Push-to-Talk Over Cellular (PoC)

WHITE PAPER

Understanding PoC Services, Systems, and Devices

Contents

Push-to-Talk Over Cellular (PoC) and Wi-Fi Overview

Introduction

This white paper will cover:

- An introduction to how Push-to-Talk over Cellular (PoC) works using 4G/LTE and Wi-Fi networks, who uses PoC, and the general features and benefits of PoC systems

- Review of a PoC services subscription based operational expenditure (OPEX) model

- Review of a customer-owned PoC system with a capital expenditure (CAPEX) model

- Comparison of a subscription based OPEX model and a customer-owned CAPEX model

- Overview of the Hytera HALO PoC solutions and devices available

What is PoC?

PoC provides group communication services over both Wi-Fi, 4G 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 and Wi-Fi infrastructure to create a wide-area radio network that provides national coverage for voice and video 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.
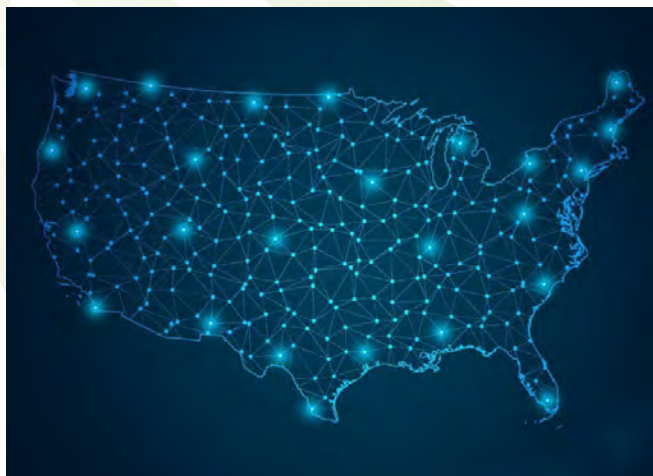
Today, PoC provides the best of both narrowband digital radios and broadband 4G/LTE networks. PoC radios support the advanced features of Digital Mobile Radios (DMR), including messaging, instant group calling, GPS location tracking, and emergency notifications.   Combining this functionality with Wi-Fi and 4G/LTE cellular networks provides the 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 and video 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/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/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 controllers (network appliances) that are operated by a PoC platform service provider. PoC controllers can also be privately owned and operated by the customer. Gateway routers provide connectivity between the 4G/LTE network and the cloud hosted PoC controller. Dispatch Applications and the Management Application (used to configure customer accounts) are connected to the PoC cloud server through the internet.

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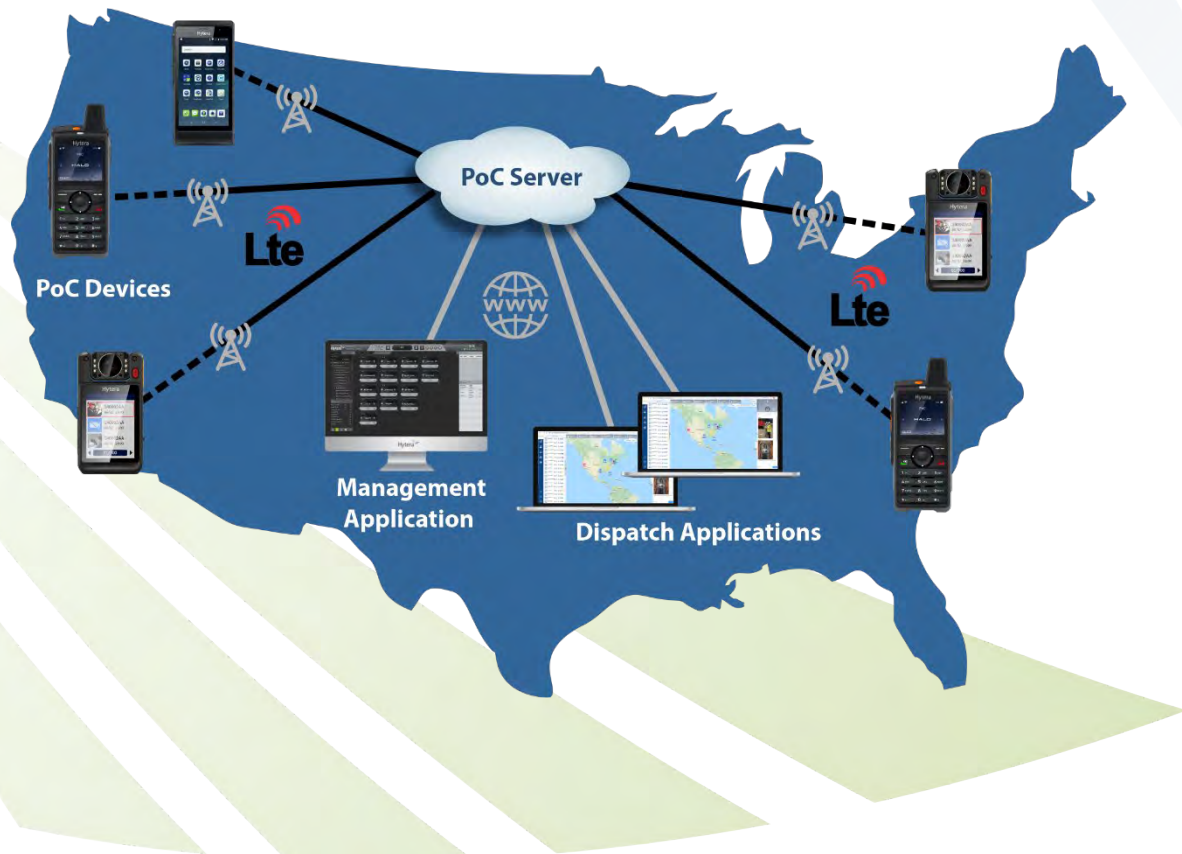
PoC Group Calling

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/LTE networks with the installation of a SIM card. PoC devices can also connect to Wi-Fi networks for a single-site deployments (that do not require SIM cards), or multiple Wi-Fi sites can be connected over an IP Network or VPN.

No Radio Infrastructure or FCC Frequencies Required

Since the network infrastructure for PoC is existing cellular 4G/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 work out-of-the-box with SIM cards pre-installed, and system configuration is done through an easy-to-use web-based dispatch application.

Instant Push-to-Talk Voice and Video 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 with cameras and video capabilities enable instant picture messaging and video conferencing with individuals or groups using dispatcher applications.
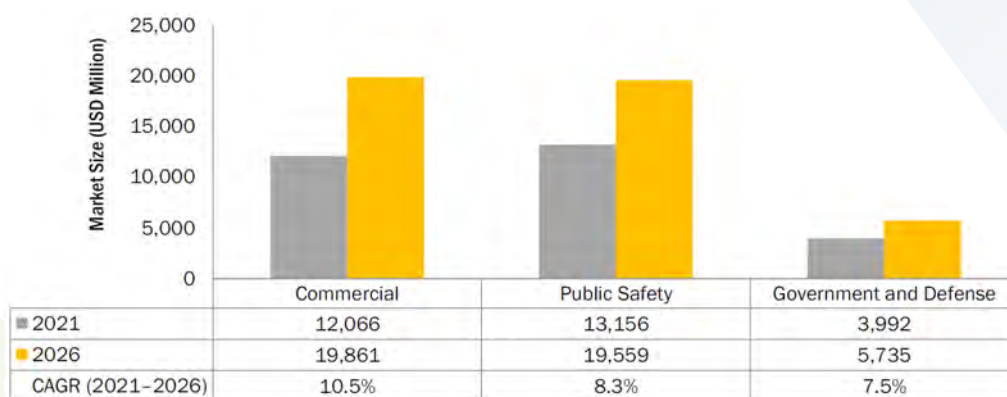
GPS Location Tracking and Dispatching

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

PoC Market Growth

Growth in PoC services is being driven not just by the 4G/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 – In their January 2022 report, Markets and Markets projected that the push to talk over cellular market will grow dramatically over the next four years, with the greatest growth taking part in the Commercial sector.

	Commercial	Public Safety	Government and Defense
2021	12,066	13,156	3,992
2026	19,861	19,559	5,735
CAGR (2021–2026)	10.5%	8.3%	7.5%

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.

Omdia / Informa Tech – The global PoC client installed base is projected to growth at a CAGR of 17% between 2020 and 2024, taking the number of clients from 3 million in 2020 to 5.6 million in 2024.

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
- 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
- Convention Centers
- Factories and Warehouses
- Office Buildings
- Hotels and Resorts
- Agriculture
- Transportation and Logistics

PoC Vs. Traditional DMR Radio Systems

Traditional private DMR radio networks require significant 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.

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 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 mobile radios and handheld radios with car docking kits are safe and legal to use while driving
- PoC devices provide features typically not supported on smartphones:
    - o Rugged devices that withstand high impact (dropping), water submersion, and dust
    - o High volume speakers and noise cancelling technology for use in loud environments
    - o High power batteries that guarantee calling availability for the entire work shift
    - o One touch emergency alarms for worker safety

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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 and video 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.
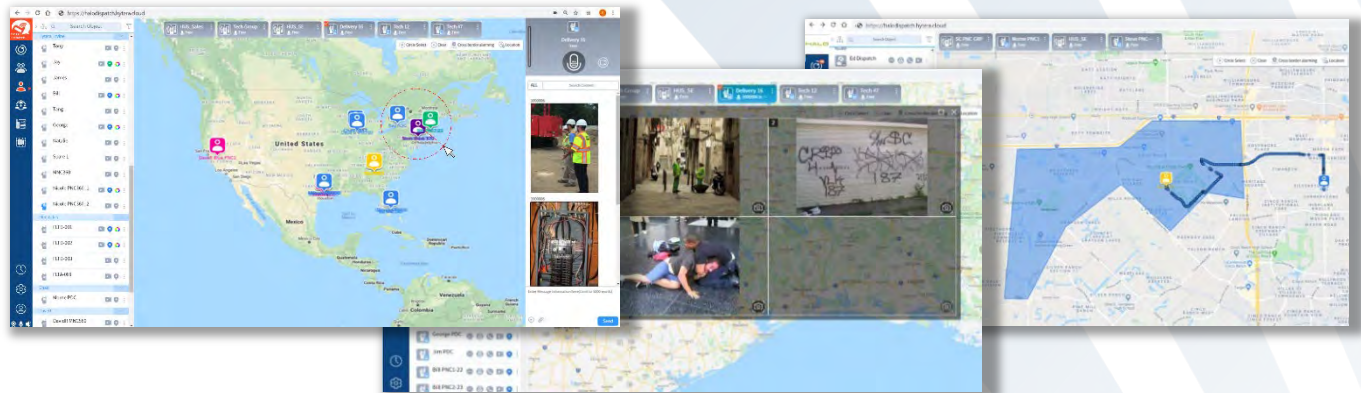
Dispatch applications can track multiple user locations and travel routes with job site time stamps to manage and dispatch remote workers. Dispatchers can draw geofences on the map to define boundaries for territories and service areas. Alarms can be generated when users enter or leave a geofenced areas. Note that location tracking is GPS based, which does not track locations of indoor users in a large facility like a convention center.

Subscription Based PoC Services

PoC radio services can be purchased on a subscription basis. The subscriptions are available as monthly or annual plans that can include the PoC devices, or the PoC devices can be purchased and owned by the subscriber. The subscription costs typically include the SIM card which has a monthly service fee from the mobile cellular operator (AT&T 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

Subscription Based PoC Application Example

This diagram illustrates how PoC devices on subscription plans access a cloud based PoC system using Wi-Fi and cellular 4G/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 controller. 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 controller anywhere in the facility. Wi-Fi connectivity is optional and 4G/LTE coverage can be used if there is no high-quality Wi-Fi network available.
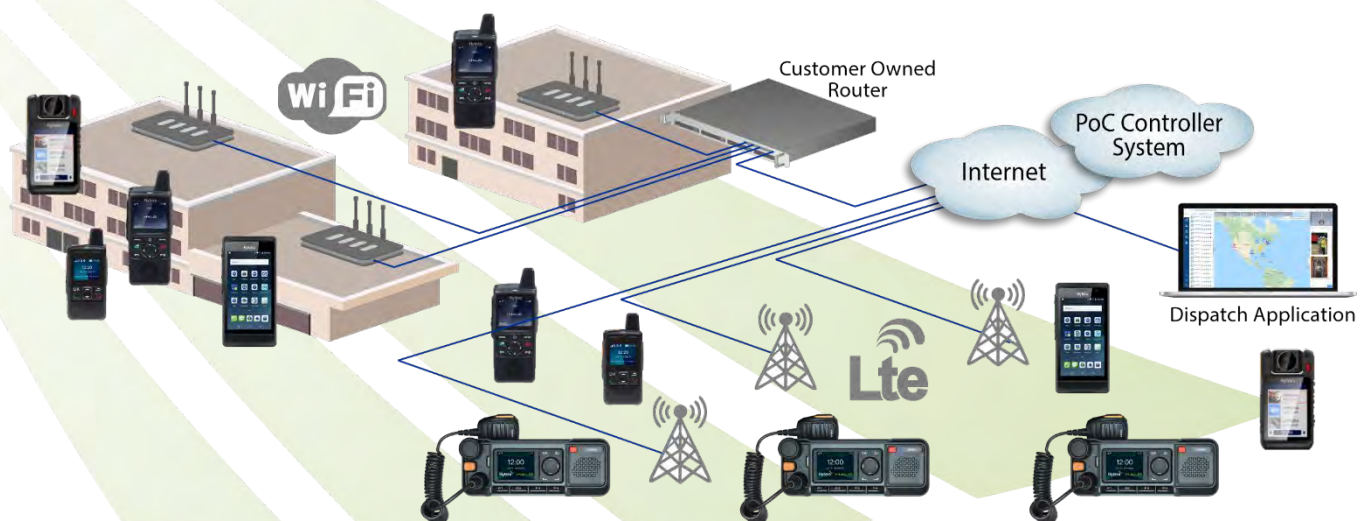
The PoC devices on the nationwide 4G/LTE network (lower right of the diagram) use SIM cards to access the mobile operator's cellular network with an Access Point Name (APN) that routes the data traffic to the mobile operator's internet gateway. The PoC devices on the 4G/LTE network include mobile PoC radios installed in vehicles, in addition to the same devices as on the Wi-Fi network. The PoC controller accesses the internet through the customer's network router.

PoC subscriptions can also include a web-browser based dispatch application that accesses the all the PoC devices on the system via the internet. The dispatch application provides a fleet dispatching and group calling interface for nationwide voice and video 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 controller. This is due to the use of a single, cost-effective PoC controller; compared to PoC controllers on the cloud used for subscription services that utilize several high-performance devices in a carrier grade data center that can scale to an unlimited number of users.

PoC systems are available with entry-level and advanced PoC controllers. Entry-level systems provide very cost-effective PoC communications. They support Wi-Fi and 4G/LTE network access, group voice calling, text messaging, and a limited number of PoC devices. Advanced PoC controllers add capabilities and functions such as dispatch applications, and supporting video calls from PoC bodycams and other video capable PoC devices.

## 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 controller (network appliance)
- No FCC frequency licenses are required
- Scalable to 200 users so the system can easily grow with the needs of the organization.
- 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 controller using Wi-Fi and cellular 4G/LTE networks. This is similar to the subscription application diagram, but instead of the PoC controller residing on the cloud, it resides at the customer premises. PoC controllers are typically available in cost-effective basic models and advanced models that support more features and users. This application diagram has an advanced PoC controller that supports a dispatch application and video calls.

The PoC devices on the Wi-Fi network are utilizing the existing wireless network infrastructure of the facility to access the PoC controller. A Wi-Fi coverage survey is recommended to ensure there is sufficient coverage for the devices to access the PoC controller anywhere in the facility because coverage for Wi-Fi users is based in the quality of the Wi-Fi network. The PoC controller 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/LTE coverage can be used if there is no Wi-Fi network available.
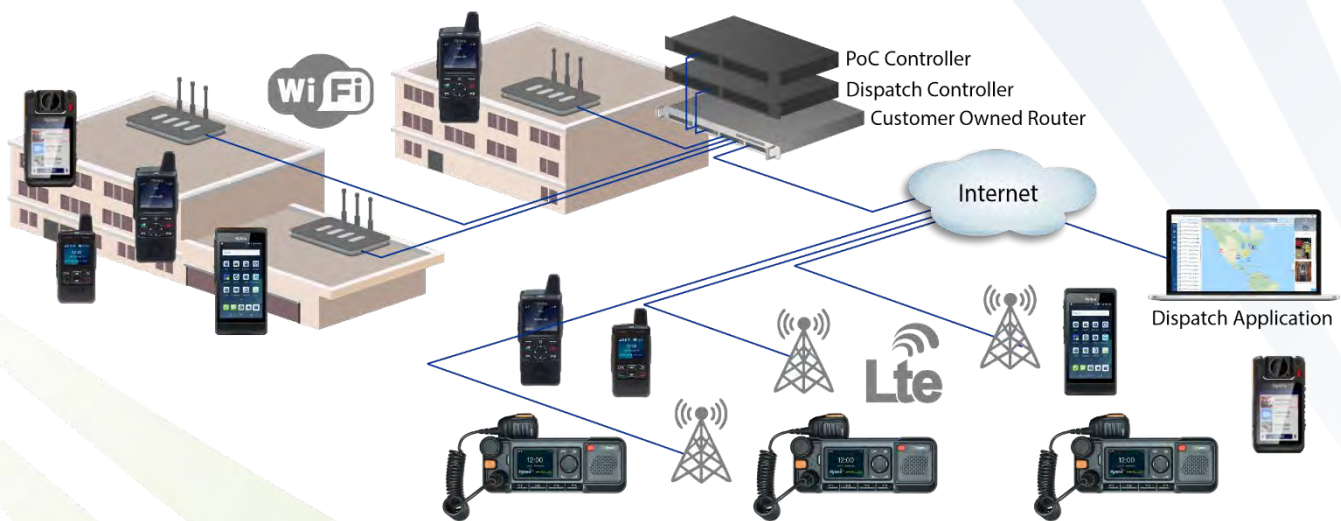
The PoC devices on the nationwide 4G/LTE network use SIM cards to access the mobile operator's cellular network with an Access Point Name (APN) that routes the data traffic to the mobile operator's internet gateway. The PoC controller accesses the internet through the customer's network router.

Customer-owned PoC systems with a dispatch application typically require an additional dispatch controller. The dispatch web-browser based application accesses the dispatch controller 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 controller(s).
Dispatch application with license subscription	Customer owned dispatch controller
Unlimited number of PoC users	Basic Controller – Up to 200 PoC users Advanced Controller – Unlimited PoC users
Flexible deployments on Wi-Fi and 4G/LTE networks	
No FCC frequency licenses required	

PoC Use Cases

Three use case scenarios compare different numbers of users with PoC devices located at a single facility and remote mobile users.

Use Case #1 Most users at a local facility with some remote users

This scenario applies to hotels with a few shuttles, convention centers, sports venues, theme parks, and any organization where most communications at a single site location.

PoC Subscription Services – If users are located at a one or more facilities with good Wi-Fi coverage, then there is no need to pay for SIM cards for these on-site devices. The SIM cards can be used for the remote users with PoC radios or mobile PoC radios in vehicles. A dispatch application subscription is typically not required due to the limited number of remote users.

PoC Customer Owned Systems – In this use case, an basic entry-level PoC controller is used, and there is no need for a dispatching application since there are only a few remote users. Again, most users are located at a single facility with good Wi-Fi coverage and the SIM cards and associated subscription fees can be reserved for the small group of remote users.

Use Case #2 Mostly remote users

This scenario applies to security companies providing personal security and protecting many locations, construction companies with several work sites, and companies with large vehicle fleets such as trucking companies, tow-truck operators, plumbing and electrical subcontractors, and delivery companies. Wi-Fi access is not required since most of the users in this scenario require wide area 4G/LTE cellular communications coverage.

PoC Subscription Services – Most or all the remote users are using mobile PoC radios in vehicles with SIM cards for nationwide 4G/LTE network access. One or more subscriptions are required for the dispatch application.

PoC Customer Owned Systems – Most or all the remote users (unlimited in number) are using mobile PoC radios in vehicles with SIM cards for nationwide 4G/LTE network access. This requires an advanced PoC controller and a dispatch controller for the dispatch application.

Use Case #3 Many local facility users and many remote users

This scenario applies to security companies, schools with a large bus fleets, warehouse and logistics operations, and companies with several facilities and service fleets.

PoC Subscription Services – For users that stay at a single facility with good Wi-Fi coverage, then there is no need to pay for SIM cards in the devices for these on-site devices. SIM cards are used for the remote users with PoC radios or PoC mobile radios in vehicles. A dispatch subscription is required for managing the remote users.

PoC Customer Owned Systems – For users that stay at a single facility with good Wi-Fi coverage, then there is no need to pay for SIM cards in the devices for these on-site devices. An advanced PoC controller is used along with a dispatch controller and dispatching application for remote users.

Hytera HALO PoC Solutions

Hytera HALO is a suite of PoC services, systems, applications, and devices that provide nationwide PoC group communications.

Hytera HALO PoC Services and Systems

HALO Nationwide is a subscription based PoC solution with nationwide connectivity over cellular 4G/LTE and Wi-Fi networks

HALO OnSite and OnSite Plus are customer owned PoC systems with nationwide connectivity over cellular 4G/LTE and Wi-Fi networks.

HALO Bridge is a Radio over IP (RoIP) gateway that enables connectivity between PoC radios and existing DMR and Analog radio systems.

Hytera HALO PoC Devices

Hytera provides a wide variety of PoC handheld radios, PoC mobile radios, PoC handheld smart devices, and PoC bodycams. HALO systems and services also support the HALO Android app for Bring Your Own Device (BYOD) users with cell phones. These compact, rugged, and easy-to-operate handheld devices enable group voice and video communications over Wi-Fi and nationwide cellular 4G/LTE networks.


The key features of the Hytera HALO PoC devices:

- Digital noise suppression and high-volume speakers for excellent 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 IP and MIL-STD-810 G or H standards
- Supports individual or group texting
- Built-in Bluetooth supports wireless connection with audio accessories for hands-free operation
- Powerful battery provides reliable operation over multiple shifts
- Multi-unit chargers available for most HALO PoC devices
- Car kits are available for specific handheld PoC radios to provide safe and DOT approved use in vehicles
- PoC handheld smart devices run any Android business app for a true unified communications device
- PoC bodycams and integrated radio design reduces equipment costs and simplifies communications
- PoC devices and bodycams with cameras support user-initiated video calls

Hytera HALO Dispatch

Hytera HALO includes 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.
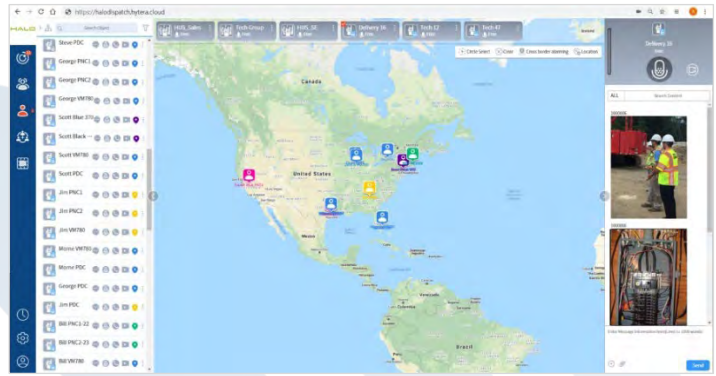
Hytera HALO Dispatch supports instant group calling as well as individual calling. Dynamic call groups can be quickly created with a simple list selection or geographically by selecting an area on the dispatch map. The dispatcher may stun (turn off) and reactivate a radio and receive emergency alarms.

Summary

Push-to-Talk over Cellular enables businesses and organizations to leverage the capabilities of advanced wide-area communications without the time and expense required to deploy traditional radio infrastructure.

- PoC systems provide key advantages, including wide area coverage, rapid deployments with no radio infrastructure or FCC licensing expenses, dispatching and GPS location tracking

- Organizations have the choice between PoC subscription services or PoC customer owned systems depending on the CAPEX or OPEX model they wish to deploy

- PoC devices are full-featured and ruggedized devices that support and enable instant individual and group push-to-talk communications, video conferencing, data services, and Wi-Fi connectivity.

PoC technology along with modern cellular and wireless networks provides the flexibility, low cost, and wide-area coverage required for modern workforce communications.

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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 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.

We focus 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
- Hytera Communications Systems and Applications

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