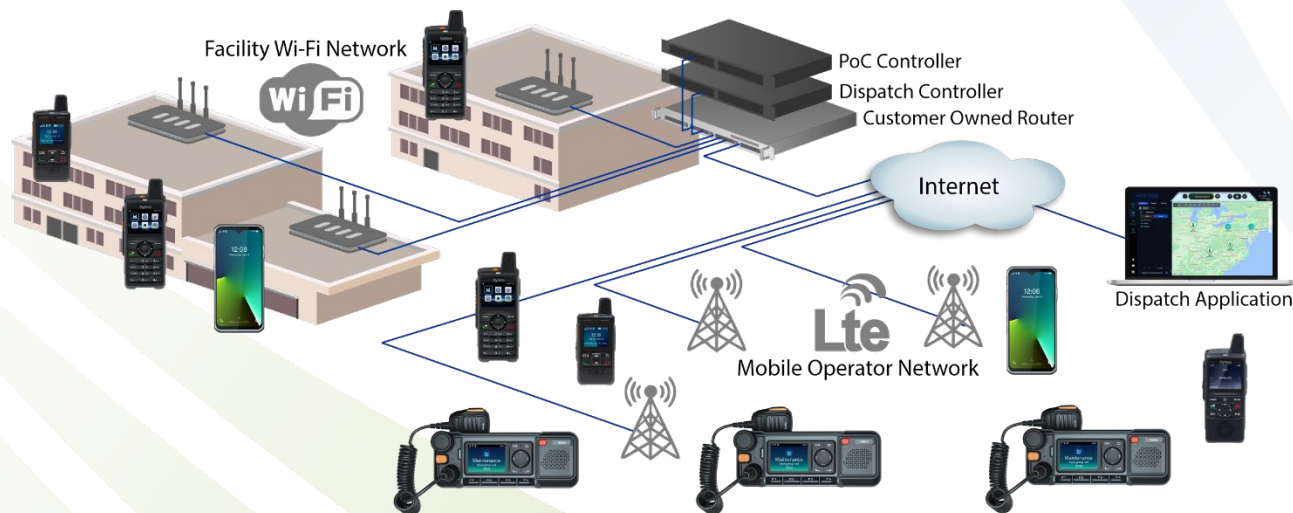
- Customer owned PoC systems can have a lower Total Cost of Ownership (TCO) over several years compared to a PoC subscription plan
- CAPEX cost model with all costs up front in a single purchase and no monthly service payments
- Fast deployment of reliable wide-area radio communications
- Simple equipment installation of a PoC server (AKA controller or network appliance)
- No FCC frequency licenses are required
- Flexible deployment options with Wi-Fi and LTE networks

Customer Owned PoC System Application Example

This diagram illustrates how PoC devices access a customer-owned PoC server using Wi-Fi and cellular 4G/5G/LTE networks. This is like the subscription application diagram, but instead of the PoC server residing on the cloud, it resides at the customer premises.

The PoC devices on the Wi-Fi network are utilizing the existing wireless network infrastructure of the facility to access the customer-owned PoC server. The PoC server can be connected to multiple Wi-Fi networks at various locations through an IP network or VPN.

Wi-Fi connectivity at the facility is optional and 4G/5G/LTE coverage can be used if there is no Wi-Fi network available.



The PoC devices on the nationwide 4G/5G/LTE network use SIM cards to access the mobile operator's cellular network with an Access Point Name (APN) that routes the data traffic to the mobile operator's internet gateway. The PoC server accesses the internet through the customer's network router.

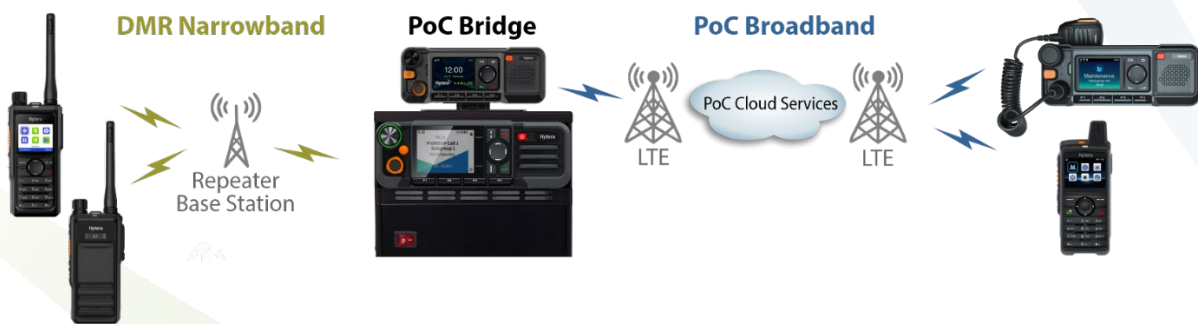
Customer-owned PoC systems with a dispatch application typically require an additional dispatch server. The dispatch web-browser based application accesses the dispatch server via the internet or a direct LAN connection.

PoC Subscription and Customer Owned Comparison

Subscription Based PoC Services	Customer Owned PoC System
OPEX subscription payment model (may purchase or rent PoC devices)	CAPEX purchase model where the customer owns all the PoC devices and the PoC server(s).
Dispatch application with license subscription	Customer owned dispatch server
Unlimited number of PoC users	Up to 200 PoC users
Flexible deployments on Wi-Fi and 4G/5G/LTE networks	
No FCC frequency licenses required	

Connecting PoC Devices to Existing Radio Systems

PoC bridging systems provide a simple, reliable, and cost-effective Radio over IP (RoIP) gateway between broadband PoC radios and a variety of narrowband DMR and analog radio systems. PoC bridging systems enable low-latency group radio calling connectivity between PoC radios and analog radios or DMR standards compliant radio systems. A typical use for a PoC bridge is adding fleet vehicle communications with PoC mobile radios to an existing single site DMR or analog radio system. This provides a cost-effective way to add PoC wide-area communications and preserves investments in existing DMR and analog radio systems.



The PoC bridge provides a single talk channel interconnect from PoC to DMR radios with a special mobile radio hardware and software system that interconnects and re-broadcasts communication between the PoC and DMR or analog radio systems. Multiple talk channels can be deployed between the two radio systems by installing additional PoC bridges.

Criteria for Selecting PoC Services and Devices

PoC Systems and Subscription Services

Is the Service Reliable? PoC subscription services from well-known companies are having issues with regular system outages. When selecting a PoC service platform provider, check on the system reliability and service availability. Ask if they have had service outages, for how long, and how often. Select a PoC service that runs on the latest high-capacity and high-performance servers, and ones that have geographically diverse redundancy. That means that if a server or even an entire datacenter goes down, the service will switch to another back-up server to in a different location with no down time for the subscribers.

Is the System Scalable? PoC subscriptions should enable adding PoC subscribers to your radio system quickly and easily. For large enterprises, providing access to the PoC system management enables complete customer control of the system with the ability to silo users at different locations, create and modify call groups, and quickly program and deploy radios across the system.

Is There a Dispatching App? If your organization has fleet vehicles and remote workers, then a professional web-based dispatching app is a necessity for centralized communications, location tracking, and making multiple group calls.

PoC Devices

Are They Well Built and Reliable? There has been a race to the bottom over the past few years on PoC device pricing. Consumers have benefitted from this trend with lower priced PoC devices, but it has also resulted in cheap, low-quality PoC devices on the market. There are visible differences in quality between different PoC manufacturers' devices, so inspect them carefully. Some PoC devices have only a six-month warranty and have high failure rates after the warranty expires. Look for devices that have at least a two-year warranty from manufacturers that are confident in their device quality and back it up with a longer warranty.

Are They Rugged? It is important for PoC devices to stand up to long-time use in tough environments and deliver extended life value. PoC devices are used over long shifts and need to stand up to everyday use and abuse that includes dropping on hard surfaces, getting wet or submerged in water, getting dirty and exposed to fine dust particles. Look for devices that are IP67 and IP68 rated for water and dust protection. IP67 and IP68 ratings ensure the device is impenetrable by water (sprayed water and full submersion) and fine dust particles. A MIL-STD rating means the devices are durable to withstand dropping and repeated impacts, along with exposure to extremely high humidity.

Is Audio Quality Loud and Clear? There is also a discernable difference in audio quality between different PoC devices on the market. Many devices have substandard audio quality, especially when used in a loud environment. Seriously, what is the point of having radio communication if you can't understand the person speaking? Make sure the PoC devices have high-quality loudspeakers and digital noise cancellation that separates human voice from background noise in real time. The latest PoC devices have AI-based noise cancellation and can learn the human voice to remove background noise as loud as 60db for crystal clear radio communications.

Are There the Right PoC Devices and Features to Meet Your Specific Needs? When provided with a wide variety of devices, companies can select the devices that match the specific needs of staff and departments instead of being sold what happens to be in stock. This ensures that the PoC communications solution is highly effective, aligns costs with value, and the system is utilized to its full capabilities by employees.

Handheld PoC radios are available as ultra-compact and cost-effective devices that provide excellent value for employees that need simple voice communications. Handheld PoC radios are also available with a full set of features that can include cameras for sharing pictures and video, and keypads for configuring features and sending text messages. PoC devices are also available as mobile smart computers for employees and managers that need a mobile device that runs business apps in addition to providing PoC communications. These are available with cameras, and infrared scanners for reading barcodes.

Many organizations rely on cell phones and handheld devices for communicating with drivers in fleet vehicles. This is an unsafe practice that brings liability to the company, and it is illegal in most states. Mobile PoC radios with handheld microphones are a legal and DOT approved way to safely communicate with drivers who can make and receive calls while keeping their eyes on the road.

The Proof is in the Product. The best way to find the right PoC services and devices for your organization is to get a demonstration and test the PoC devices firsthand before you buy. Check the PoC system yourself and determine if the device quality, service quality, and audio quality is to your standards, and use the features on the devices and decide if they are beneficial to your specific business needs.

Hytera PoC Solutions

HORIZON Push-to-Talk over Cellular Platform

HORIZON

[HORIZON](#) is a subscription-based Push-to-Talk Over Cellular (PoC) service that provides instant individual and group calling over the most advanced and reliable cloud-based communications network. HORIZON utilizes the 4G/5G/LTE cellular infrastructure of Mobile Network Operators and Wi-Fi networks to access the cloud-based PoC servers. 4G/5G/LTE cellular networks enable unlimited coverage area so radio users are untethered by the range of repeaters and base stations used in traditional radio networks.

HORIZON supports all the rugged and feature rich Hytera PoC devices.

HORIZON has unparalleled reliability and service availability with high-performance and high-capacity cloud servers with geographically diverse failover. So even if an entire data center goes down, the servers will switch to new redundant location so there is no service outage to HORIZON subscribers.

Hytera also provides a customer-owned PoC system for organizations that prefer to control their own system rather than pay for a subscription-based cloud PoC service.

Hytera PoC Devices

Hytera provides a wide variety of PoC handheld radios, PoC mobile radios, and PoC handheld smart devices. These compact, rugged, and easy-to-operate handheld devices enable group voice communications over Wi-Fi and nationwide cellular 4G/5G/LTE networks.



The key features of the Hytera PoC devices:

- High-quality devices backed by a two-year warranty
- Wide variety of device types and features to align the devices with any organizations' specific needs
- AI-Based noise suppression and high-volume speakers for industry-leading voice quality in loud environments
- Built-in Wi-Fi that automatically switches over to the LTE network when out of Wi-Fi range
- GPS enables tracking and positioning for the dispatching application
- Ruggedized to IP67/IP68 and MIL-STD-810 G/H standards
- Supports instant individual and group calling and texting, and sharing pictures and videos
- Mobile PoC radios are DOT approved and legal to use in vehicles while driving
- Car kits are available for specific handheld PoC radios to provide safe, and DOT approved use in vehicles
- Powerful battery provides reliable operation for over 24 hours
- Multi-unit chargers available for most PoC handheld devices
- Built-in Bluetooth supports wireless connection with audio accessories for hands-free operation
- PoC handheld smart devices run any Android business app for a true unified communication device

Hytera BRIDGE PoC Radio Gateway

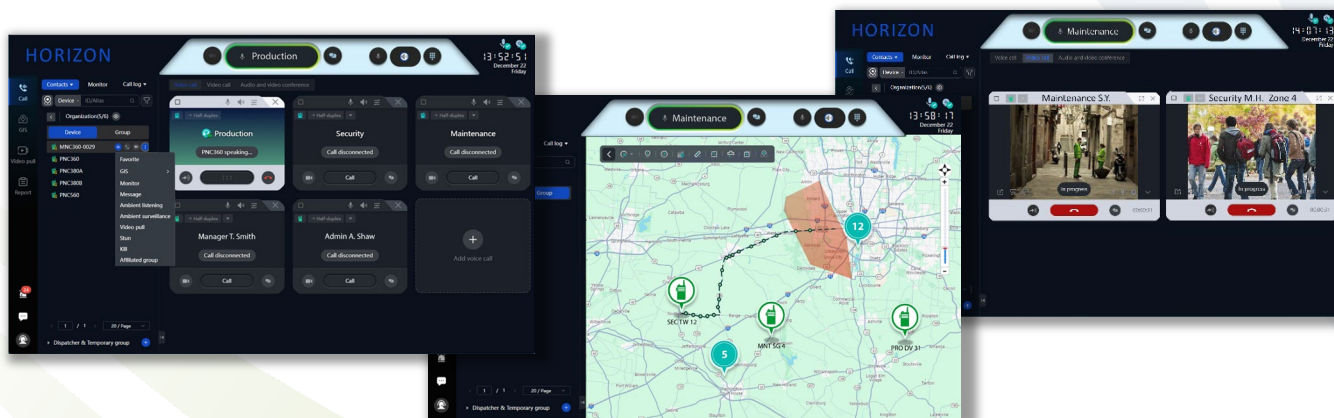
[Hytera Bridge](#) is a Radio over IP (RoIP) gateway that enables connectivity between PoC radios and existing Analog and DMR standard compliant and radio systems. Add nationwide PoC communications to existing two-way radio systems with simple, reliable, and cost-effective radio system gateway

- Delivers low latency communications between PoC and DMR radios
- Enables a variety of flexible system interconnect configurations
- Preserves investments in existing DMR and Analog systems



HORIZON Dispatch

[HORIZON Dispatch](#) is a powerful web-based dispatch and fleet management application that tracks driver locations and travel routes with time stamps. The dispatch application works with the GPS built into Hytera PoC devices and supports geofencing capabilities.



HORIZON Dispatch supports instant group calling as well as individual calling. Dynamic call groups can be quickly created with a simple list selection or geographically by selecting an area on the dispatch map. The dispatcher may stun (turn off) and reactivate a radio and receive emergency alarms. HORIZON Dispatch supports call record storage and reporting to instantly review, play, search, and export logs for calls, messages, emergency alarms, geofencing alarms, and overspeed alarms.

About Hytera US Inc

Hytera US Inc is a US corporation with offices, warehouses, and support facilities based in Irvine, California and Sunrise, Florida.

Hytera US Inc boasts an experienced staff of professionals that have been implementing innovative radio communication solutions in the US for more than 15 years and are established specialists in DMR, push-to-talk over cellular, and related communications technologies.

We regard ourselves as a solution provider whose core area of expertise is providing cost-effective radio communications systems of the highest reliability, durability, and quality.

Hytera US Inc is a rapidly growing company with an expanding US radio communications market share. Our solutions are provided to a broad base of customers that range from small to medium sized businesses, Fortune 500 companies, and other organizations. There are hundreds of thousands of users nationwide from the industrial, education, hospitality, transportation and logistics, security, construction, energy, and health care markets.

Hytera US Inc focuses on products specifically designed for the US market and develop our own customized systems and software solutions.

- Push-to-Talk over Cellular Devices and Systems
- DMR Two-Way Radios
- Analog Two-Way Radios
- Wide-area and High-Capacity Radio Systems and Applications

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