PoLTE: The GPS Alternative for IoT Location Services
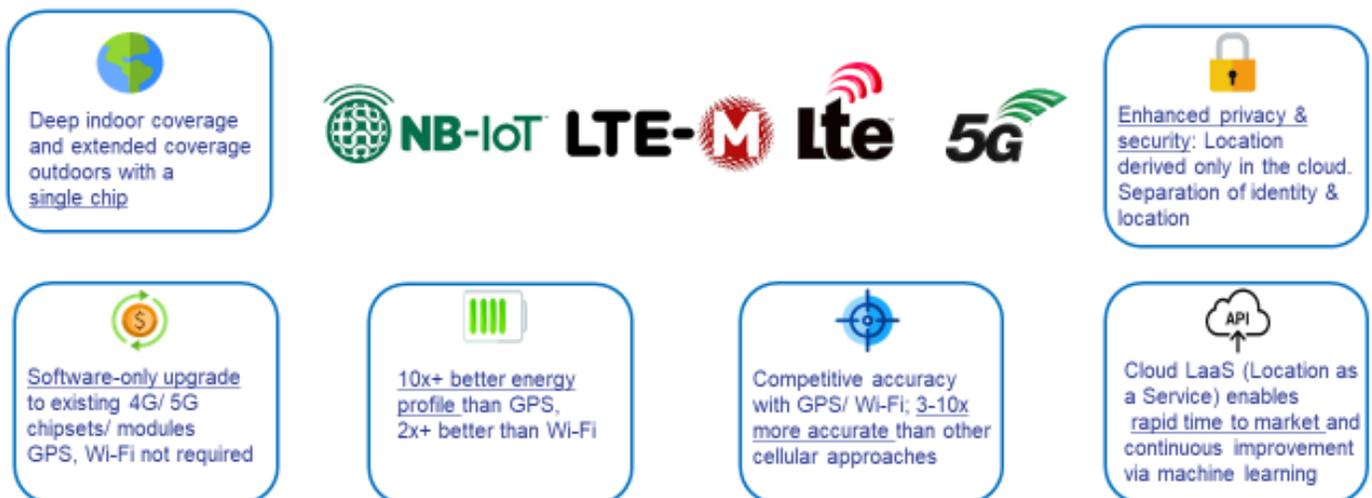
A Cost-Effective New Cellular IoT Location Solution that is Power Efficient, Low Cost and Rapidly Scalable

Global positioning system (GPS) has been the gold standard for outdoor location-based services (LBS), but GPS can't provide a low cost, low power and highly accurate option for indoor/outdoor location of Internet of Things (IoT) devices. Using PoLTE's cellular-based LBS, IoT product and application developers can add location capabilities to IoT devices cost effectively without significantly expanding the bill of materials (BOM), increasing the power draw or sacrificing accuracy.

A PoLTE Whitepaper

PoLTE - Location as a Service (LaaS)
Seamless, accurate location indoors & outdoors using only 4G/ LTE & 5G signals
No need for GPS, Wi-Fi or Bluetooth

Deep indoor coverage and extended coverage outdoors with a single chip

NB-IoT LTE-M lte 5G

Enhanced privacy & security: Location derived only in the cloud. Separation of identity & location

Software-only upgrade to existing 4G/ 5G chipsets/ modules GPS, Wi-Fi not required

10x+ better energy profile than GPS, 2x+ better than Wi-Fi

Competitive accuracy with GPS/ Wi-Fi; 3-10x more accurate than other cellular approaches

Cloud LaaS (Location as a Service) enables rapid time to market and continuous improvement via machine learning

PoLTE's PATENTED and PROVEN platform is the ONLY viable solution to unleash the full potential of the Internet of Things

PoLTE.com

PoLTE

Introduction

The Internet of Things (IoT) is on the verge of becoming a multi-trillion-dollar industry, and location-based services (LBS) for IoT is a critical piece of the equation as it enables the majority of the critical IoT use cases in the market.

Frost & Sullivan reports the global Internet of Things ecosystem and trends market will continue to see broad interest and momentum with an expected market size of $1.4 trillion by 2021. According to Research & Markets, GPS/ outdoor positioning will be $83 billion and indoor positioning will be $44B by 2022.

PoLTE offers the only cost-effective, long-battery life, indoor/ outdoor location solution for IoT devices, helping drive broad adoption and growth in the marketplace.

Today's global positioning system (GPS)-based location for mobile devices works effectively for systems with large batteries and enough space for a GPS radio, and in situations where the cost of the added components is small relative to the overall product cost.

GPS has limitations for many IoT location applications because IoT sensors can't easily absorb the cost, power budget and additional components needed for successful implementation and scalability. GPS does not work indoors; additional radios and sensors, such as Wi-Fi, are needed to offer seamless indoor/ outdoor coverage.

The key to successful IoT location is to get both indoor and outdoor location capability while meeting the economic and operational constraints of an IoT sensor. This whitepaper reviews those benefits and introduces the PoLTE location solution for IoT.

Essential LBS Features for IoT

LBS technology was first mandated to allow e911 services to access smartphone location information in the event of an emergency. Now, location is the basis of many must-have applications, including maps and directions, asset trackers, manufacturing efficiencies, lost devices and other use cases that rely on location information. With the advent of 5G, location becomes even more vital for applications across the board.

For IoT, the utility of location information is just as important. IoT sensor location information can help businesses with inventory management, asset tracking, manufacturing, position of nearby assets, plus safety and security.

Popular LBS technologies include GPS, assisted GPS (AGPS), observed time difference of arrival (OTDOA), RF pattern matching, time of arrival (TOA) and cell ID (CID). Bluetooth, Wi-Fi, and LoRaWAN™ also offer location-based services.

When evaluating one of these technologies for IoT, the sheer breadth of IoT applications means a robust LBS system that provides the following capabilities is required:

- Low Power: With battery lifespan measured in years, having a low power solution is critical.
- Speed: The faster an LBS can acquire a signal or report navigation data, the better as it can impact power consumption (see above) and ensure that a service is responsive to the user.
- Low Cost: Many tracking applications require significant infrastructure deployment and maintenance, driving up the deployment cost and the total cost of operation. Tags become complicated devices that have multiple sensors, which drives up the bill of materials (BOM). GPS radios add a proportionally significant cost to the BOM, more if an AGPS solution is required.
- Small Size / Form Factor Freedom: There are a variety of sensor sizes as no one size fits every application. Even so, the smaller the sensor size for any application, the more flexibility it gives the user. The ideal size option is to integrate LBS into an existing radio or other chipset, which translates to no additional board space required.
- Seamless Indoor/ Outdoor Coverage: In applications that require indoor/ outdoor tracking, APGS leverages Wi-Fi to provide this functionality, which is typically not feasible for broad deployment of inexpensive IoT sensors.

Each leading LBS technology listed above delivers on some of the features required for IoT applications, but only the PoLTE solution is optimized for IoT devices. No other technology solves the indoor/ outdoor solution as effectively as PoLTE.

The PoLTE Solution

PoLTE is a software platform that uses LTE/ 4G and 5G cellular networks and the PoLTE cloud to deliver highly-accurate location information (see Figure 1). Other location solutions that use GPS, Wi-Fi, Bluetooth or a combination of these technologies are cost prohibitive when large quantities of items need to utilize location intelligence. By using cellular networks to determine location, IoT devices need only one radio.
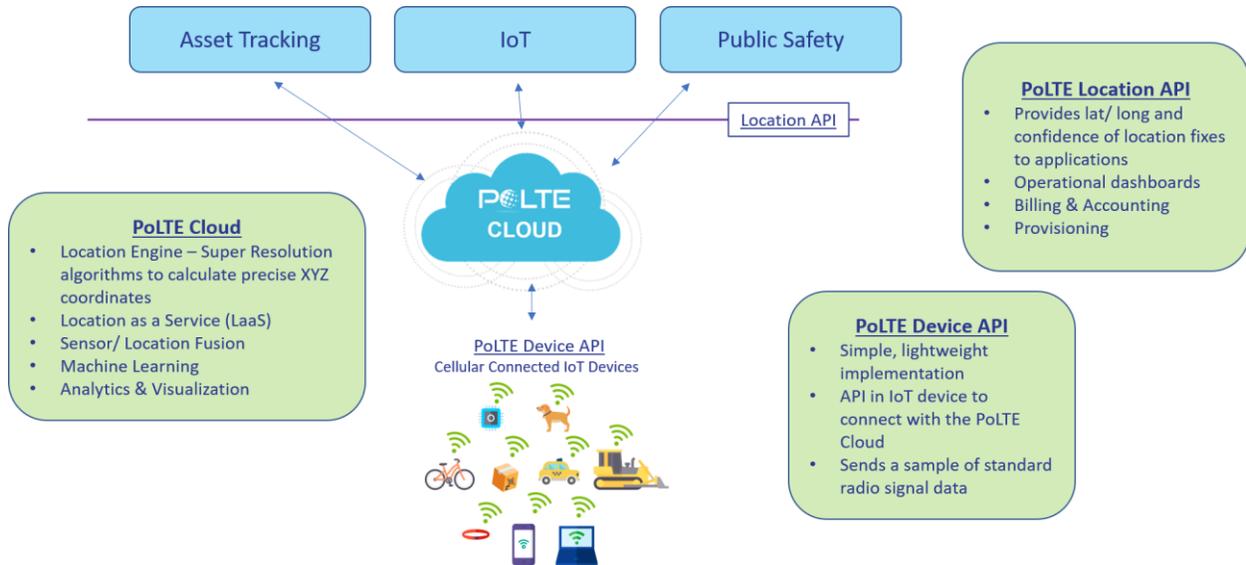

Figure 1: An overview of the PoLTE IoT location architecture.

PoLTE works with LTE/ 4G and 5G chipset manufacturers, such as Sequans and Riot Micro, to incorporate its firmware on the chipset. The PoLTE firmware leverages LTE/ 4G and 5G signals using only a small portion of the cellular reference signal (CRS) for location determination. While the cellular tower transmits other location information, PoLTE needs only a small amount of data to determine location resulting in less latency per location fix.
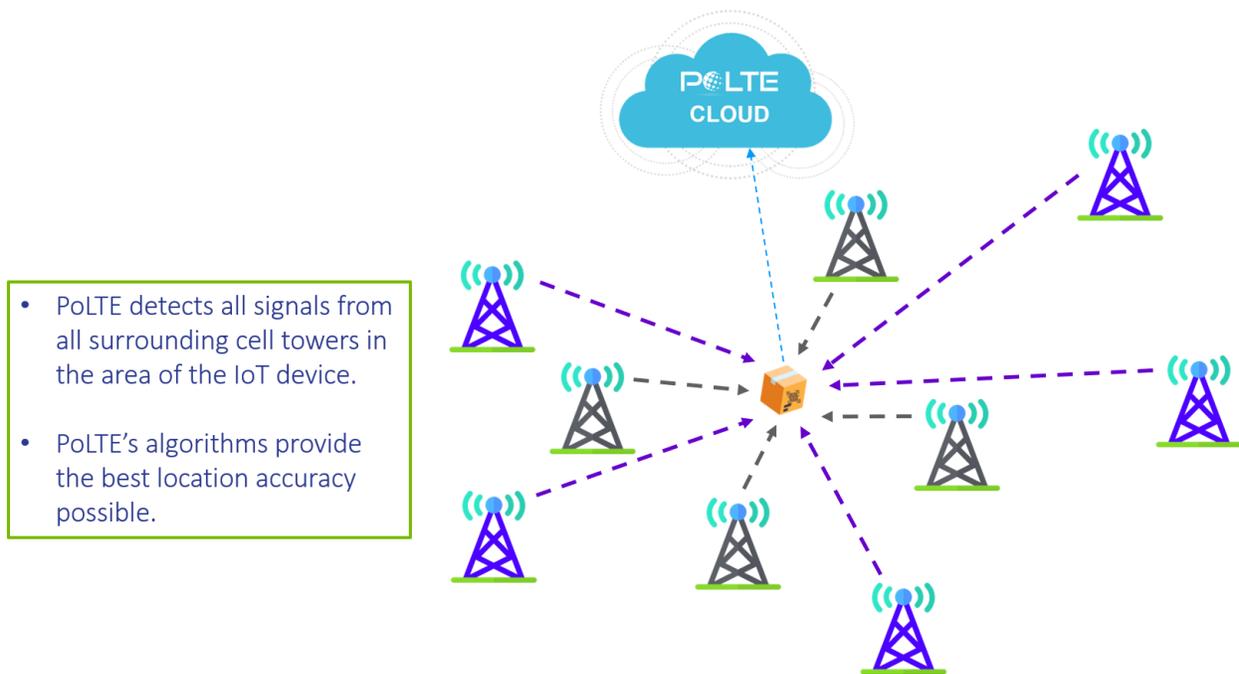
- PoLTE detects all signals from all surrounding cell towers in the area of the IoT device.

- PoLTE's algorithms provide the best location accuracy possible.

Figure 2: PoLTE utilizes CRS signals for highly accurate location determination.

By using the cellular radio for location, no additional hardware is needed on the sensor, which means minimal increase in power consumption, and no need for additional radios.

PoLTE Cloud for Processing

By enabling mobile chipsets with the PoLTE solution, location information on IoT devices is handed off to the PoLTE cloud. With the limitless computation available in the cloud, PoLTE provides the best possible results using a combination of multiple location techniques that are optimized on the signals received. The IoT device is not tasked with computations; therefore, can be smaller, require less battery power and costs are reduced accordingly.

An IoT device enabled with PoLTE's software sends a small payload to the PoLTE cloud where the location computations are determined. The PoLTE solution avoids the need for additional processing capabilities or increased power onboard the IoT sensor.
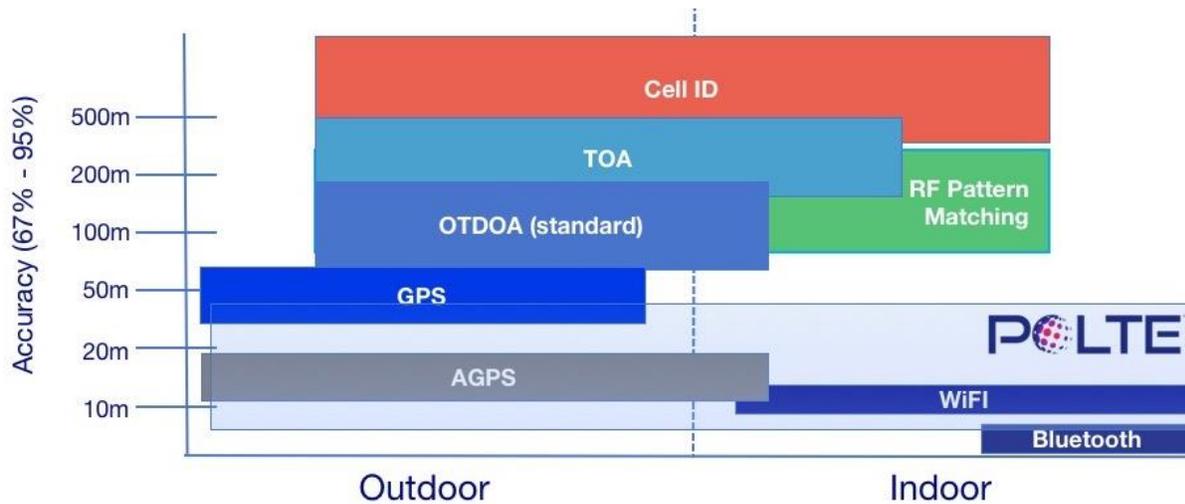

Figure 1: Comparison of accuracy of leading location services technologies.

The location information gathered in the PoLTE cloud can be combined with other data sets to provide actionable intelligence, which can help IoT users automate processes or increase efficiencies. This location data provides a crucial element that will help drive the IoT marketplace growth.

Because the PoLTE cloud-computation solution is patented, PoLTE is the only company that can provide the combination of low power, low cost, small size and high accuracy in one platform for an IoT device.

PoLTE Use Cases

PoLTE's software platform enables an entirely new category of use cases. Any use case that needs highly accurate, seamless location information delivered at a very low cost can utilize PoLTE's technology. Location information and tracking that was once cost prohibitive is now incredibly affordable and rapidly scalable.

Use cases include asset tracking, Industry 4.0, manufacturing, transportation, shipping, agriculture, logistics, wearables, healthcare, public safety, and more.

Virtually any industry or market that needs location as part of their offering can now cost-effectively offer a location solution that is extremely cost competitive and rapidly scalable.

Use Cases:

Asset Tracking

Asset tracking solutions can face a number of location tracking barriers, from the need to track an asset's location through multiple steps of travel before its final destination to the potential for signal blind spots. With PoLTE, asset tracking can be more effective because it offers blanket indoor and outdoor coverage wherever there is cell site coverage. Consider an equipment manufacturer that uses a sensor enabled by PoLTE. The manufacturer can monitor that equipment from assembly to the train yard to its final destination. This gives the customer the ability to understand when it's order will be delivered and better manage its projects and crews based on the timeline of the delivery.

Agriculture

Farms have used autonomous tractors for years, but location technology from PoLTE gives rise to a new set of agriculture applications. Take for instance the cow that is ready to give birth, sensors can provide her exact location. Or, when a sensor shows soil in a certain field to be too dry, the irrigation system can be redirected to that area to ensure the soil remains moist and that water isn't wasted on areas that don't need it. Or, if a sensor shows a feed trough to be running low, the feed truck can be directed toward that location first.

Industry 4.0

Industry 4.0, or the automation of manufacturing technologies, is a hot topic today. A wide variety of IoT applications have emerged from predictive maintenance to analytics. With PoLTE, location sensors on an automated manufacturing floor can enable maintenance crews to immediately locate each other or tools needed and find the exact location of a maintenance issue, resulting in a continuous workflow and reduced work stoppages.

Public Safety

In recent years, there have been a number of natural disasters that have put an increased focus on location information for public safety. Consider the consequences of an earthquake, fire, flood, hurricane or tornado that delivers significant damage to structures, leaving people trapped or stranded. Being able to provide precise location data enabled by PoLTE location technology built into mobile phones and IoT devices in the buildings can mean the difference between life and death.

Conclusion

If you would like more details about PoLTE's technology and chipset implementations, please contact us at info@polte.com.

For developers, please contact engineering@polte.com for availability of our SDK and API.