

**RFind Systems, Inc.**

When you need to know where something is...  
Don't just look for it...  
RFind it!

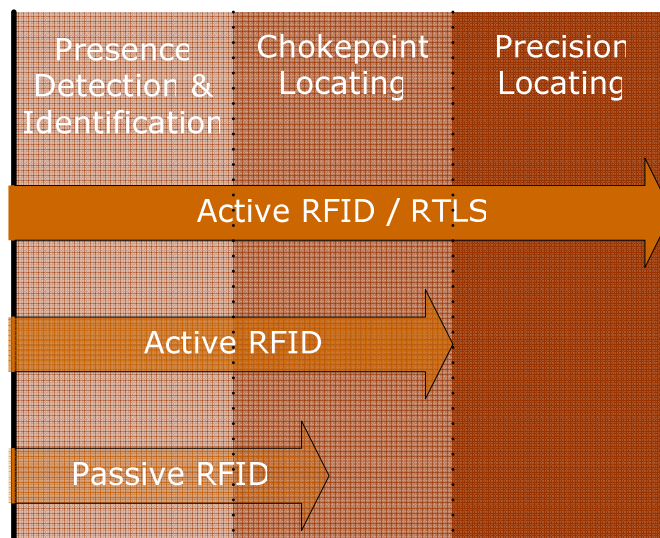


**By Sharon Barnes, CEO RFind Systems Inc.**

**Introduction**

Radio Frequency Identification (RFID) has been in existence for several decades and is just now starting to obtain wide spread adoption in the marketplace. Just about everyone has heard of RFID but there is still a lot of confusion about all the different types of RFID and how they are used. Added to this is a new term, real-time locating system (RTLS), which uses active RFID to perform precision locating functionality. RTLS is a substitute for GPS outdoors, and replaces GPS indoors where GPS does not function well. It delivers the answer to "Where are my Assets?" by providing a precise x, y coordinate location for a particular asset.

At its root, RFID is the ability to detect the presence of a tag and to uniquely identify that tag. All RFID systems can perform these simple tasks: identification and presence detection. The range or distance from tag to reader/access point/gateway, at which this task can be performed depends on the technology being used. Passive RFID has a maximum range of about 20-30 feet (6-10 meters) while active RFID can achieve ranges of several thousand feet.



**Figure 1: Passive RFID, Active RFID, and RTLS**

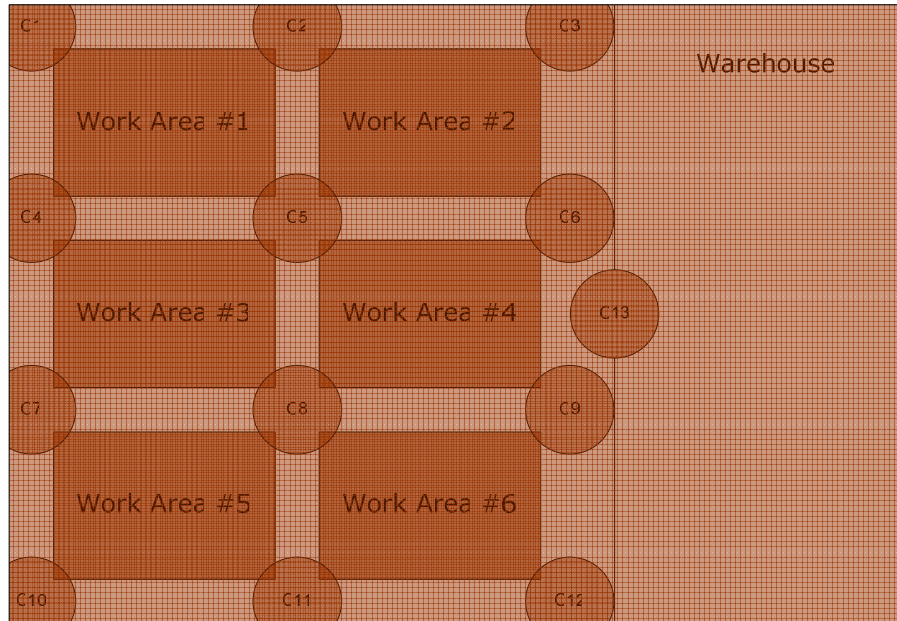
Aside from presence detection and identification of tags, RFID is able to perform various types of locating. Both passive and active technologies are capable of performing basic chokepoint

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locating while the RTLS technology which is built upon active RFID technology is capable of performing more sophisticated precision locating. The capabilities of the various technologies are outlined in figure 1.

## Chokepoint Location

Chokepoint locating is accomplished by deploying a series of RF coverage areas or zones of coverage established by the presence of an RFID reader and its associated antenna within a defined space (see figure 2). The actual size of a chokepoint area can be varied based on the vendor hardware being used and/or parameter settings in the system. The circles C1 to C13 represent the chokepoints.



**Figure 2: Locating with Chokepoints**

As tagged objects move through a chokepoint, they are recorded, typically in a software database, and a notation is made that that object passed through a specific chokepoint. The location of an object is determined by looking at the path created by the last 2 or 3 chokepoints through which an object passed as recorded in the historical records of the database. Resolution is increased by adding more chokepoints to the environment. This method of locating has several limitations:

- 1) If a tagged object starts through a choke point and then turns around, it is still recorded as having passed through the chokepoint.
- 2) Depending on the environment, there can be numerous 'holes' in the chokepoint net where objects can get from one point to another without passing through a chokepoint.
- 3) It is possible to create a bottleneck in the internal processes by requiring items to be passed through a chokepoint.
- 4) The reliability of chokepoints can easily be affected by the changes in the environment and the speed at which objects pass through the chokepoint.
- 5) The data in a chokepoint system is, by its nature, historical and not current, or real-time. Chokepoint systems by their very nature are not truly RTLS!
- 6) Increasing the number of chokepoints adds high costs to the system.

Every RFID system can be set up to perform this type of locating. The cost of this type of locating depends on the number of chokepoints that are set up. An estimated cost per chokepoint is \$5,000 plus cabling for network and/or power, bringing the total price tag to approximately \$8,000 or \$9,000 for each one.

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RFind Systems, Inc. Mail: Suite 102-#9-3151 Lakeshore Rd, Kelowna, B.C. V1W 3S9 Canada

## Triangulated Location

To obtain precise and current real time locating, it is necessary to install RTLS which works by using the signal from a tag to triangulate its position. The accuracy of these systems is determined by the density of the triangulation points in the system. The device used as the triangulation point depends on the type of RTLS technology being utilized.

Traditional RTLS uses access points for the triangulation points. These devices are anywhere from \$1000 - \$5000 and require power and/or network connectivity. Like chokepoints, each access point will cost approximate \$8,000 or \$9,000 to deploy.

RFind uses a new technology called **TAQnav™** for tag-to-tag communications using trilateral targeting algorithms. This technology makes use of the inexpensive active tags that are present in the environment as the triangulation or reference points for the system. Because of this, there is very little infrastructure in the environment. These tags, which range in price from \$30 to \$50, are fully self-contained and do not require any cabling and even light up as a guide to the asset. They are capable of performing the same duty as a triangulation engine in the traditional RTLS systems. The tags blanket even heavy metallic environments with assured signal integrity for low-cost RFID coverage and increased reliability.

**What is TAQnav™?**  
**TAQnav is an acronym for “Tag Acquisition Query navigation”, RFind’s patented tag to tag technology for precise locating.**

## Comparison

In comparing the three different types of locating, it is important to compare both the cost of the system and the relative accuracy obtained for that cost:

- 1) Chokepoint Locating
- 2) Triangulation Locating using Access Points or Readers
- 3) RFind’s Tag-to-Tag **TAQnav™** technology

The cost of the system is based on the amount of infrastructure that is needed to support the locating functionality. The accuracy is based on how closely the system can identify the exact location of the item. Figure 4 on the following page demonstrates the comparison of these three different types of locating.

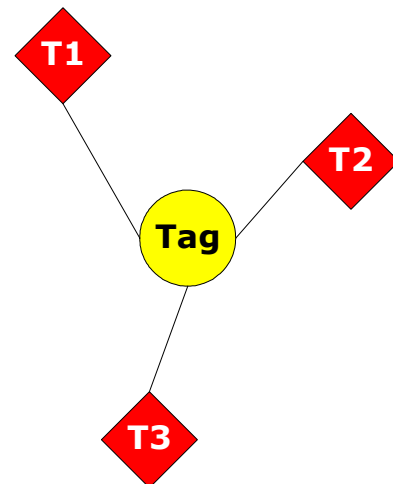
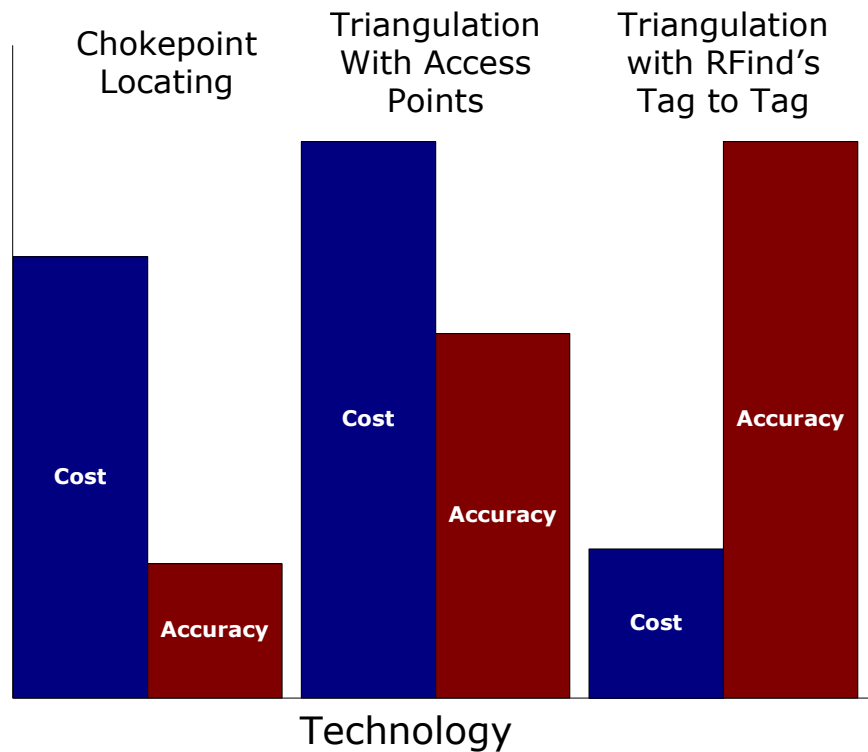


Figure 3: Triangulated Location



**Figure 4: Comparison of cost and accuracy for different locating technologies**

Chokepoints and triangulation using access points is a very costly approach to locating. Increasing the accuracy of these two approaches presents an exponential increase in the overall cost of the infrastructure.

By attacking the traditional high infrastructure cost associated with these methods, trilateral targeting using RFind's **TAQnav™** tag-to-tag technology makes RTLS truly affordable and offers the promise for ubiquitous use and deployment. As a side benefit, RFind's technology provides the most accurate locating granularity of all the locating approaches – as granular as 3 feet or even less in some applications.

## Conclusion

All RFID systems can perform simple presence detection, identification, and chokepoint locating. To achieve a high level of accuracy while maintaining the lowest cost to deploy, systems that utilize RFind's tag-to-tag technology offer the best option for users with a need for precise GPS-type asset locating ability, indoors or outdoors.

With patent protected RFID **TAQnav™** tag-to-tag technology, RFind has changed the game of Real Time Locating System (RTLS) solutions for industry clients who need to precisely locate and track important assets.