

Case Study: Asset Tracking for Paramedic Services



Across North America, Emergency Medical Services organizations frequently contend with shortages of personnel and equipment. One of BeWhere's recent customers, an Ontario Paramedic Service which is one of the busiest organizations in the Province of Ontario (population of ~14 million), Canada, is a case in point.

As a public agency in a municipality with about ½ million in population, this Paramedic Service of close to 370 employees completes approximately **80,000 vehicle responses per year**. Its fleet of 64 vehicles (including 40 transport ambulances) works from a main fleet centre and 20 satellite stations and support facilities, and in 2016, the Service **transported close to 50,000 patients** to local hospitals. Among other statistics, the paramedic emergency response time is recorded and analyzed every year, adding pressure to increase their performance.

Like many other Paramedics organizations across Canada, this Ontario service has its operations strained by a growing urban population, an emerging opioid epidemic, and an ageing population. Underlying these challenges, it has also been working to mitigate chronic issues related to the management of their medical equipment distributed across twenty different locations.

Working within constrained budgets, the Ontario Paramedic Service strives to deliver a consistent level of services while meeting an expanding set of challenges, playing a role in negatively pressuring the agency's mandated response time standards, and exacerbating demands and stress on personnel.

The Issue

Paramedic services use a variety of specialized equipment, some of which requires periodic inspection and maintenance. With equipment loaded on vehicles and deployed to dispersed stations, locating equipment is a perennial challenge—particularly as it frequently moves between vehicles or is occasionally downloaded at stations.

Looking for opportunities to optimize outcomes under constrained resources, the **Logistics team** at this Ontario Paramedic Service identified the management of their medical equipment as a process with significant potential for improvement. Out of the 370 employees, there is a very small Logistics staff to manage the entire fleet of equipment.

The Logistics team's primary role is to ensure **the real-time availability of properly maintained equipment** used for the delivery of emergency medical services. They are tasked with sourcing appropriate inventories, implementing and reporting the recommended inspection and maintenance intervals established by equipment manufacturers on specific assets (90, 180 or 365 days). **The Ontario Paramedic Service is required by the Ontario Ministry of Health and Long-Term Care to inspect, maintain, and produce records showing compliance with these manufacturer's recommendations.**

As an example, the 65 defibrillators used by the Ontario Paramedic Service are to be inspected **once a year**. However, the devices also need to be physically located **every 60 days** to calibrate the Carbon Monoxide detector attached to each defibrillator—a safety requirement. Further, these devices are also used to record the vital statistics of patients in every response, with this data being incorporated in the patient record. While most data is transmitted electronically, manual data extraction is occasionally necessary; necessitating location of the device—often on an urgent basis. Without some form of automated tracking system, locating a defibrillator—or any piece of equipment—necessitates a time consuming manual search.

During the annual inventory of the defibrillators, only about 2/3 of the devices are able to be located easily. **The other 1/3 have taken at times many days to locate.** With an individual cost of \$25K to \$40K, and the need to maintain 15 to 20 spare units to make up for contingencies, **the cost for the spares alone can reach \$800,000.**

As another example of the challenges faced by Logistics, every vehicle in the fleet goes through a “deep clean”/inspection/standardization process every 90 days. If the equipment stayed on an assigned vehicle, then the team would be able to easily see everything every 90 days, **however equipment doesn't stay on one vehicle.** The Ontario Paramedic Services' inspection records will show that a piece of equipment is overdue, and would have to send a Logistics staff member or modified duty paramedic out on a manual search to try to find it, sometimes with mixed success.

The existing logistics process leverages the use of paramedics on **modified duty** (usually due to a

temporary medical restriction) to assist the Logistics team to help satisfy maintenance obligations. The limited and unpredictable availability of modified duty Paramedics assigned to perform support tasks has meant **that the hours wasted looking for equipment** throughout the 20 stations has had a negative impact on meeting internal equipment maintenance standards.

In parallel, and adding to the issue of finding the assets for maintenance purposes, **Logistics identified significant staff time expended while trying to locate equipment during normal operations when:**

- responding to a call;
- equipment had been left behind on the scene of an emergency;
- equipment had been left in hospitals during patient transfer.

The decentralized disposition of assets has compounded the challenges for routine inventory and maintenance programs. When planning its budget, it studied the impact of the gaps within its current abilities to track the misplaced or missing equipment. It recognized the possibility that resolving these deficiencies could potentially free up capital and resources. **To tackle them, they began researching options for tracking assets.**

The Solution

To address these ongoing issues, Ontario Paramedic Service looked for technology and innovation to enhance patient care and service delivery. As a result, the organization initially invested in Automated Vehicle Locator (AVL) systems. AVL systems have allowed the EMS decision-makers to make real-time choices on optimal deployment of ambulances. These choices ensure coverage to comply with legislated response times.

In 2015, the city overseeing the Ontario Paramedic Service initiated a Request for Proposal (RFP) to replace its existing AVL systems, including its EMS fleet. Since use of the paramedic equipment is so intimately tied to the operation of the fleet, this was the natural entry point for an asset tracking tool. Based on the city's research of available technologies, **they included provisions in the AVL RFP for asset tracking.**

After an RFP and thorough evaluation process of seven responding suppliers, the city awarded the contract to SkyHawk Telematics. **Among the factors for this award was SkyHawk's partnership with BeWhere.**



In addition to the core features of the SkyHawk system, their straightforward integration with BeWhere's Bluetooth® low-energy (or BLE) asset tracking system was a factor in the Ontario Paramedic Service's decision. The combination of BeWhere with SkyHawk allows the Ontario Paramedic Service staff to track assets during operations as well as provide real-time inventory at fixed locations. This was a game changer as it created the ability **for remote logistics management.**

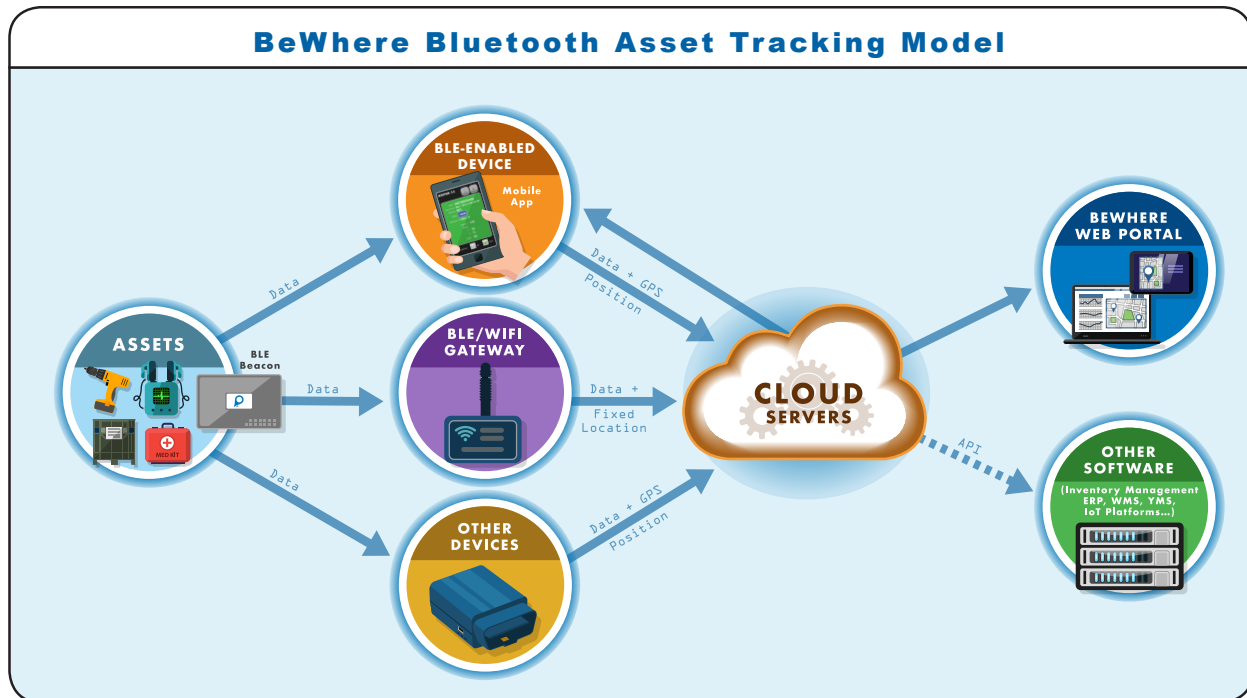
Why Bluetooth® Fits

Because **Bluetooth® low-energy** (or BLE) is the most commonly used short range communications standard in the world, there is a wide availability of non-proprietary devices and operating systems to support it. This **easy-to-access** infrastructure greatly simplifies implementations, and **keeps costs in check** that translates into a significant advantage for public sector organizations with limited resources.

BeWhere's ruggedized BLE beacons are small and simple "**attach and go**" devices. The models used by the Ontario Paramedic Service are waterproof (they can be left in the bags during laundry). They have a range of up to **250 meters** and a battery life of approximately 2+ years. They also come with a variety of sensors such as temperature, light exposure and an accelerometer.

Using BLE, BeWhere's beacons continually broadcast their presence along with their sensor data. This data can be read by **any authorized BLE-enabled device** in range. A sample of BLE-enabled devices used by BeWhere to read the beacon data include the following:

- Telematics hardware (like SkyHawk and others);
- Smartphones/tablets (Android or iOS);
- Laptops (Windows 10);
- BLE/Wi-Fi gateways.



To maximize battery life in terms of years (and not days), GPS sensors and cellular modems—two major power users—are left off within the beacons. Instead, the system appends the GPS location from the reading device to the beacon data and forwards it to the database. The system also keeps a record of the name of the device which sent the data for auditing purposes.

Having a BLE capable telematics device allows users to see what equipment is on an ambulance when it leaves the station or an emergency scene. When beacon-equipped assets are left at a scene, the BeWhere system has the ability to provide **out-of-range alerts** (audible and via email) and will provide a record of the last known location. In this way, paramedics and logistics staff will know **if, when, and where an item was left behind.**

The introduction of **BLE/Wi-Fi gateways** has opened up additional options for real-time tracking of inventory at fixed locations, such as hospitals and stations. BLE/Wi-Fi gateways plug into any power outlet and connect to the local Wi-Fi network. Once installed, **they continually detect and report beacons present at those locations in real-time.**

The Implementation

The Ontario Paramedic Service deployed BeWhere beacons using only Logistics staff based at one station. **They currently equip over 700 critical items with BeWhere beacons with plans for further deployments.**

A list of assets that the Ontario Paramedic Service had prior difficulty locating, that are now tagged with BeWhere beacons include:

- Defibrillators
- Portable suction units
- Stryker Powercot stretchers
- Stairchair evacuation patient carriage chairs
- Paramedic Response Bags
- Toughbook Laptop Computers

Monitoring assets on ambulances

The web-based combination of SkyHawk and BeWhere solutions has provided the Ontario Paramedic Service with a much-needed tool for tracking the real-time disposition of their valuable assets on 64 vehicles. Should an asset be left on the scene of an emergency,

the Ontario Paramedic Service now has the ability to **receive an immediate notification and recover the items at their last known location**. This also allows operators to leave a site with the appropriate equipment on board.

Beacons have also proven to be useful for **monitoring the temperature of Response bags**, which can compromise the pharmaceuticals in the bags. By equipping the med bags with beacons (which can withstand temperature from 80°C to -40°C) provides Ontario Paramedic Service logistics supporters now have the ability to inform their in-field personnel whether or not the bags and their contents are at risk of exposure.

Finding assets in stations/hospitals

Complementing their new ability to see 'mobile inventory' on ambulances, the Ontario Paramedic Service saw the benefit of quickly and cost-effectively equipping fixed locations with BLE/Wi-Fi Gateways. The Logistics team installed BLE/Wi-Fi readers in each of the 20 stations/facilities as well as hospitals (in emergency entrances). This immediately gave them real-time visibility to assets on hand at those specific locations.

Under this new model, they saw that that Logistics **could monitor asset utilization remotely** and facilitate maintenance more **efficiently across multiple locations including vehicles on the move**. This was a significant break-through for the Ontario Paramedic Service; they no longer had to wait for a restricted-duty employee to become available and then send them for a laborious search throughout multiple stations which are spread over many kilometers.

As an example, **Logistics can now immediately locate and recall an asset back for inspection as desired, rather than having to manually search**; freeing front-line staff for more productive responsibilities.

Conclusion

The Ontario Paramedic Service's enhanced ability to **track the condition and location of medical equipment has fundamentally provided greater peace of mind**. When and if required, Logistics staff are now able to communicate with paramedics in real-time about the status of equipment tagged with the beacons. This can be particularly useful when equipment may be left behind at a scene.

However, the biggest impact that the Ontario Paramedic Service has experienced has been the **reduction of time searching for misplaced items**. BeWhere has decreased the need for restricted-duty paramedics to run through many stations to locate items. It has allowed Logistics to focus their time and the limited available time of restricted-duty staff on more value-added activities.

When considering that the contract awarded to SkyHawk accounted for less than one percent of the of the city's total annual budget, and that within that figure the cost for the BeWhere beacons forms only a small fraction, the cost of implementing asset tracking for the Ontario Paramedic Service was relatively insignificant. **As the beacons are built to last for at least two years, their cost, including the BeWhere software, comes to less than \$0.10 a day**. In fact, when bearing in mind the financial burden spared from the otherwise lost and misplaced equipment and factoring in the manpower hours involved: the SkyHawk/BeWhere Solution is a a reasonably small investment that demonstrates both short and long term return.

The Ontario Paramedic Service expects to see further benefits as it expands its use of BeWhere beacons, paired with SkyHawk AVL systems. Management has greater confidence that the Ontario Paramedic Service resources are being used effectively. Staff have greater job satisfaction that comes with having the tools to allow them to more easily meet the requirements of the job. Ultimately, it allows them to focus more time on patient care and less time worrying about finding things. Patients benefit from improved services that come with the enhanced assurance that vehicles are properly equipped.