



# Wi-Fi location services

Enabling indoor location services — everywhere

**Key benefits**

- Reduce IT burden by automating AP positioning thereby eliminating error-prone manual surveys and mapping.
- Leverage APs as a foundation for accurate indoor measurements to widely deploy new location-aware services and enhance existing applications.
- Scale indoor location across the organization using Open Locate to broadcast measurements over air to any mobile device.
- Create seamless user experiences across indoor and outdoor environments.

**Growth in location-aware services**

Digital modernization is accelerating, driving the creation and expansion of location-aware services like turn-by-turn wayfinding, high-value asset tracking, retail customer engagement, and smart office initiatives. Yet, despite the importance of location context, organizations are unable to deploy indoor location as widely as they would like or provide seamless user experiences across indoor and outdoor environments due to the complexity, cost, and level of effort existing solutions require. HPE Aruba Networking provides an easier way to enable indoor location services at scale with Wi-Fi based location services.

**Today’s indoor location services limit widespread adoption**

Today’s traditional Wi-Fi and Bluetooth ranging technologies are reliant on manually mapped reference points and relative distance measurements. To map reference points, IT must conduct site surveys and hand place reference points on site-specific maps. This requires costly professional services efforts and results in maps that are error-prone and difficult to use. Because of the manual effort involved, only 25% of organizations map AP location and even fewer update it.

This limits the impact of innovations such as virtual Bluetooth because their accuracy is based on manually mapped reference points.

Newer solutions such as ultra-wide band (UWB) two-way ranging methods have the ability to measure relative distance down to the centimeter level; however, they are too costly and complex and are reserved for niche uses. Like traditional Wi-Fi and Bluetooth approaches, UWB is also reliant on manually mapped reference points that limit the accuracy of device measurements.

Incorporating indoor location measurements is also a challenge. Indoor measurements are typically locked in local x-y coordinates, making them incompatible with Google Maps™, Apple Maps, and other off-the-shelf applications. Applications that use local coordinates require additional development effort, delaying the rollout of new services and increasing the cost.

To improve the accuracy and access to indoor location services, what is needed is an automated method to map the absolute reference measurements using universal latitude, longitude, and altitude coordinates and then broadcast this information to client devices to be used in a wide range of location-aware applications.



**Figure 1.** Location aware services common use cases

## HPE Aruba Networking's approach

To address these challenges and make indoor location services more widely available, HPE Aruba Networking has introduced the first self-locating access points that broadcast location to client devices and creates a foundation for accurate indoor location. Our goal is to bring the ease and widespread adoption of outdoor GPS to indoor environments.

Our APs use built-in GPS receivers, fine time measurements, and intelligent software to establish their locations accurately and automatically using universal latitude, longitude, and altitude coordinates. Unlike today's manual approaches, which use site surveys and local map coordinates, HPE Aruba Networking automatically locate themselves, refine their measurements over time, self-heal when APs are moved or replaced, and serve as absolute reference points for accurate client location. APs share their location coordination information with clients, who then calculate their own position for use in location-aware applications using fine time measurement. Privacy is protected since the client determines its own location, not the AP.

Through our Open Locate initiative, HPE Aruba Networking is committed to establishing industry standards for sharing AP reference locations with client devices and network-based services.

In coordination with mobile OS vendors, HPE Aruba Networking makes sure that any application will have access to accurate and reliable indoor location.

## Components of location services

### Self-locating APs

Using embedded GPS receivers, HPE Aruba Networking Wi-Fi APs are able to self-locate and establish reference points that can be used to accurately determine indoor client location.

### Location engine

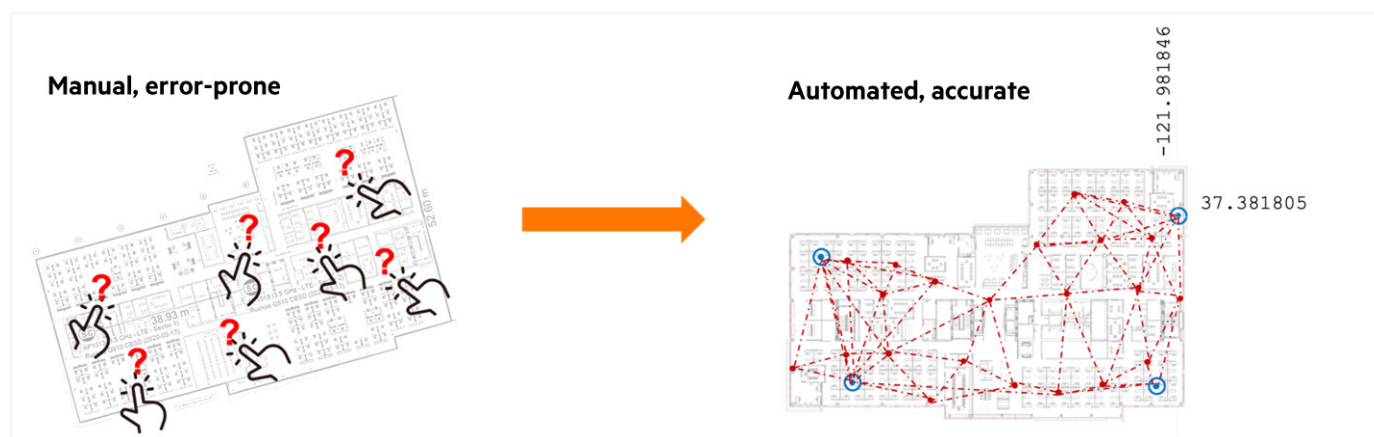
As part of HPE Aruba Networking Central, all measurements are refined overtime and can be used in location analytics. APs are automatically placed on maps in the Floor Plan Manager.

### Open Locate

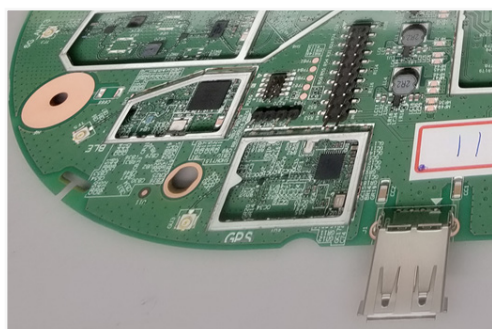
Open Locate aims to standardize the way APs advertise their location over the air and through cloud-based APIs, enabling mobile devices to locate themselves and applications to support a wide range of location-based services.

### Partner ecosystem

Major OS vendors and device manufacturers like Google™, Zebra, Tile, and Samsung are partnering with HPE Aruba Networking on Open Locate and leveraging HPE Aruba Networking for new and enhanced location services.



**Figure 2.** Manual mapping approaches with site surveys and proprietary maps do not offer the same level of accuracy or usability as self-locating APs



**Figure 3.** GPS receivers are embedded in HPE Aruba Networking's access points

## APs as a foundation for indoor location

HPE Aruba Networking APs act as a foundation for accurate indoor location so that location-aware services can be deployed at scale. Our Wi-Fi APs determine and transmit universal latitude, longitude, and altitude coordinates over air so that they can be consumed by any mobile OS. There is no need for custom map development or to create separate applications for indoor and outdoor environments. New in Wi-Fi 7, the APs also include barometric sensors to determine floor level in multi-story buildings.

### How it works

- Location-aware Wi-Fi APs automatically determine relative indoor location using ranging techniques known as fine time measurement (part of the Wi-Fi Location standard).
- Wi-Fi APs with built-in GPS anchor these relative locations using the universal coordinates of latitude, longitude, and altitude.
- HPE Aruba Networking Central provides location intelligence and orchestration via the Location Engine and includes the Floor Plan Manager to visualize APs on a map.
- APs broadcast their location over the air to clients that support the Open Locate protocol and publish it over the cloud API.
- Clients can use APs as reference points to determine their own location.
- Developers use the location coordinate information (LCI) in a wide range of applications — without needing to create custom mapping engines.

### AP portfolio support

HPE Aruba Networking campus APs that support Wi-Fi 6 and higher can participate in Wi-Fi indoor location services.

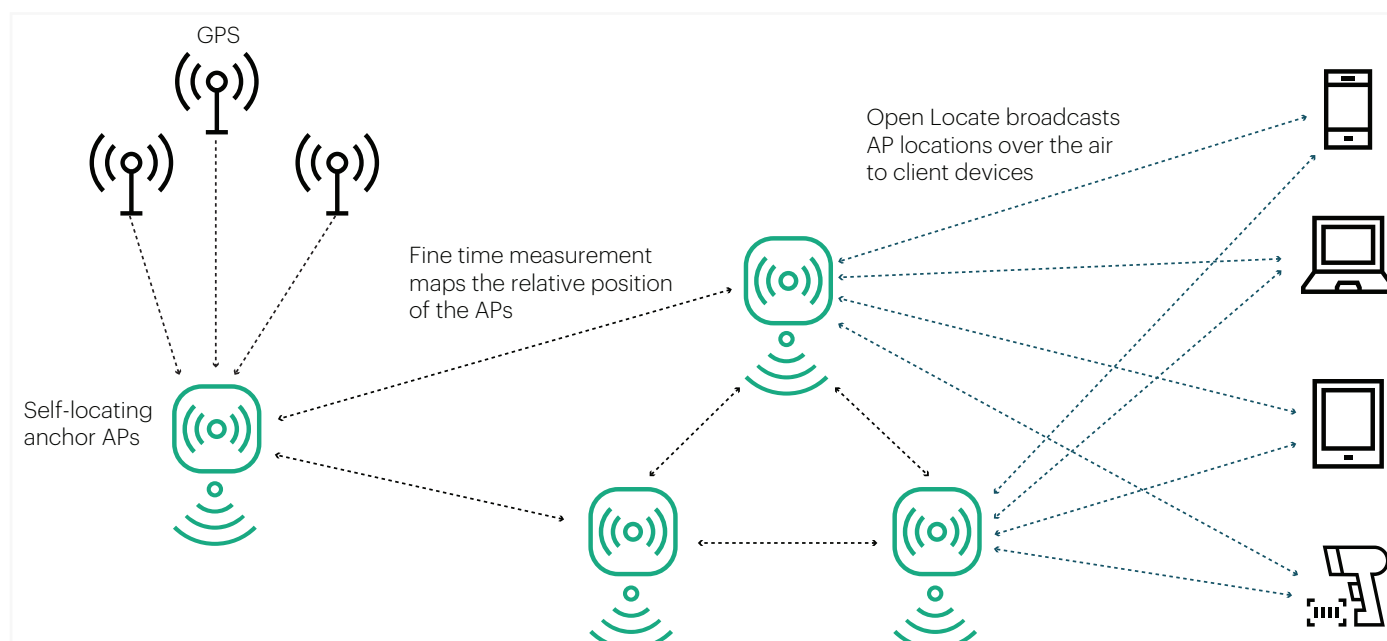
HPE Aruba Networking Wi-Fi 7 also includes barometric sensors to determine height above sea level which can be translated into floor level measurements.

HPE Aruba Networking Central includes the Location Engine for location intelligence and orchestration as well as the Floor Plan Manager to visualize APs on a map. Because the APs are self-locating, there is no need to manually place APs on the map or update maps and client devices can calculate their location based on latitude, longitude, and altitude measurements that the AP transmits over the air.

## Open interoperable framework

As part of our efforts, HPE Aruba Networking is collaborating with IEEE and Wi-Fi Alliance to leverage and extend the 802.11 fine time measurement (FTM) standard with Open Locate. Our goal is to expand the methods for collecting, storing, and sharing indoor location information and to provide greater interoperability.

HPE Aruba Networking self-locating access points can also be used as absolute reference points for Wi-Fi, Bluetooth, or UWB technologies to drive greater accuracy. Android™ devices can use Wi-Fi based location with fine time measurement; iOS (Apple) leverages Bluetooth.



**Figure 4.** HPE Aruba Networking APs act as a foundation for indoor location using built-in GPS, fine time measurement ranging techniques, and intelligent orchestration and the Location Engine



## Summary

With HPE Aruba Networking's Wi-Fi based location services powered by our broad portfolio of APs enterprises and service providers will be able to deliver location-aware applications more quickly, accurately, and at a scale. IT teams eliminate manual surveys and site-specific floor plans by automatically placing APs on the map. Indoor location — whether it uses Wi-Fi, beacons, UWB, or other methods — is highly accurate because clients calculate their location based on precise location coordination information.

In the future, indoor location services will be applied in a variety of new ways to extract value. Location-enabled workflows and analytics have the potential to

dramatically improve network operations. For example, location-aware machine learning can be used to optimize AP placement and to identify and replace failing APs before users experience issues. Lines of business can roll out and enhance applications without customization, and users benefit from seamless indoor and outdoor experiences.

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