



# RFID ASSET SECURITY

Identification and intelligent tracking.



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## Introduction / Background

The current proliferations of mobile devices in the retail environment has created an emerging set of security requirements at the retail store level. A Device Security strategy is required to protect the retailer's investment in mobile technology and to maintain the optimum population of devices for the intended application(s). Mobile applications may include Personal Shopping / Gift Registry involving the customer as the device users, or Use Cases such as mobile POS, Line Busting, and a number of store support activities where store-associates are the users.

## Abstract / Business Case

The paper is intended to describe how RFID Technology can be deployed to provide a real-time security system which protects a retailer's investment of in-store mobile technology. The solution in its simplest form involves three components.

1. Integration of a GEN 2 passive RFID Tag into the device to be protected.
2. Installation of an RFID Portal which provides an RFID Read-Zone at each exit point of the store to detect the presence of any RFID security Tags and report Tag Reads to the application software.
3. Development of a software application to interpret any Reads as alarm conditions and trigger the appropriate system response. A desired alarm condition may be an email or SMS alerts, triggering of video equipment or a tightly coupled alarming wave file sent to the device in jeopardy.

The inclusion of a Mobile Device Management Dashboard can offer additional functionality to aid store management personnel with the task of End-of-Day reconciliation of the equipment. This added visibility to the device status can significantly aid in locating misplaced or incorrectly allocated mobile assets.

## Problem Statement / Introduction

[Tag Selection / Integration](#) - Tag selection and integration with the device to be protected must be done in conjunction with Reader/Antenna selection based upon their designs. The primary goal is of course to Read the Tag as early as possible once it approached the limits of the secure area and issue the desired Alert or Alarm conditions.

[Reader/Antenna Selection and Portal Design](#) - The selected RFID equipment must be physically positioned and tuned to provide optimal response once a Tagged device has entered the Security Area. However significant consideration must be given to NOT allow the RFID Read Area to bleed into the intended operational area. (Normally the selling floor).

[Software functionality and response time](#) - Reader Response Time, Device Client and Mobile Device Management features.

[Device support post installation](#) - Depot Service and Advance Replacement services may be required in many instances.

## UHF RFID Basics

Radio-frequency identification (RFID) technology uses radio waves to exchange identification and tracking data between an RFID reader and an electronic RFID tag that is attached to an object such as a shipment of products, a forklift in a warehouse or even an employee badge. A microchip in the RFID tag contains the data. Tags data can be stored in two states, locked and unlocked. In the locked state, the data can only be read by the reader. An unlocked tag, on the other hand, allows data can be captured and modified. New data can be appended to the existing data set, or new data can completely overwrite the existing information on the tag including its ID and/or the data stored in the microchip. The antenna on the RFID reader enables the communication between the tag and reader. The distance that an RFID tag can be read depends on a number of factors, including the environment, as well as the size and type of RFID tag.

Ultra High Frequency (UHF) RFID is especially exciting to the business world because it offers long read ranges with low cost RFID tags, allowing organizations to tag and automatically track large quantities of goods and assets. Typical read ranges for UHF passive tags are 8 to 30 feet (2.4 m to 9.14 m) and beyond.

### Unique RFID characteristics

- No line of sight required
- Read many tags simultaneously
- Re-usable tags — read and write data to low-cost, flexible tags
- Rich data capacity
- Durability
- Difficult to replicate, reducing opportunities to introduce a counterfeited product

## RFID reader types

- Fixed RFID readers automate data capture at key entry and exit points, such as building entrances or the door to the IT data center, and typically require external antennas to either sides of the portal.

Handheld RFID readers allow on-the-spot reading of RFID tags, allowing workers to perform quick and accurate inventories or search for specific items on a warehouse shelf or in a store dressing room.

- Mobile RFID readers can perform additional search features or operated as fixed RFID readers in temporary and hard-to-install locations.
- Presentation RFID readers are ideal wherever workers or customers need to present RFID-enabled items to the reader — for example, at the retail point of sale (POS), an asset management commissioning station or at an entry point (for example an airport gate or event entry point)

## UHF RFID Privacy

While the advantages of RFID are clear, privacy and security will be a concern not only for you, but also for your customers. Regardless of what type of UHF application you need, you can count on your data remaining secure.

### Security in inventory, supply chain and asset management applications

UHF RFID tags are typically utilized to identify product and goods on the retail floor or in the supply chain, or assets utilized to conduct business — from IT assets to material handling equipment in the warehouse or machinery on a production line. The Electronic Product Code (EPC) or asset number that is stored on an RFID tag typically contains product and stocking information only — data that is not sensitive. Just like a bar code, the data may correlate to sensitive information that resides on a secured and encrypted back office database. Even if an unauthorized user gained access to the RFID tag data, the information would be a meaningless string of numbers, with no context.

To further guard against unauthorized access, transmissions between RFID readers and tags can also be protected by encryption and authentication protocols. RFID Generation-2 and ISO 18000-6 standards (most often used for RFID in retail settings) offer enhanced security. You can now add passwords to individual tags to prevent impermissible copying, much like the additional protection a personal identification number (PIN) provides when paying for goods with a credit or debit card.

### Security in identity management and credentialing

Since RFID tags are nearly impossible to forge, just their mere presence can increase the security of sensitive documents, such as passports or agency ID cards. An integrated RFID tag can play a valuable role in preventing fraud and the counterfeiting of government-issued identification documents, helping thwart unauthorized personnel from entering a country or a government agency.

## OPI's Asset Protection

The OPI Loss Prevention System protects the retailer's investment in various mobile technologies. Any RFID equipped asset can be tracked at the Entrance/exit or any designated areas such as hallways, emergency exits, and loading docks.

## Introduction to OPI's Asset Protection

OPI has integrated a solution that combines the wireless communications integrated in mobile devices with passive RFID technology using OPI's software. When an asset crosses beyond the designated boundary, the antennae energize the tag and check to see if the asset is allowed to leave. If not, a message can be sent to the device to deactivate, sound an alarm, or alert staff to a potential loss before it becomes one.

## Application of Solution

Utilizing inexpensive passive RFID tags as a loss prevention solution allows for a cost effective and comprehensive asset protection plan. Not only can you identify when the asset crossed a threshold and pair that with a video recording system (DVR) or even trigger snapshots, you can remotely disable a device protecting its contents from getting into the wrong hands. Utilizing a middleware connection, a network connected controller with the proper software can issue a remote lock, remote wipe, or alarm condition rendering the device useless and making it an undesirable target for theft. The solution also integrates with a mobile device management console providing real time reporting and device statuses on demand.

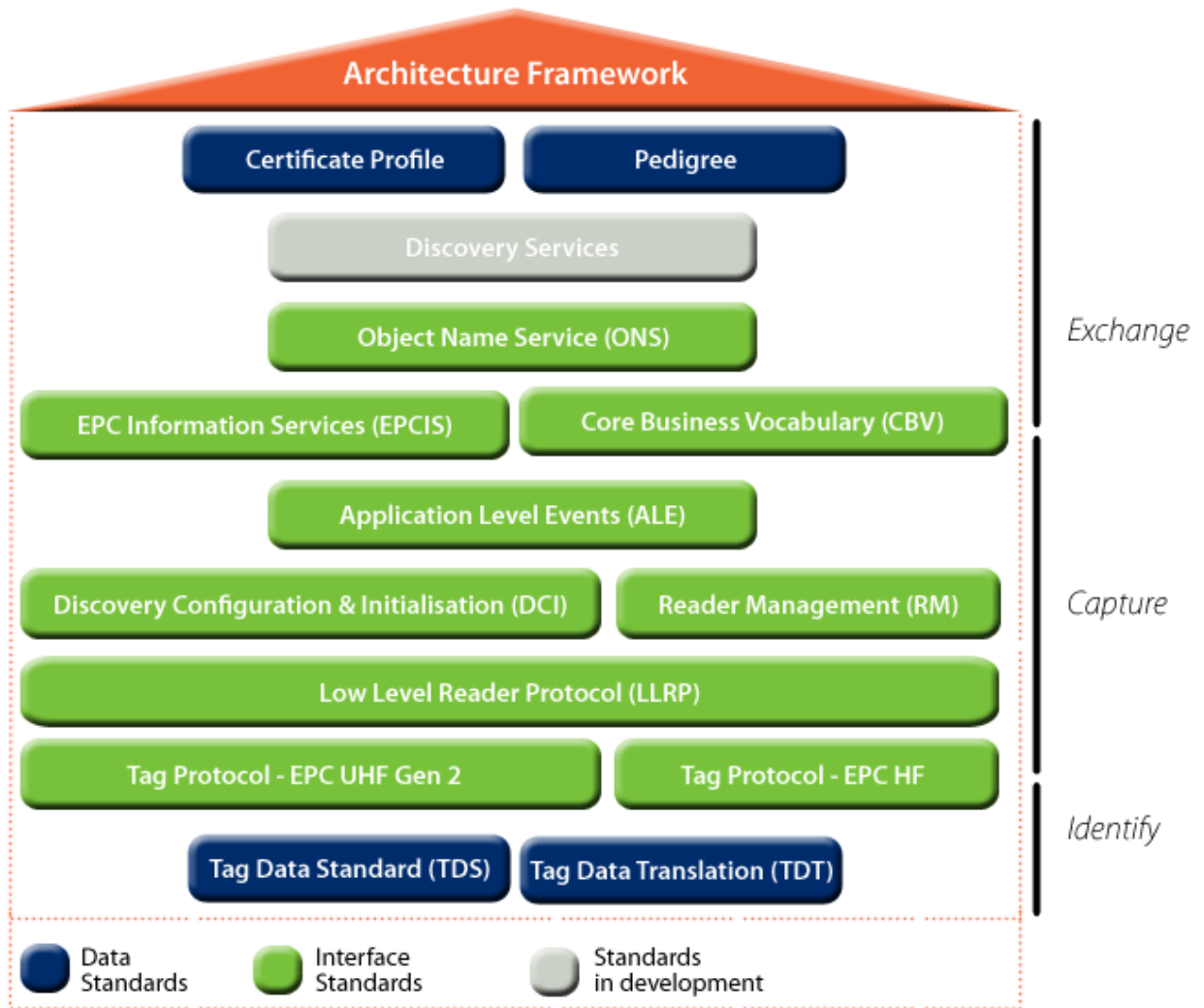
## Results / Conclusion

OPI's RFID asset protection systems are custom integrated to provide visibility and exposure to guard your assets. The systems equip you with real time notifications and exposure to threats that are unpredictable and affect your bottom line. Middleware integration allows for the protection of intellectual property remotely before the device leaves the premises unless properly checked out ensuring that any sensitive or important data remain in the enterprise, where it was intended to be.

## About OPI

Optical Phusion, Inc. (OPI) is an enterprise mobility integration company that helps customers manage the entire lifecycle of RFID and wireless technology projects with application-based solutions for a range of markets specializing in retail, supply chain and field sales organizations. Its mobile device management solution supports a broad range of kiosk and enterprise mobile assets. For retailers, OPI has implemented a variety of RFID-based systems for loss prevention, mobile device security and mobility asset management that lead to faster delivery of products, reduced total cost of ownership (TCO) and greater return on investment (ROI).

# Appendix A – EPCglobal Standards Overview



## Appendix B – References

### **RFID Journal white papers and Case studies**

<http://www.rfidjournal.com/pharmaceutical>

<https://www.rfidjournal.com/purchase->

<access?type=Article&id=7527&r=%2Farticles%2Fview%3F7527>

<http://www.rfidjournal.com/glossary/>

### **Electronic Product Council**

[http://epc-rfid.info/Rfid\\_Tags](http://epc-rfid.info/Rfid_Tags)

### **Getting Started UHF RFID White Paper. – Motorola Solutions,**

[http://www.motorolasolutions.com/web/Business/Products/RFID/ Documents/ Documents/ stati cFiles/Getting\\_Started\\_UHF\\_RFID\\_White\\_Paper.pdf](http://www.motorolasolutions.com/web/Business/Products/RFID/ Documents/ Documents/ stati cFiles/Getting_Started_UHF_RFID_White_Paper.pdf)

### **EPCglobal Standards Overview**

<http://www.gs1.org/gsm/kc/epcglobal>

[http://www.gs1.org/gsm/kc/epcglobal/uhfc1g2/uhfc1g2\\_1\\_1\\_0-standard-20071017.pdf](http://www.gs1.org/gsm/kc/epcglobal/uhfc1g2/uhfc1g2_1_1_0-standard-20071017.pdf)

## Appendix C – Glossary

**Active tag:** An RFID tag that has a battery that powers the circuitry and transmits the signal to a reader. Active tags can be read from 100 feet away or more and are used for tracking expensive items over long ranges.

**Antenna:** The element built into both RFID readers and tags that radiates and receives radio energy.

**Backscatter:** A method of communication where tags reflect back a portion of the radio waves that are emitted by the reader to transmit tag data to the reader.

**Battery-assisted tag:** These RFID tags contain batteries that provide direct power on the tag itself to increase read range (sometimes called “semi-passive RFID tags.”)

**Circular-polarized antenna:** This omnidirectional UHF reader antenna emits radio waves in a circular pattern and is designed to easily capture RFID tags that are presented in different orientations.

**Contactless smart card:** A credit or loyalty card that contains an RFID chip that can automatically transmit information to a reader — no ‘swiping’ required. Such cards can speed checkout, providing consumers with more convenience.

**Chip-less RFID tag:** An RFID tag without an integrated microchip. Materials in the tag reflect back a portion of the radio waves beamed at them from the reader. The waveforms are utilized much like a fingerprint to identify the object that is tagged. Although chip-less tags are inexpensive, they are not useful in the supply chain since they cannot transmit a unique serial number that can be stored in a database.

**Closed-loop systems:** RFID tracking systems set up within a company, where there is no data sharing with other companies required to enable the application. One example is a railroad that issues its own RFID-enabled tickets.

**Electromagnetic interference (EMI):** Interference caused when the radio waves of one device distort the waves of another. Cells phones, wireless computers and even robots in factories can produce radio waves that interfere with RFID tags.

**Electronic article surveillance (EAS):** Simple electronic tags that can be turned on or off. When an item is purchased or borrowed, the tag is turned off. When the item passes a gate with a tag that hasn’t been deactivated, an alarm sounds, helping prevent theft.

**Electronic Product Code (EPC):** A 96-bit code created by the Auto-ID Center that contains a unique number that identifies a specific item in the supply chain. The code contains digits that identify the manufacturer, product category and the individual item. It is backed by the United Code Council and EAN International, the two main bodies that oversee bar code standards.

**EPCglobal:** The non-profit organization that manages standards and numbering schemes associated with EPC and the successor organization to the Auto ID Center. EPCglobal is a membership-driven organization and is a subsidiary of the



**European Article Numbering (EAN):** The bar code standard used throughout Europe, Asia and South America. It is administered by EAN International.

**Excite:** The reader is said to “excite” a passive tag when the reader transmits RF energy to wake up the tag and enable it to transmit back.

**Frequency:** The number of repetitions of a complete wave within one second. 1 Hz equals one complete waveform in one second. 1 KHz equals 1,000 waves in a second.

**GTAG (Global Tag):** A standardization initiative of the Uniform Code Council (UCC) and the European Article Numbering Association (EAN) for asset tracking and logistics based on radio frequency identification (RFID). The GTAG initiative is supported by NXP, Intermec, and Gemplus — three major RFIDtag manufacturers.

**GTIN (Global Trade Item Number):** A GTIN is a GS1 identification key that enables global identification of an item anywhere in the supply chain. No matter in the supply chain an item may be — from manufacturer to distributor to retail store to end consumer — a scan of the GTIN enables any partner in a given supply chain to accurately identify the product and obtain pricing. The result is highly efficient ordering and invoicing across the supply chain.

**Harvesting:** A term that describes how passive tags gather energy from an RFID reader antenna.

**High-frequency (HF) tags:** HF tags typically operate at 13.56 MHz and can be read from about 10 feet away. They transmit data faster, but consume more power than low-frequency tags.

**Interference:** Anything that prevents radio waves from traveling between a tag and reader correctly and causes the tag to be read incorrectly. Can be caused by other radio signals or by some physical objects metals and liquids that absorb or reflect the radio signals.

**Interrogator:** See RFID reader.

**Linear-polarized antenna:** A UHF antenna where the radio energy is focused in a narrow beam to increase read distance and enable the signal to penetrate dense materials. Unlike circular-polarized antennas, the linear-polarized antenna requires tags to be aligned with reader.

**Microwave tags:** Radio frequency tags that operate at 5.8 GHz. They have very high transfer rates and can be read from as far away as 30 feet, but they use a lot of power and are expensive.

**Middleware:** Computer software that connects software components or applications. It is used most often to support complex, distributed applications based on XML, SOAP, Web services and service orientated architecture (SOA). Middleware can include web servers, application servers and content management systems.

**Nominal range:** The read range at which a tag can be read reliably.

**Object Name Service (ONS):** An Auto-ID Center system that allows the look up of unique Electronic Product Codes (EPC). ONS is similar to the Domain Name Service, which points computers to sites on the Internet.

**Passive tag:** An RFID tag without a battery. When radio waves from the reader reach the chip's antenna, it creates a magnetic field. The tag draws power from the field and is able to send back information stored on the chip.

**Power level:** The amount of RF energy radiated from a reader or an active tag. The higher the power output, the longer the read range, but most governments regulate power levels to avoid interference with other devices.

**Radio Frequency Identification (RFID):** A method of identifying unique items using radio waves. Typically, a reader communicates with a tag, which holds digital information in a microchip. Chip-less forms of RFID tags use material to reflect back a portion of the radio waves beamed at them.

**Read:** The process of retrieving data stored on an RFID tag by sending radio waves to the tag and converting the waves the tag sends back into data.

**Read accuracy:** This term usually refers to percentage of tags read successfully. If there are 100 tags in the field and 95 are read, the read accuracy is 95 percent.

**Read rate:** A term usually used to describe the number of tags that can be read within a given period or the number of times a single tag can be read within a given period. The read rate can also mean the maximum rate at which data can be read from a tag expressed in bits or bytes per second. (See Data transfer rate.)

**Reader (also called an interrogator):** A device used to communicate with RFID tags. The reader has one or more antennas, which emit radio waves and receive signals back from the tag. The reader is also sometimes called an interrogator because it "interrogates" the tag.

**Read range:** The distance from which a reader can communicate with a tag. Active tags have a longer read range than passive tags because they use a battery to transmit signals to the reader. With passive tags, the read range is influenced by frequency, reader output power, antenna design and method by which the tag is powered. Low frequency tags use inductive coupling (see above), which requires the tag to be within a few feet of the reader.

**Read-only:** A term used to describe RFID tags that contain data that cannot be changed unless the microchip is reprogrammed electronically.

**Read-write:** A term used to describe an RFID tag that can store new information on its microchip. These tags are often used on reusable containers and other assets. When the contents of the container are changed, new information is written to the tag.

**RFID (Radio Frequency Identification):** Any method of identifying unique items using radio waves. Typically, a reader (also called an interrogator) communicates with a transponder, which holds digital information in a microchip. But there are chip-less forms of RFID tags that use material to reflect back a portion of the radio waves beamed at them.

**Read lock:** Locking one or more of a Tag's memory areas so that a subsequent reader is required to exchange appropriate security safeguards with the Tag before being able to read these memory areas.

**Reader field:** The area of coverage. Tags outside the reader field do not receive radio waves and can't be read. This is also sometimes referred to as the read field.

**Reader module:** The electronics of a reader, including a digital signal processor, on a circuit board. Modules can be put in an RFID label printer or other device, as opposed to a standalone reader.

**Reader talks first:** A means by which a passive UHF reader communicates with tags in its read field. The reader sends energy to the tags but the tags sit idle until the reader requests them to respond. The reader is able to find tags with specific serial numbers by asking all tags with a serial number that starts with either 1 or 0 to respond. If more than one responds, the reader might ask for all tags with a serial number that starts with 01 to respond, and then 010. This is called "walking" a binary tree, or "tree walking." (See singulation.)

**Real-time locating system:** A system of finding the position of assets, using active RFID tags. The tags broadcast a signal, which is received by three reader antennas. The time each signal is received is passed on to a software system that uses triangulation to calculate the location of the asset. RTLS is used to find containers in a distribution yard, and many automakers use it to track parts bins within a large factory.

**Received signal strength indication (RSSI):** A measurement of the strength of a radio signal being received. In RFID, RSSI is used to determine a tag's distance, as the signal is stronger from a tag that is closer to the reader antenna.

**Return on Investment:** The ratio of money gained or lost on an investment relative to the amount invested. The amount gained or lost may be referred to as interest, profit/loss, gain/loss or net income/loss, while the money invested may be referred to as the asset, capital, principal or cost basis of the investment. ROI is sometimes also known as "rate of profit" or "rate of return."

**RFID Journal:** The leading independent publication focused on radio frequency identification and its many business applications.

**RFID tag:** A microchip attached to an antenna that is packaged in a way that it can be applied to an object. The tag picks up signals from and sends signals to a reader. The tag contains a unique serial number, but may have other information, such as a customer's account number. Tags come in many forms, such as smart labels that can have a barcode printed on it, or the tag can simply be mounted inside a carton or embedded in plastic. RFID tags can be active, passive or semi-passive. Smart cards and key-chain wands for purchase transactions; and a box that is affixed to your windshield to enable you to pay tolls without stopping. RFID tags can be active, passive or semi-passive.

**Semi-passive tag:** Similar to active tags, but the battery is used to run the microchip's circuitry and not to communicate with the reader. Some semi-passive tags sleep until they are woken up by a signal from the reader, which conserves battery life.

**Smart label:** A label that contains an integrated RFID tag that is considered "smart" since it can store information, such as a unique serial number, and communicate with a reader.

**Tag:** See RFID Tag.

**Transponder:** A radio transmitter-receiver that is activated when it receives a predetermined signal. RFID tags are sometimes referred to as transponders.

**Ultra-high frequency (UHF):** Typically, tags that operate between 866 MHz to 930 MHz. UHF tags can transmit information faster and farther than high- and low-frequency tags. But radio waves don't pass

through items with high water content, such as fruit, at these frequencies. UHF tags are also more expensive than low-frequency tags, and they use more power.

**UHF Generation 2:** The current EPC standard for factory-programmed tags.

**Uniform Code Council (UCC):** The nonprofit organization that oversees the Uniform Product Code, the bar code standard used in North America.

**Uniform Product Code (UPC):** The bar code standard used in North America. It is administered by the Uniform Code Council.

**Write Range:** The distance where a tag is written by a reader/writer without any object between the tag and the reader/writer. Normally, write range is lower than read range.

**Write rate:** The rate at which information is transferred to a tag, written into the tag's memory and verified as being correct. UHF

**Universal Serial Bus:** An external peripheral interface standard for communication between a computer and external peripherals over an inexpensive cable. Many newer RFID readers can connect to computers via a USB port.

**USB:** See Universal Serial Bus

**Wi-Fi:** The generic wireless interface of mobile computing devices, such as laptops used in local area networks (LANs). The term "Wi-Fi" (a play on the term "Hi-Fi") is thought to be an abbreviation for "wireless fidelity." Common uses include Internet and voice-over-IP phone access, gaming and network connectivity for such consumer electronics as televisions, DVD players and digital cameras. In spite of media reports about possible health risks from Wi-Fi, scientific studies have failed to show a causal effect.

**WML:** A markup language that is based on XML (extensible Markup Language). The official WML specification is developed and maintained by the WAP Forum, an industry-wide consortium founded by Nokia, Phone.com, Motorola, and Ericsson. This specification defines the syntax, variables, and elements used in a valid WML file.