Caltta

Push-to-Talk over Cellular — A Viable Team Communications Solution for Now and the Future

1 Background

Push-to-talk (PTT), also known as press-to-transmit, is a special wireless communication technology of making conversations on half-duplex communication lines, by using a dedicated button to switch from voice reception mode to transmit mode. In general, push-to-talk is carried out over a dedicated frequency and within a certain territorial coverage.

Nowadays, these popular dedicated PMR systems, including TETRA, DMR, P25, PDT and analog MPT are encountering the following problems during the process of deployment, usage, operation and maintenance:

Less Capacity

- Restricted frequency resource makes it difficult to expand network capacity;
- Traditional architecture limits single-site simultaneous calls;

Narrowband Services

- Support only traditional voice PTT services and narrowband data services, which can hardly meet the growing versatile requirements from modern workers and employees;
- Unable to meet increasing demand for broadband data applications from different industries;

Limited Coverage

- Traditional dedicated PTT systems can only provide regional coverage instead of national coverage;
- With the persistent increase in mobile workforces of industries such as transportation, logistics, maintenance and repairs, not to mention emergency response and government agencies, a fixed regional coverage can hardly meet this need;
- Cannot offer continuous coverage for indoor and underground areas;

High TCO

- High CAPEX for network construction with land acquisition, tower construction, infrastructure purchases, licensed frequency application;
- Daily operation, maintenance, upgrade, and expansion of networks and infrastructure;
- High purchase price and maintenance cost of professional PTT radios;

2 PoC Benefits

After many years of development, the PTT over cellular (PoC) network is gradually unveiled. The PoC system is different from traditional PMR systems such as TETRA, DMR, and P25. It provides the best of both narrowband PMR systems and broadband LTE networks. The PoC radios not only support features of traditional PMR systems, including messaging, instant group call, GPS location tracking, and also combine with broadband cellular networks to provide broadband data and multimedia applications, along with the national even international coverage of 3G/4G/Wi-Fi, and even 5G in the future.

Adoption of PTT over Cellular and Wi-Fi networks keeps growing steadily in the PMR market

due to its wider area coverage, lower TCO, bandwidth-free to accommodate voice and broadband multimedia communications, and integration with dispatching and customized applications:

Cost-effective Networking

- There is no need to acquire land, construct base station, apply for licensed frequency, purchase infrastructure, which can save a lot of CAPEX;
- Zero infrastructure greatly reduces the OPEX for operation, maintenance, upgrade, and expansion;
- Mature and standard PoC radios can be purchased with affordable price;

Multifunctional Services

- Besides PTT voice calls, location, SMS, also support full-duplex voice call, MMS, picture, video and broadband data;
- Abundant dispatching services and user-defined customized services;
- Broadband data applications of various industries can be realized by using PoC smart phones accessing broadband cellular networks

Wide Coverage

- As the operator's cellular network coverage becomes wider, PoC system can provide national even international coverage;
- PoC radios also support push-to-talk over Wi-Fi, providing good Wi-Fi connection in indoor and suburb areas to ensure service continuity;

Flexible Deployment

- It is convenient and easy to expand PoC site capacity according to user needs based on cellular broadband base stations;
- The PoC core network capacity can also be dynamically adjusted due to its modularized design or cloud-based deployment;
- By adopting open inter-working standards and protocols, PoC system is able to

interconnect with traditional PMR systems;

Rapid Deployment

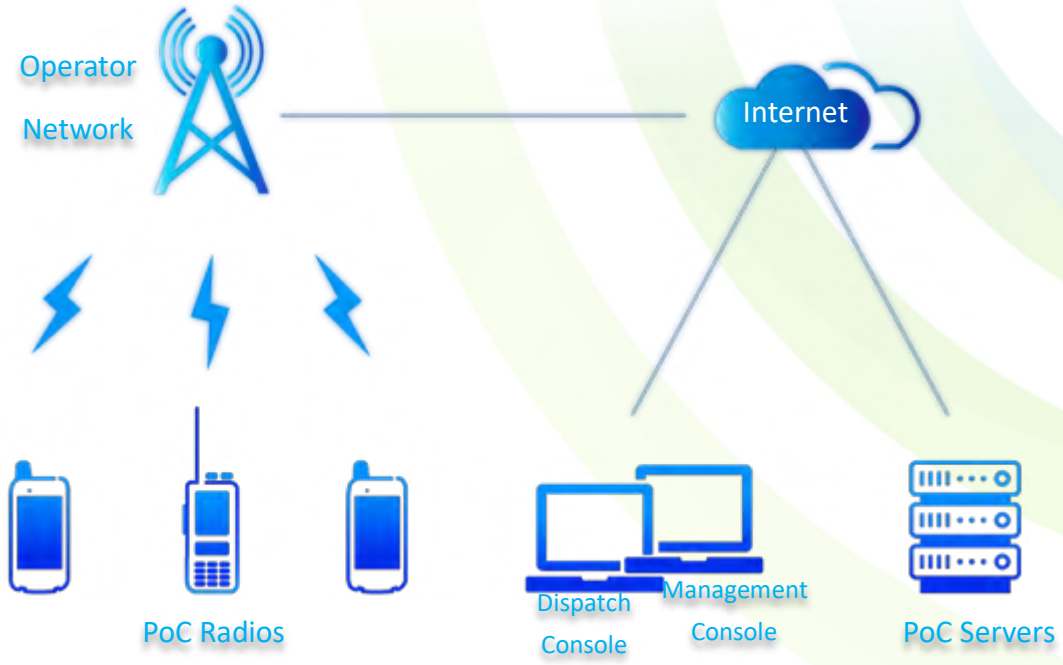
- Relying on cellular network, there is no need to construct base station, and the server supports cloud deployment, therefore, PoC can achieve rapid deployment;
- Based on carrier's broadband network, the signal and media transmission delay is greatly reduced, and the communication connection speed is faster, which can meet the business-critical and even mission-critical requirements;

Mature Industry Chain

- With the rapid development of the carrier networks and the Internet of Things, the PoC market is becoming larger year by year, and more and more manufacturers are participating in this market. New functions, application scenarios, platforms and radios are constantly being developed and put into use, and the PoC industry chain is improving and maturing, providing users with a more user-friendly PTT solution.

3 PoC System

The architectures of PoC systems from different vendors are similar. They are based on the operator's wireless networks and only need to deploy PoC servers, radios, dispatching and management consoles:



PoC System General Architecture

PoC Radios: A diversified range of radios can access to the PoC network, thus meeting the application scenarios of different users.

Dispatch Console: A dispatch terminal for the command center, it supports voice dispatch, HD video dispatch, GIS dispatch, as well as SMS and MMS dispatch. Centered on user tasks, it provides concise interaction, visually displays dispatch resources and status of users, groups, and cameras.

Management Console: A management client for PoC users, it offers general service management, including user management, group management, VPN management, and device management, including configuration management, alarm management, performance statistics, and log management.

PoC Servers: A core unit of the PoC system, it provides a diversified range of core services, such as voice, video, positioning, SMS, and MMS. The service server can be installed in distributed architecture and services can be processed simultaneously in multiple centers.

3.1 Products

3.1.1 PoC Radios

To address the needs of different users, PoC radios consist of a hardware device and an App. Taking full consideration of the differences in operators' networks and users' requirements for radios, PoC systems support radios of different classes. Radios can be divided into the following categories:

(1) High-end radio: This type of radio is equipped with the dedicated PTT key and high-standard rugged design (dust-proof, shock-proof, and water-proof). With the built-in App, it can provide rich PTT services and multimedia services, including voice, data, positioning, and video.

(2) Low-end radio: This type of radio is also equipped with the dedicated PTT key. It only provides voice and positioning, very cost-effective.

(3) Smart radio adaptation: Diversified PTT services are realized through App on smart phones and tablets. App can be installed on the smart phones running Android system.

(4) Accessories: Wireless and wired accessories are provided, including earphones and dedicated keys connected by Bluetooth.

3.1.2 Dispatch Console

(1) A professional dispatch console that can be installed on the Windows operating system, including Win7, Win8, and Win10.

(2) Rich dispatching functions, including voice dispatch, map dispatch, video dispatch, recording, and playback.

(3) Compatible with diversified accessories, including earphones and devices for quick dispatch (such as pedals), thus facilitating dispatch.

(4) Standard and open API can be used by the third party to rapidly integrate the corresponding PTT services into the existing application systems.

3.1.3 Management Console

(1) Web-based access. You can access the management console easily and rapidly through the Internet explorer.

(2) Domain-based operation management mode. The management console offers a multi-level management platform: administrator, agent, group and fleet management platforms. The management platforms at different levels have different service management functions.

(3) User-friendly interfaces are easy to use.

(4) Diversified management functions, including agent management, fleet management, group management, and user account management.

3.1.4 PoC Servers

PoC servers can be either deployed locally or on the cloud. There are voice, data, location, and video servers, which are essential to the system. Different servers process different services, including PTT voice, MMS, video dispatch, and location service.

All the servers can be installed in distributed architecture and services can be processed simultaneously in multiple centers. With modularized design, the system capacity can be flexibly expanded by increasing server nodes.

4 PoC Application Scenarios

PoC systems are now becoming increasingly popular in many industries across the world, because there are apparent benefits as we listed above.

At present, business-critical users such as logistics, transportation, manufacturing, hotels, supermarkets and so on are more inclined to use PoC as their preferred solution for PTT, because PoC can not only provide a wider coverage (work forces are widely dispersed, working place is not fixed) and indoor Wi-Fi access, and the overall network deployment is more cost-effective and faster.

With the increasing reliability of carrier networks, better coverage, and continuous improvement of PoC's own security and encryption measurements, more and more mission-

critical industry users have joined or are going to join the PoC family.

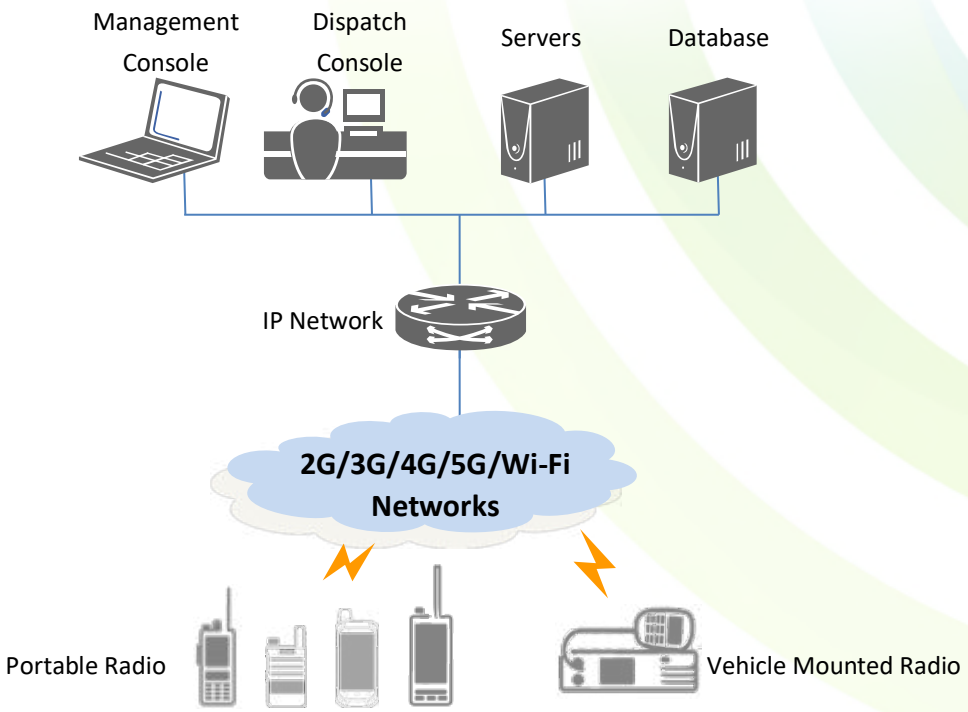
PoC Application Scenarios

According to the report published by Allied Market Research, the global PoC market was pegged at $3.43 billion in 2019 and is estimated to reach $6.95 billion by 2027, anticipating a CAGR of 9.4% from 2020 to 2027, which means the PoC industry chain keeps growing steadily and becoming more mature.

5 eChat Solution

5.1 eChat Overview

Caltta's eChat PoC system is an advanced PoC system that supports a variety of features and functions. eChat utilizes the carrier's 2G/3G/4G/5G/Wi-Fi infrastructure to provide wide coverage and unlimited channels, to free customers from the small coverage and limited capacity of traditional PTT networks.



eChat Solution Architecture

Caltta offers end-to-end eChat PoC communication solutions, including high-quality PoC radios and innovative PoC platforms. eChat solution provides customers with an instant and reliable global communications experience to enhance business operations and boost productivity. Apart from optimizing these basic functions of PoC communication solutions, Caltta does more for customers.

5.2 eChat Features

The eChat system is a simple, reliable, cost-effective solution which can be deployed locally or on the cloud with the following features:

Worldwide Coverage

- National even international communication via carrier's 5G, 4G LTE and 3G WCDMA networks, Wi-Fi, even customized APN mobile networks.

Free of Base Station

- Based on carrier's network, customers do not need to build their own base stations, saving a lot of CAPEX and OPEX.

Modularized and Distributed Design

- Modularized design allows customers to deploy the required services and makes the future expansion easy and fast.
- Distributed technology ensures system redundancy, stability, and service continuity.

Unrestricted Channels and Bandwidth

- eChat platform puts no limitation on channel allocation, and carrier's 4G and 5G networks provide more than enough bandwidth for all eChat services.

Group Call and Individual Call

- eChat supports half-duplex group call, private call, temporary group call, dynamic regroup, and full-duplex individual call.

Location-related Features

- eChat supports diverse map-based location services including: real-time positioning, historical track, ranging, geo-fence, circle selection call, etc.

Multimedia Services

- Besides basic PTT services, eChat dispatcher and user can send text message, picture, video or other files to an eChat group or other eChat users.

Rapid and Flexible Deployment

- Support cloud platform or local standard PC server deployment, with modularized architecture, allowing users to quickly and flexibly deploy eChat according to their actual needs.

Safety Matters

- Support remote disaster recovery, and the service modular stackable design can ensure service continuity.
- Support private control signaling and triple authentication (IMEI, ICCID and account).
- Support end-to-end encryption for different services to maximize user data security.

Connection to DMR and Analog

- Support protocol-level full-service intercommunication with DMR systems, as well as voice intercommunication with DMR and analog radios from other vendors.

Over-the-Air Management

- eChat radios and dispatch console support online version detection and remote upgrade, saving OPEX for customer.

Industry Customizable Services

- Provide industry customizable services such as Lone Worker according to customer needs. The Lone Worker service has made special customization to both the dispatch console and radio to ensure the personal safety of the user in a work-alone scenario.

5.3 eChat Services

In addition to supporting the PTT services of traditional PMR systems, eChat can also support various broadband multimedia services, dispatch and command services, based on the operator's broadband network.

The eChat's services can be divided into the following types: multi-mode network supporting, voice services, video services, data services, dispatch console services, management console services, location services, interconnection, and so on.

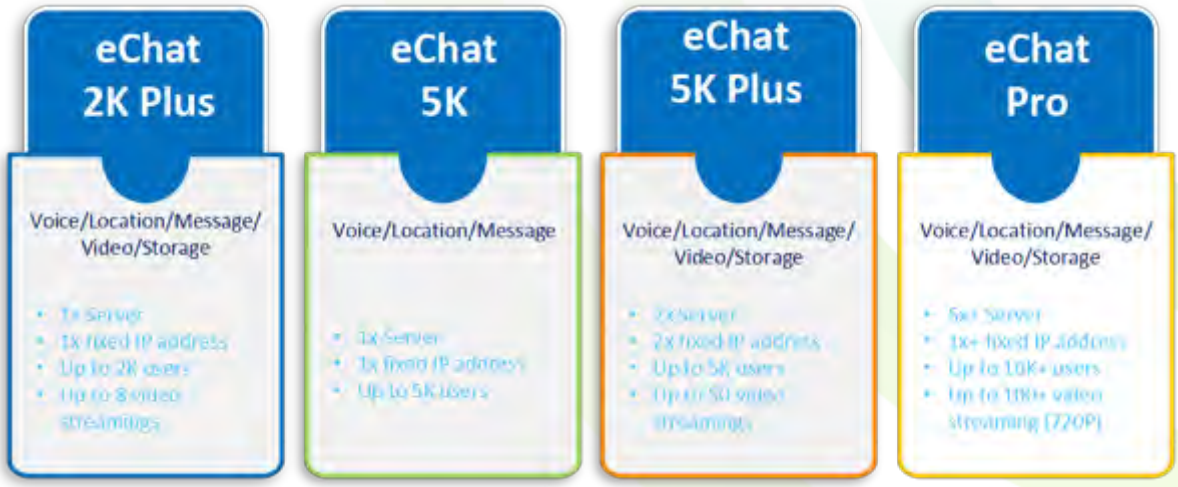
eChat Diversified Services

5.4 eChat Products

5.4.1 eChat Platform

Modularized design allows customers to deploy the required services and makes the future expansion easy and fast. The eChat platform adopts modularized design, and can be deployed either on local IDC (Internet Data Center) servers or on the cloud according to customer requirements.

Customers can customize different service combinations according to their real needs. When the number of users changes, the number of servers can also be dynamically adjusted, so that platform resources are not wasted.

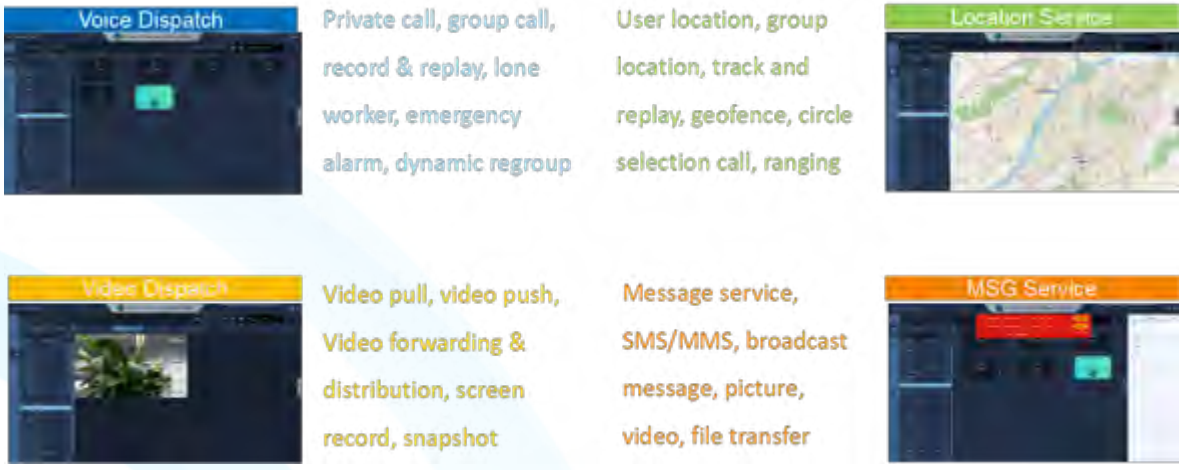


Various eChat Platform Deployments

5.4.2 eChat Dispatch Console

Dispatch console is an indispensable part for professional communications system, which provides great convenience for command and dispatch.

The eChat dispatch console integrates dispatch services such as voice, video, positioning, and message, making command and dispatch easier, more intuitive, and more professional.



eChat Dispatch Console

5.4.3 eChat radios

eChat devices are purpose-built for professional business communications. These compact,

rugged, and easy-to-operate radios enable instant group voice and video communications over nationwide 3G/4G cellular networks and Wi-Fi.

PoC radios are compact radios with prominent PTT buttons, SOS buttons, built-in GPS for dispatch applications, Bluetooth, and Wi-Fi:

eChat Radio e350

eChat Radio e360

eChat radios are also designed to support harsh outdoor working environments. They are rugged with IP ratings (up to IP68) for water and dust resistance and MIL-STD 810G compliant for shock and vibration, and feature noise suppression and high-volume speakers for excellent voice quality in noisy environments. They also feature powerful Lithium-Ion batteries for guaranteed operation over long shifts:

eChat Radio e600

eChat Radio e690

eChat Smart radios support installing App on smart phones. They are smart phones, but not just smart phones. They are equipped with professional PTT buttons, high-power speakers, high-capacity batteries, and professional eChat App, which integrates PTT and industry applications into one radio, eliminating the trouble of using multiple radios at the same time.

eChat Radio e700

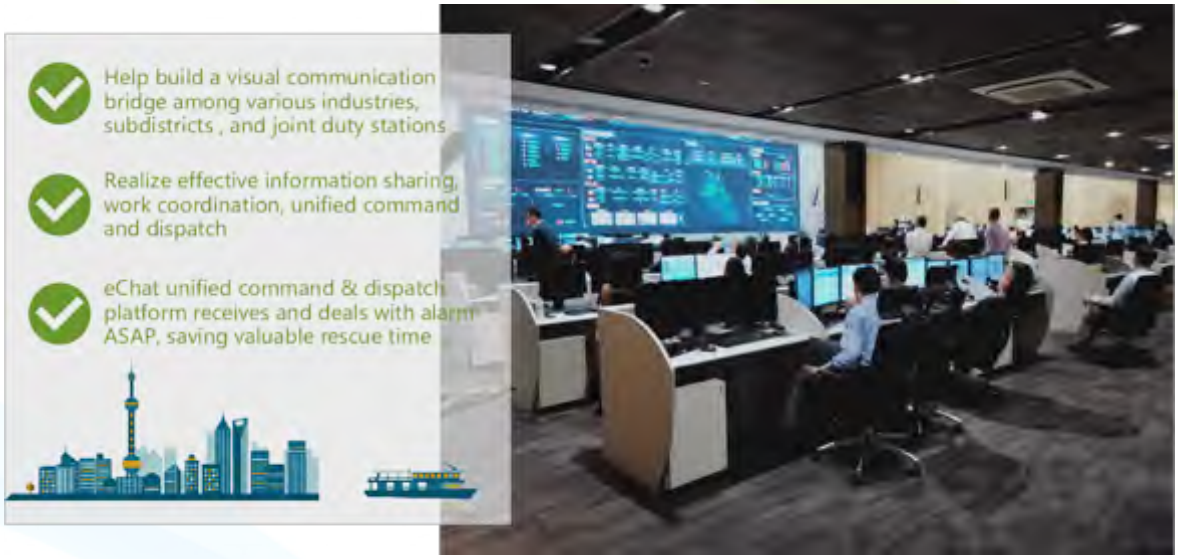
eChat Radio e800

Radios from other manufacturers and BYOD radios can also be connected to the eChat platform by installing eChat App. Excellent compatibility allows users to have more choices.

5.5 eChat Successful Cases

eChat has been deployed and launched in many countries and has successfully provided professional services to customers in municipality, police, fire fighting, airport, private network operators, large chain malls, hotels, logistics and other industries.

- Shanghai Operation Management Center



- Hunan Expressway Police

Smooth communication, smooth traffic

- Enable seamless coverage along the 5,493 km expressway in Hunan province cost-effectively
- Guarantee the smooth communication between front-line policemen and dispatching center

- Hubei Fire Brigade

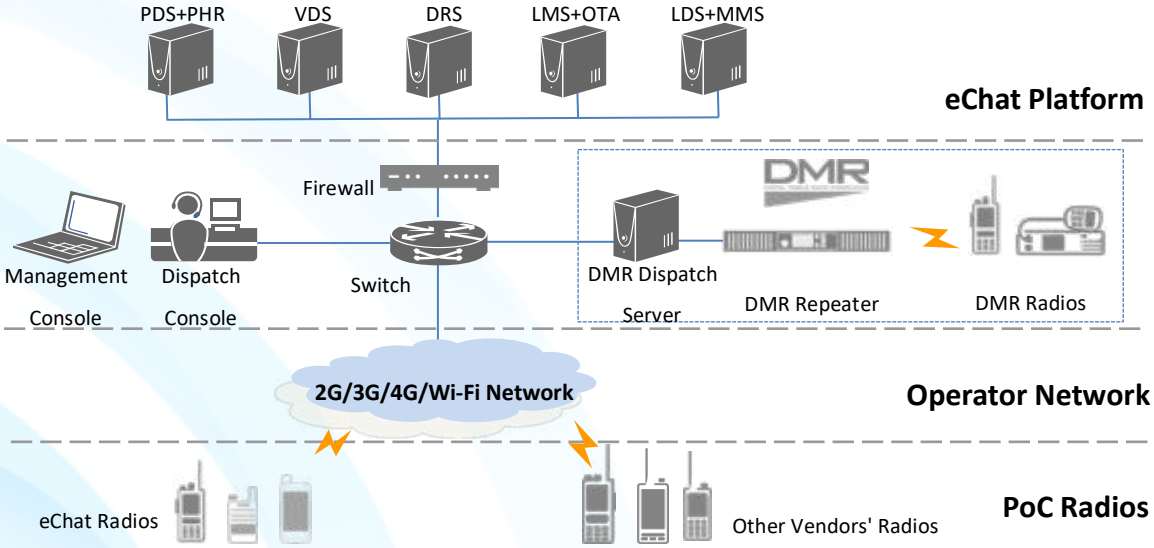
- Ezhou Airport

With rapid growth in passenger throughput and ongoing phase II expansion, traditional 400MHz analog can hardly meet requirements

eChat PoC ystem is deployed to replace 400M analog to provide PTT, voice location, video multimedia and other dispatching services

eChat greatly improves the safety level, service quality and work efficiency of the airport with minimal investment, which is well received

- Turkey Private Network Operator
  - ✓ Users exceed 10,000.
  - ✓ Replacing existing platform, saves costs and provides safer PoC services.
  - ✓ Distributed cloud deployment supports disaster redundancy & smooth expansion.
  - ✓ Adapt PoC radios from other vendors to protect historical investments.
  - ✓ Customized services, including operation management, statistics, lone worker, geo-fence, etc.
  - ✓ eChat+DMR hybrid solution realizes unified command and dispatch without any gateway.



eChat+DMR hybrid solution

About Caltta

Caltta Technologies Co., Ltd is a leading provider of integrated professional trunking communication solutions. Our company is committed to delivering value to customers by providing innovative solutions and Converging All to Talk. With more than 700 experienced professionals and over 300 trunking technology patents, Caltta is capable of providing DMR, CDMA GOTA, LTE and POC complete ranges of PTT end-to-end products and solutions, which have been accepted and deployed in more than 40 countries and regions globally, delivering satisfactory products and services to customers from various fields such as government affairs, public safety, transportation, energy, utilities, etc.

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