

# **A Guide to Selecting an Active RFID Tag**

Gabi Daniely, VP Marketing and Product Strategy,  
AeroScout, Inc.



## Table of Contents

Introduction .....	2
Definitions and Usage .....	2
Key Factors .....	3
Conclusion .....	6

## Introduction

Active RFID tags are now commonly being used to track and locate valuable assets in the healthcare, manufacturing and logistics markets. Quite different from the Passive RFID solutions famously championed by Wal-Mart and others, Active RFID systems are integrated into critical business processes to improve operational efficiency and reduce costs by providing real-time location information about assets and even people. While Passive RFID has held the limelight in the past, Active RFID and Real-Time Location solutions (RTLS) have in fact been quietly saving millions of dollars for enterprises around the world.

This guide introduces Active RFID with a special focus on the tags themselves, outlining common deployments and explaining how to choose the right Active RFID tag to meet your needs. Unlike their Passive counterparts, Active tags are sophisticated wireless devices, capable of communicating data at long range and operating in rugged environments for years at a time.

Active tags do differ in price, with a wide range available, but unlike Passive tags, price is not the distinguishing factor. Instead, organizations must consider a wide range of attributes and technological factors when selecting the correct configuration.

This guide will help you locate the correct Active tag solution.

## Definitions and Usage

To start with, a few definitions:

- RFID – Radio Frequency Identification uses electromagnetic or electrostatic signals to uniquely distinguish and identify a unique mobile “tag” device. Valuable assets can be tracked if the identity of the attached tag is known.
- Active RFID – identification system in which tags have their own power source (usually a battery), enabling them to broadcast an identifying signal. This extends the range of the tags and the capability for communicating advanced information such as location.
- Passive RFID – identification system in which the tags are not powered, relying on active signals from the location transmitters for their response. This limits the range of the tags to a few feet.

- RSSI – Received Signal Strength Indication is an algorithm that determines the location of an Active tag by measuring the power of radio signals. Typically works best for indoor deployments, where the density of Active RFID or Wi-Fi readers is high.
- TDOA – Time Difference of Arrival is an algorithm that determines the location of an Active tag through triangulation, measuring the time differences of a single signal received by multiple receivers. TDOA typically works best in outdoor environments or large open indoor environments (e.g. large manufacturing hangars).

Sample uses of Active RFID tags include tracking infusion pumps throughout a hospital so that nursing staff and biomedical teams can find them in a timely manner; tracking high-value work in process (WIP) inventory in the aerospace and automotive manufacturing sectors; and tracking trailers and containers in the transportation/logistics industry, both inside a warehouse and around the depot.

Once you have made the decision that Active RFID fits your asset tracking needs, there are a wide variety of technologies, possibilities and options to consider. Unlike Passive RFID, most Active RFID systems are sold as complete solutions, with tags, readers (if necessary), and software.

## Key Factors

The following are the key factors to consider when choosing an Active RFID tag:

- **Standards-based or proprietary?** – some tags require their own specialized wireless reader network specifically for the asset tracking system. Others are compatible with existing standards-based Wi-Fi (802.11) networks. The choice of a tag's over-the-air frequency should be made as early in the process as possible, as it has major implications for the physical infrastructure of the installation and the way the installation will be rolled out. There are some instances where the investment in a supplementary, proprietary network is appropriate, and others where the initial and recurring cost advantages of leveraging the current wireless infrastructure makes more sense.
- **Tracking and location capabilities** – nearly all Active RFID tag vendors claim some form of “location tracking”, but this definition can vary greatly from provider to provider. Some tags only offer basic long-range presence detection (i.e., is the tag within range or not?), while others use an algorithm such as RSSI and/or TDOA to determine location in real-time.

Some also have built-in “choke-point” capabilities to provide an instantaneous distinct indication that a tag passed through a certain point, such as when passing through a doorway. The most advanced tags combine many of the above methods. As each of these approaches is geared specifically towards certain environments and applications, you should choose a tag that includes all of the location types you need. Determining your need for location information is a critical step, and will help narrow the list of potential tag vendors. In addition, you should also think about the need for potential future deployments, and choose a vendor that can be flexible enough to address your needs now, and in the future.

- **Batteries: bigger isn’t better** – think about the lifespan of the tag you require. Much is made of the battery life of a tag, and the tag’s power consumption is often a good measure of the battery life to expect. But long battery life can also be a function of a larger or more expensive battery, which might not be practical for your implementation. A high power consumption tag can have a short lifespan, even with a large battery. In order to make a fair comparison, make sure you understand the size and cost of the batteries being proposed, not just the maximum battery life listed on the product data sheet. Ideally you should look for a combination of small battery form factor with low power consumption, which will give a compact, long-life tag.
- **Network impact and scalability** – be sure to investigate the effect tags will have on any existing wireless traffic, and whether the number of tags can scale without impacting other applications. Some tag frequencies, for example, have been shown to interfere with Wi-Fi data traffic. For Wi-Fi-based tags, the critical factor is the method which the tags use to communicate with existing WLAN access points. Some Wi-Fi tags utilize a “beaconing” method in which tags send small unidirectional Wi-Fi messages to networks as needed, keeping bandwidth utilization low and ensuring high levels of scalability. “Beaconing” tag installations currently account for the largest in the market, with some individual deployments exceeding the tens of thousands. Other tags use a form of communication known as “association”, which requires more network resources, resulting in low scalability and high required maintenance.
- **Sensor sensibility** - does the tag have the right sensing features, such as pre-installed motion sensors? Motion sensors conserve battery life, as they enable separate transmission intervals for tags which are stationary or in motion. They also minimize network traffic, and conserve processing power and storage. As your deployment rolls out, you may want to introduce new sensing functions such as temperature gauges, humidity


and pressure sensors, as well as telemetry capability (the ability to remotely access and report information from 3rd party devices wirelessly through the tag). Some tags come with this functionality pre-integrated, others enable these functions to be bolted on, and still others do not have the required upgradeability. Make sure your tags are future-proofed against emerging needs and more complex tracking requirements.

- **Learning new tricks** – some tags allow you to automatically modify the tag's behavior in the field as it passes through a specific point, such as a door or gate. This could be used to switch the tag off when leaving the campus to preserve battery life, for instance. These features provide much greater flexibility and sophistication to the implementation since behavior is more configurable.
- **Ease of configuration** – every tag will need to be commissioned and configured upon purchase, so if you're looking at larger installations, ease of configuration is key. Verify that you will not have to rely on pre-determined factory settings, and that all the parameters you will ever need are fully configurable (such as transmission rates, motion sensing settings, call button messages, telemetry, etc.)
- **In the field implementations** – nothing validates a vendor's claims better than real world customer deployments with large numbers of tags. Field implementations put the tags through far more stringent tests than can be recreated in a lab. New batches of first generation tags will be less sophisticated and less proven than more mature products. As new entrants launch untested products this becomes an increasingly important factor to consider. Make sure that the vendor you choose has a history of successfully installing systems that meet the size and scope of your needs.
- **Range of accessories** – how will the tag mount/attach to all the assets you wish to track? A sophisticated tag will have a range of attachment accessories which enable it to be fixed to a wide variety of assets. Don't just think about the assets you want to track today – can the tag be attached to other assets (or people) that you may want to track in the future? Does the vendor offer hanging mounts for vehicles, or a badge clip attachment for tracking people? Also, look for specialized tag form factors, such as a credit card-like size, and make sure the tags are fully customizable in case your needs are more specific than an off-the-shelf tag. If you work in a specific vertical market, such as healthcare, it's likely that your needs will differ from a user in the aerospace industry, so again, vendor flexibility is key.

- **Total cost of ownership** – a tag is made up of multiple components such as the system chip, the antenna, battery, capacitor, sensors, memory and housing. When costing the tag, ensure you are taking into consideration all the required elements including accessories. Some vendors promote the price of just one element, rather than the final production tag, attracting potential customers with a false illusion of low cost. As with any IT purchase, be sure to take into consideration the total cost of ownership (TCO) of the solution. The TCO of a \$65 tag can often be lower than that of a \$25 tag if the software, infrastructure, installation and scalability costs are lower.
- **Range** – tags are only good at tracking assets if they are in send/receive range of the appropriate reader or access point. The range of a tag's signal will impact the density of readers required, and the effectiveness, accuracy and cost of the tracking system.
- **Environmental factors** – think about what a tag in your environment is likely to experience every day: will it be outside, or cleaned with a chemical, under extreme heat, or potentially dropped? This will inform the environmental specifications you need. Look for a high environmental rating and a wide temperature range, and make sure the vendor can provide proof of testing under conditions similar to yours (e.g. drop and vibration tests). Some environments may require more specialized tag certifications, such as being intrinsically safe (e.g. explosion-proof) for use in oil refineries or mining.
- **Make tag data actionable** – a tag can only provide value if you use the data to make improvements to business processes. With this in mind, consider the management software that is offered along with the tag, and be sure that it supports your business needs. Can tag movement trigger alerts, or automated actions? Can employees search for particular tags, or groups of tags at once? What kind of reporting is offered? If the tag you've chosen doesn't feed data to a robust middleware or enterprise software system, you may have to reconsider your choice.
- **Security** – ideally, the tag itself should carry minimal valuable data, or else include a trusted security mechanism for data protection.

## Conclusion

Selecting the right tag is fundamental to the success of an asset tracking and Active RFID deployment. It's important to select a proven tag which operates well



within your physical environment, which has the functionality, longevity and scalability required for current and future needs, and which integrates securely into your broader enterprise systems, and meets deployment costs and timeframes.

While selection is a complex task, we hope the points highlighted above help you to find the right tag for your needs.

## **About AeroScout**

AeroScout is the market leader in Active RFID asset tracking and location solutions over standard Wi-Fi networks. The company's enterprise visibility solutions accurately locate and monitor assets and people in both indoor and outdoor environments to improve business processes. AeroScout products are used by several hundred customers worldwide in the healthcare, manufacturing and logistics industries, including Fortune 50 enterprises and many of the world's leading hospitals. Founded in 2000, AeroScout pioneered the Wi-Fi visibility market by introducing the industry's first Wi-Fi-based Active RFID tag, and is widely recognized as leading the market in number of tags shipped.

### **AeroScout, Inc. (HQ)**

1300 Island Drive  
Suite 202  
Redwood City, CA 94054  
Tel: +1 (650) 596-2994  
Fax: +1 (650) 596-2969  
E-mail: [info@aeroscout.com](mailto:info@aeroscout.com)

### **AeroScout EMEA**

Pegasus Park  
Pegasuslaan 5  
B-1831 Diegem  
Belgium  
Tel : +32 2 709 29 49  
Fax : +32 15 30 80 99  
E-mail: [emea@aeroscout.com](mailto:emea@aeroscout.com)

### **AeroScout Israel**

3 Pekris St.  
Rorberg Building  
Einstein Entrance  
Park Tamar, Rehovot Israel, 76702  
Tel: +972 (8) 936-3136  
Fax: +972 (8) 936-5977  
E-mail: [info@aeroscout.com](mailto:info@aeroscout.com)

### **AeroScout Japan Co., Ltd.**

Ichibancho K.K. Bldg 7F, 13-8  
Ichibancho  
Chiyoda-Ku, Tokyo 102-0082,  
Japan  
Tel: +81 (3) 3556 9003