Is a Real-Time Locating System Right for Your Organization?

A Guide to Identifying the Best Location Tracking Solution to Meet Your Specific Needs

FLEXWARE™ innovation
A Hitachi Group Company

THE GROWTH OF REAL-TIME LOCATION TRACKING

The implementation of Internet of Things (IoT) technology has brought numerous advancements in manufacturing. As a result, facilities are becoming smarter, safer, and more efficient. One IoT technology that is experiencing rapid adoption today is location tracking. The ability to know at any given time where products, people, equipment, and other valuable assets are located, where they have been, and where they are going provides operational insight that can impact everything from production efficiency to employee safety.

Conceptually, location tracking isn't exactly new - telematics and GPS have been used for years to monitor or track vehicle fleets, shipments, and other long-range applications in outdoor environments. What is new is a variety of advancements in connectivity tools and smart sensors that makes indoor location tracking much more precise. The resulting new technology, known as a Real-Time Locating System (RTLS), makes it possible not only to identify the location of an asset or person precisely in real time, but also to integrate the resulting location data with existing systems and workflows.

At Flexware Innovation, we have seen an increasing interest in the capabilities of an RTLS. However, with the increasing variety of available indoor tracking technologies and solutions, it can be difficult to determine whether RTLS is the right approach, and if so, how best to implement it. This whitepaper aims to address questions, concerns, and misconceptions about RTLS solutions by providing a general overview of what an RTLS is capable of across a variety of industries. We will also offer details of an in-depth RTLS technology evaluation performed in the Flexware lab. Finally, we will outline how organizations can leverage our experience to decide if their application requires the high degree of accuracy for indoor, real-time tracking offered by an RTLS or if another location tracking tool may be the right fit.

WHAT IS RTLS, HOW DOES IT WORK, AND HOW IS IT DIFFERENT FROM GPS AND RFID?

While RTLS is often referred to as "indoor GPS", the two technologies are quite different. As we know, GPS technology relies on satellite communication and works best outdoors where man-made structures will not interfere with the required signals. Alternatively, RTLS technology is designed to work primarily indoors and uses a network of mobile tags and fixed sensors that communicate using various radio frequencies, including the 2.4Ghz WiFi/Bluetooth spectrums and the 3.1 to 10.6 Ghz Ultra-Wide Band (UWB) spectrum.

In a typical RTLS implementation, the mobile tags are either worn by individuals who are moving, or attached to objects that will be transported, around the facility. Typically using radio frequency (RF) signals, the tags may communicate either with each other, or with a network of fixed sensors installed in the areas where the objects or people will be moving. A location algorithm is then used to determine the precise location, in real-time, of the asset or person within the facility.

It is this precise, real-time location tracking that differentiates RTLS from more traditional RFID solutions. RFID technology, which also uses RF signals to communicate between tags and sensors (aka readers), has been used successfully for many years, in numerous industries, to detect and verify the unique identification of both objects and people as they move around a facility. However, a typical RFID solution lacks advanced location algorithms, and therefore it only knows the last reader that detected a particular tag. As a result, it cannot pinpoint the exact location of the tag within the scanned area, nor can it guarantee that the tag is even still in that area. While it has many useful applications, RFID typically cannot compete with RTLS in use cases that require precise, real-time location tracking.

THE APPLICATION OF RTLS AND OTHER LOCATION TRACKING TECHNOLOGIES IN MANUFACTURING

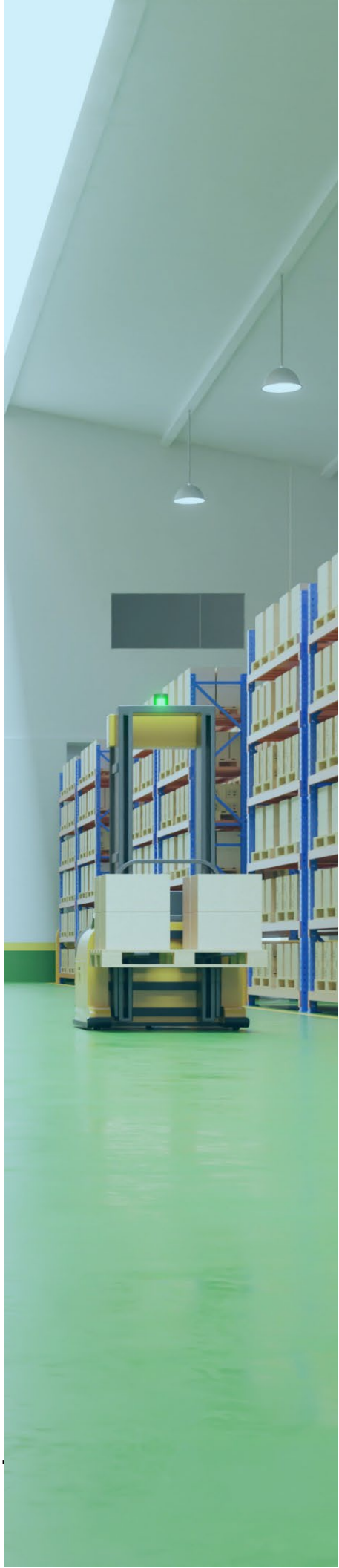
While an RTLS can be used in any contained environment where the location of people or things needs to be monitored, those in and around manufacturing have found the technology particularly useful. Within manufacturing operations, an RTLS can be used for material tracking purposes, from raw materials needed on the plant floor to finished goods stored in the warehouse. Many manufacturers have inventory management systems, but these systems typically rely on either barcode scanning or manual input to move the inventory units from one location to another. Both of these methods introduce human error and inaccuracy into the solution. An RTLS can improve the accuracy by detecting the movement of tagged parts/loads automatically and sending the information directly to the inventory management system.

In order to improve accuracy even further, an RTLS can work in conjunction with a fleet of autonomous vehicles (AGVs/AMRs), removing human error entirely when transporting materials or finished goods to and from manufacturing and warehousing areas. In this case, tags may be affixed to the vehicles themselves, as well as to the parts/containers being transported, allowing the system to know automatically, in real-time, which materials are being transported by which vehicles, and where the materials are being delivered. The result is an entirely autonomous material handling and inventory management solution.

In addition to tracking raw materials and finished goods, an RTLS can serve as a method for loss prevention as companies track high-value assets to ensure expensive parts or tools are not misplaced. There are numerous options for different types and sizes of tags designed to fit on even the smallest part or tool. By tracking the movement of these high-value assets, in real-time, manufacturers reduce not only the amount of time required to locate items, but also the associated cost of replacing lost items.

When deployed as a location tracking solution for employees, an RTLS can help improve workplace safety. For example, if certain manufacturing processes require specific operator training, an RTLS can be used to ensure that everyone in the vicinity of a specific line or equipment is properly trained and qualified to operate that equipment.

When used in more advanced applications, RTLS solutions can also play a pivotal role in improved quality control. For example, a drill can be programmed such that it is not operable unless it is located in a designated area, or a torque tool can be restricted to a specific pre-programmed torque sequence based on which area the tool is being used, or a production machine can be configured to start only if a trained operator is in the area. These types of location-based restrictions not only contribute to improving employee safety but can also lead to reduced scrap or rework.



Finally, it is important to note that an RTLS does not need to operate in a silo as a single location tracking tool. The real power lies in the ability to interface RTLS with other systems to create an integrated solution. For example, large-scale manufacturing operations may move parts between various facilities, both on and off-site. In this case, a hybrid RTLS/GPS solution can be used to create an effective system that tracks where the WIP is located, in real-time, at any point in the manufacturing process. The RTLS may also be integrated with one or more other systems, such as an inventory or warehouse management system, a manufacturing execution system (MES), or an enterprise resource planning (ERP) system, to introduce additional automation and to propel the manufacturer forward on their digital transformation journey.

FINDING THE RIGHT RTLS VENDOR

In 2020, Flexware set out to test this emerging technology first-hand. We established an in-house lab and sent a Request for Information (RFI) to 24 vendors with RTLS solutions. As part of this RFI, we set out to identify technology that could track a variety of assets including people, small components, tools, and larger items such as vehicles in single-story industrial locations with large open spaces. We narrowed down RFI responses to a subset of vendors who were best positioned to service Flexware customers.

During the technology exploration phase, we surveyed vendors on service capabilities, product features, and engineering rates to determine how these products might serve future projects. Sample projects were created and provided to vendors to gain insight into the recommended architecture and components.

Each solution we evaluated offered various out-of-the-box functionality, some including built-in contact tracing and smart space/geofencing functionality that we believe would be useful to our current and potential customers. At the end of the evaluation period, our engineering team felt Ubisense was the current market-leader for RTLS technology. As a result, Flexware installed a permanent demo of the Ubisense technology at one of our campuses for ongoing testing and learning.

IS AN RTLS RIGHT FOR YOUR FACILITY?

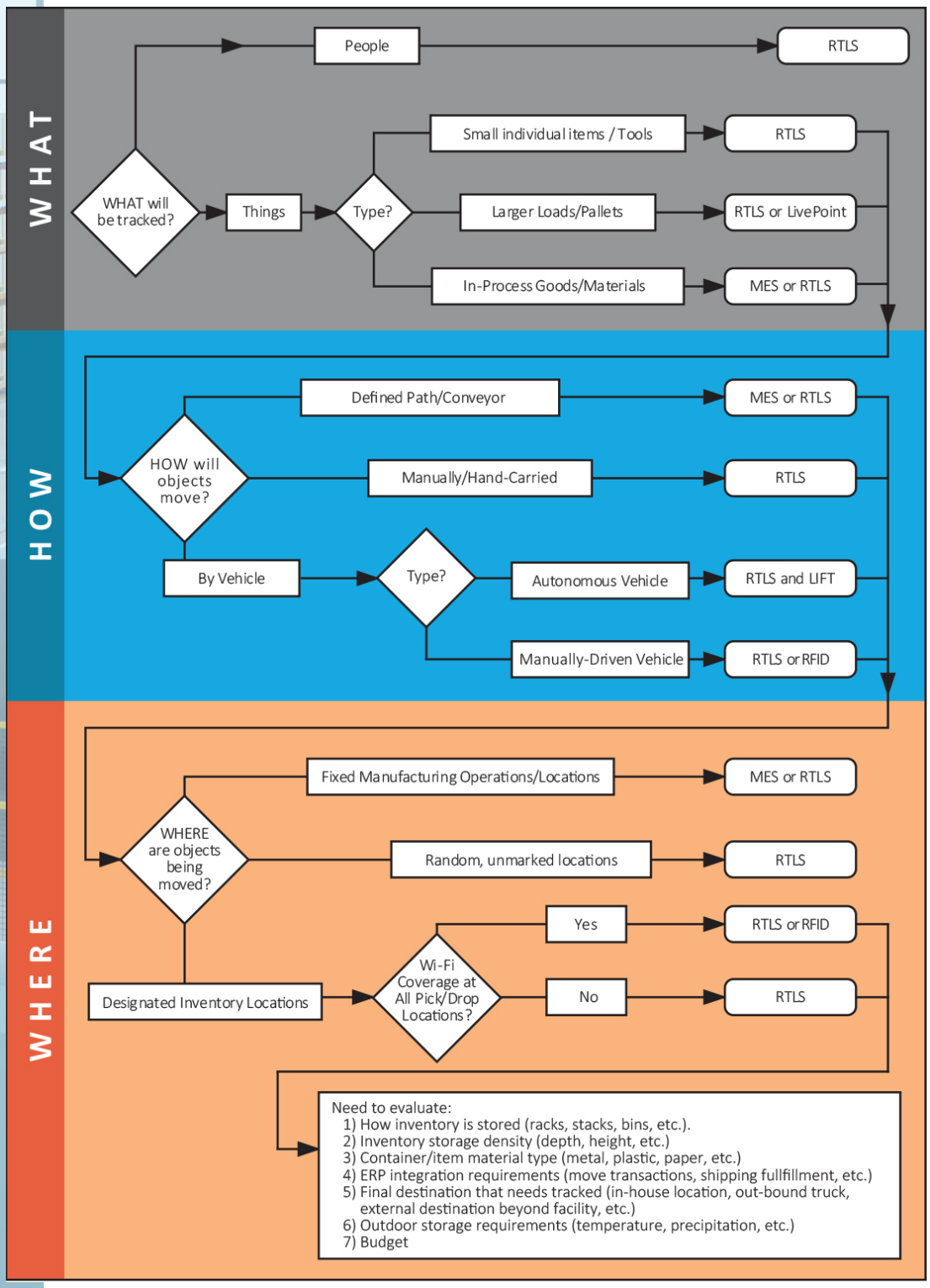
As with any new technology, it is tempting to believe that your organization needs to implement RTLS in order to keep pace with the market and not be left behind. However, RTLS solutions are fairly advanced and ambitious, and it is important to perform an in-depth evaluation to determine if it is the right solution. One of the first items to evaluate is whether other fundamental systems, which will act as foundational components for the RTLS, are in place. For example, in manufacturing, knowing the location of raw materials or finished goods is useful, but the real power comes when that location data is integrated with other systems, such as Inventory Management Systems (IMS), Manufacturing Execution Systems (MES), or Enterprise Resource Planning (ERP) systems. These other systems work with the RTLS to contextualize the location data and produce event-driven, actionable results. While RTLS may be able to stand on its own in some use cases, most successful implementations require that one or more of these other fundamental systems are already in place.

Example use cases include:

- Executing an automated move transaction in an IMS when the RTLS detects that a material has been moved from WIP storage to a lineside staging location.
- Incrementing a good product counter in an MES when the RTLS detects that a finished good has come off the end of an assembly line.
- Clocking-in an employee automatically to the correct operation/cost center within an ERP when the RTLS detects that the employee has moved to a different production area.

Once you confirm that you have the foundational components in place to connect with the RTLS and contextualize the location data, it is good to take a step back and examine all of the potential use cases you have for location tracking to make sure that an RTLS is in fact the right method to solve those use cases. Flexware has developed a flow chart (see Figure 1) that can get the conversation started and may help simplify the decision-making process.

Figure 1 Summary: The What, Where, and How of RTLS



- **What:** First, start by first looking at what needs to be tracked.
- **How:** If you need to track people, the decision to use an RTLS is pretty clear. But, if you need to track objects, the next step is to look at how those objects move around the facility - a defined path, manually, automatically, etc. Flexware developed LIFT, a configurable, system-agnostic automated logistics framework to simplify plant floor logistics by allowing information to flow between systems as necessary.
- **Where:** And finally, consider where the objects will be moved.

As you can see, there are a variety of considerations that need to be evaluated. In certain cases, there may be more cost-effective solutions than RTLS. For instance, if your goal is to track the movement of large loads or pallets that are transported by human-operated vehicles to designated inventory locations, then a vehicle-based RFID solution such as LivePoint may be sufficient. However, if you want to track people or objects that may not always move to a fixed location, or that may be moved by means other than a traditional hoist truck, then an RTLS could be the right solution.

Once you conclude an RTLS is the right option based on the initial evaluation process, you still need to consider other factors, such as infrastructure requirements and budget. An RTLS solution is comprised of both hardware and software. From a hardware standpoint, numerous fixed sensors will need to be mounted strategically throughout the physical areas where tracking will occur, and these sensors will need to be networked together, typically through hard-wired network switches that will be added to network closets. Depending on the platform selected and the facility you are working in, line-of-site may be necessary for transmitting and receiving signals, which means more sensors may be needed to achieve the required location accuracy. In addition, every item/person that will be tracked will require a physical RFID tag that will communicate back to the fixed sensors. Regarding software, typically there will be license costs not only for the server-based software, but also for the sensors and tags, resulting in software costs that increase proportionally with the quantity of sensors/tags. Finally, there will be services costs associated with the installation and configuration of the system. In short, deploying an RTLS can be a capital-intensive endeavor.

Another important, often overlooked, consideration when investigating and selecting an RTLS solution is the power requirements for tags and sensors and how you will develop a long-term operation and maintenance plan. For example, if the fixed sensors do not support power over ethernet (POE), then you will have to run a separate power feed to each of the fixed sensor locations. In addition, if you are using active, battery-operated tags, you need to have a system in place that alerts you when batteries need to be replaced, as well as a solid process for changing the batteries and performing other required maintenance.

While these are some of the big overarching topics to consider, there are some additional key questions to keep in mind as you evaluate RTLS solutions, including the following:

- How much out-of-the-box functionality do you require?
- How well do the vendor-provided tools integrate with your ecosystem?
- What level of system support are you able to manage moving forward?
- What vendor relationships do you need to consider?

GETTING THE MOST OUT OF AN RTLS

Once you've decided to move forward with an RTLS and begin planning your installation, keep in mind that it is typically not enough to know simply that something or someone has moved from one location to another. Instead, knowing the context around this move, and being able to generate automated, event-driven behavior, is where the real value lies. Typically, this additional context and advanced behavior is only achieved through integration with other systems in your facility, so it is crucial that you take the time to identify and plan for all of the integration points.

This is where Flexware comes in. A good integration partner understands in depth not only the system being installed but also how it will connect to and communicate with other systems in your ecosystem. Beyond the technology integration, the partner will bring extensive domain knowledge and relevant prior experience to the project, providing leadership and guidance in key areas such as project management, process improvement, and industry best practices. As a result of our proactive approach to evaluating RTLS solutions, and our vast experience implementing integrated solutions, we can bring this value, and more, to your organization as an integration partner.

Ready to see RTLS technology in action to understand its full range of capabilities versus other location tracking solutions? Contact us today to request a demo of our on-campus RTLS.

www.flexwareinnovation.com/rtls-guide