WHITEPAPER

Understanding RFID and Barcode Differences
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Don’t misuse RFID with applications built for Barcodes

Radio Frequency Identification (RFID) technology in the Ultra-High Frequency (UHF) band has seen exceptional advancement and adoption in recent years.

The second generation of the EPCglobal Electronic Product Code (EPC Gen 2, see www.gs1.org/epcglobal) has become the global standard for UHF RFID. EPC Gen 2 has fostered many new hardware and software products designed specifically for the standard.

EPC Gen 2 provides users and solution implementers with new choices of products from many suppliers. The standard assures that these products are designed and certified to be interoperable, as opposed to the proprietary, non-interoperable products so prevalent in recent years.

EPC Gen 2 has also driven down RFID cost, making it highly affordable, and returning better ROI. UHF RFID augments barcode technology in traditional business data collection applications such as asset tracking. Furthermore, new applications arise that were infeasible using barcode technology.

Mobility Retrofit Problems

Another significant industry trend is mobility, or the deployment of mobile wireless computers in business and government.

Sponsors of contemporary mobility projects are beginning to consider incorporating RFID to gain some or all of the following valid RFID benefits:

- Tag longevity in harsh environments
- Data acquisition beyond line-of-sight
- Long-distance data acquisition
- Faster acquisition of tag data
- Simultaneous multiple tag acquisition
- Larger data payloads
- Unique sensor-enabled workflows

However, these desirable RFID benefits are nullified when mobility vendors retrofit their traditional barcode data acquisition techniques with RFID tags.

For example, a mobility vendor may expect an operator to pull the trigger on an RFID-enabled handheld and wedge (to use an industry term) the RFID data into an existing text field on an existing application form. With RFID, the triggerpull results in: no tag, one tag, or dozens of tags. To handle the many-tags case, mobility vendors have two choices:

1. Step down the mobile radio transmission power, or use low-sensitivity tags, calculating that eventually only one tag will respond.
2. Extend the way the form works so the operator can pick the right tag.

These common mobility solutions make the workflow very frustrating for the operator and eliminate many of the desired benefits of RFID.

Absent a better solution, why use RFID at all?
There IS a Better Solution
Surprisingly, Entigral’s approach is the polar opposite of the common mobility solution.

1. Turn UP power on RFID handhelds
2. Read every single tag you can!

The remainder of this white paper explains this counter-intuitive conclusion.

Missing the Sensor Aspect Boat
Retrofitted mobility systems ignore the functionality inherent in the EPC Gen 2 standard. These omitted functions, which Entigral terms sensor aspects, are really the keys to deliver business process productivity and workflow improvements.

Sensor aspects provide the automation and operational advantages that boost return on investment and justify the higher costs of RFID over traditional barcode techniques. We’ll return later to define what sensor aspects are.

Mobility vendors miss the boat on sensor aspects because they misunderstand the capabilities of RFID technology. Utilizing the sensor aspects available in EPC Gen 2 requires mobility vendors to develop special operator and database functions, the cost of which must be recovered via higher solution cost. If mobility vendors misunderstand the full function and benefits of EPC Gen 2, they cannot justify additional expenditures.

Whatever the rationale, deploying an RFID tag as a barcode label is a careless waste of capital!

Barcode: A License Plate
A linear barcode cannot say much about an asset—barcodes lack the information density to describe assets. To find out about an asset the barcode is used as a key into the application database; in other words, the barcode is used as a simple license plate.

Generally, a barcode license plate allows us to answer two questions:

- What is it?
- Where is it? “Where” requires a second license plate as a location id and an application procedure to associate the two license plates together.

RFID: Sensor Aspects
With the sensor aspects of EPC Gen 2 we can answer the preceding questions and more!

- What is it? As granular as you need. For example, if it’s a subcomponent, what machine does it belong to?
- What type is it? For example, for sale floor inventory, demo inventory, back of store inventory.
- What condition is in? For example, has it ever been hotter than 150F?
- Where is it? Like barcode, “where” requires a second location tag or a defined RFID portal location.
- Other questions answered: Where was it last seen? Now that I found it, where is it supposed to be? Who owns it? Who last serviced it? When was it last seen? How many times has it been serviced?

And many, many more: Who, What, When, Where and How!

### Tag Commissioning Process
RFID system integrators use the term tag commissioning to describe the overall process of placing an RFID tag on an asset, encoding the tag, and writing tag information to a database. The process has several steps:

1. **Selecting the right tag for each asset**
   - What tag do I use?
   - What is the asset item that needs to be tagged?
   - What is the asset made of? Metal, plastic, wood, etc.?
   - Where on the asset can I mount the tag? Tag size limitations?
   - How does the tag get mounted? Adhesive, Screws, Rivets, weld, etc.?
   - What read range distance for the tag does the application workflow or business process require?
   - Is this tag read with a fixed mounted Reader or handheld Reader or both?
   - What environmental rating must the tag meet? Temperature, Hazardous Location, shock, etc.?
   - Can this tag be reused?
   - Does this tag need to be globally unique?

2. **Associating each tag**
   - Turn on the RFID Reader/Encoder, select encode mode of operation, and write an EPC Id to the tag’s memory. This is where some users want to only write a barcode to the tag and not utilize the EPC Gen 2 standard. We can add owner, location, areas, zones, groups, classes, etc., and write additional user data to the tag, for example, commission date, last serviced, expiration.
   - Mount the tag on the asset
   - Send the EPC Id and other tag data to the user’s business software application database.

3. **Tag verification for each mounted and associated tag**
   - Switch the RFID interrogator to read mode, and decode tags. Verify previously associated data on the tag and in the database.
   - Verify can also be used to locate a tag or perform an audit function, by simply reading tags.
   - We’ll cover the tag verification step in more detail later.

### RFID License Plates
As they commission an RFID tag, most mobility vendors encode the tag with a license plate as opposed to an EPC Id.

Without the structured fields in an EPC Id the sensor aspects of EPC Gen 2 are lost. With the loss of sensor aspects, so go the automation benefits that provide business process and productivity improvement.

### RFID Sensors
An RFID tag is a sensor. What makes it so? An RFID tag is a highly functional computer on a chip having as many transistors as the original IBM personal computer. Other sensors include video, voice, gesture, and touch.

An EPC Gen 2 tag is passive — it’s just a tiny battery-less silicon grain until the RFID reader interrogates it. Then the tag absorbs power from the radio beam, boots up like a PC, and engages in a complex two-way conversation
Sensor Aspects Yield Efficiency

EPC Gen 2 tags enable sensor aspects. When software developers properly incorporate sensor aspects into mobility applications they create workflows that are far more efficient than those based on license plates.

Take Entigral’s innovative Tag Verify workflow, which audits capital assets and counts retail inventory. By reading many tags at once, applying containment aspects, and selectively filtering, Tag Verify achieves a ten-fold increase in efficiency over similar license-plate-type procedures.

Along with Tag Verify, Entigral deploys many RFID-optimized workflows.

1. Tag Verify
   - Is the asset in the right place?
   - What assets do not belong?
   - What assets are missing?
2. Tag Inquire
   - What is this? – Where is this?
   - Read an RFID tag
   - Display database or tag memory stored attributes about the asset

3. Tag Reuse
   - Remove the RFID tag from a retired asset item
   - Remount or reuse on a new asset; optionally erase the original EPC Id and encode a new EPC Id
   - Or re-associate the original EPC Id to a new asset

4. Tag Re-tag
   - Replace a broken or inoperable tag on an existing asset
   - Remove from the asset and kill tag
   - Re-commission (mount, encode, associate) a new tag on the asset using the original EPC Id

5. Tag Transfer
   - Transfer or reassign an asset to a different location
   - Update the asset location within the database

6. Tag Find
   - Search using “marco-polo” mode
   - Find one asset amid many

7. Tag Retire
   - Deactivate both the asset and tag
   - Remove the tag from the asset and scrap the asset
   - Erase the EPC Id and any data

Problem Solved
Entigral Systems is an enterprise software company that develops and sells TraxWare® -- an industry-leading sensor automation platform.

TraxWare enables a new generation of sensor-based asset tracking applications, including capital and fixed asset tracking, work in-process management, warehouse management, inventory replenishment, and retail inventory management.

Our technology is based on TraxWare, our proven enterprise software platform for sensor automation comprising both server and mobility modes.

Using TraxWare, Entigral and Entigral’s value-added resellers and customers deploy sophisticated sensor enabled applications that take advantage of all of the features of today’s RFID standards.

With the ready availability of an RFID-optimized platform like TraxWare, by all means take advantage of the EPC Id for your project. You will maximize your project’s value.

Otherwise, why spend the money on RFID and risk alienating your operations staff with processes that in practice are less efficient than the ones they are intended to replace?