### Document Summary

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1. Introduction

1.1. Purpose of this Document
The purpose of this document is to provide the reader a technical guide to adopt and/or implement RFID-based Electronic Article Surveillance in a Retail environment for reusable and/or disposable tags as defined in section 2.1 of the Strategic Overview.

The document will clearly illustrate how to implement an RFID-based EAS solution using existing GS1 and EPCglobal standards.

1.2. Who Will Use this Document?
- Systems integrators and technical project leaders in retail operations.

1.3. Scope
There are many advantages to using EPC RFID throughout the supply chain. This document refers in detail to the EPC RFID-based in Retail Environment EAS functionality at:
- Point of Entry/Exit (PoE)
- Point-of-Sale (PoS)
- Receiving goods

Other use cases may include the following; however, are not covered in detail in this document:
- Special goods receiving
  - Consumer Returns, with respect to this document, consumer returns can be seen as another form of goods receiving (see section 4.1).
- Additional read points can be seamlessly added to the system, but are out of scope for this document.
  - Fitting/Dressing Rooms
  - Compactor/Trash Bins

2. Conditions for Implementation
This guide is applicable for the following conditions:
- EPC RFID Gen 2 compliant passive tag
- 96-bit EPC, SGTIN\(^1\)
- A store or facility with one or more PoS stations, one or more PoE, and one or more goods receiving areas
- Readers, when transmitting, do not exceed the maximum power allowed by national or regional regulations
- A channel whose width is the maximum allowed by national or regional regulations

\(^1\) Reference: for further information on the scope, structure and encoding/decoding of the SGTIN, please consult the current version of GS1 EPCglobal Tag Data Standard (TDS)
3. SGTINs Database

The SGTINs Database is an accounting of all individual items in the store, not only the stock keeping unit (SKU's). It is used by the system to check the items in the store or facility, at any read point. This database could be approximately the same size as a flat file with some sort of mechanism to ensure transaction integrity.

3.1. How to build the database of SGTINs in a store

- Complete an in-store inventory audit and add the SGTINs to a database.
- Build the database as new items are received, and a full inventory of SGTINs will be available after the first complete inventory turnover. This approach will gradually implement RFID-based EAS without significant migration issues. In the meantime prior to the full inventory turnover, RFID-based EAS will be available only for those SGTINs in the system.

3.2. How to maintain the database of SGTINs in a store

The SGTINs Database must be maintained during all the processes. There are different ways to maintain it:

- Read the tags upon goods receiving.
  - In a simple installation one may use a reader to read the tags and with an application layer add them to the SGTINs database.
  - In a more complex environment, one may use read points at various locations to read SGTINs from areas such as in-store drop shipments locations, consumer returns desks, or inter-store transfers areas.
- Take the SGTINs from the Dispatch Advice (DESADV) or Advanced Shipment Notice (ASN) and add these SGTINs to the existing database in the retail store once the product(s) has been received.
- Point of Sale (PoS)
  - PoS must be able to read SGTINs.
  - After the payment transaction has been completed, the recorded SGTIN may be removed or flagged and decremented from the inventory database.
  - **Hint:** Cancellations of transactions are always made before finalization of payment. For purposes of RFID-based EAS system after payment finalization, then the item is treated similar to a customer return.
  - **Note:** Consideration should be given how to handle post void transactions.
108  ■ Point of Entry/ Exit (PoE)

  □ The reader at a PoE must read the SGTIN and check to see if the item is still in the database of known SGTINs. Potentially, the store could have multiple databases of SGTINs, but the reader at PoE must only check if it is in the EAS SGTIN database.

  □ If the item is not removed from the database, then notification occurs to alert the store personnel that the item is leaving the store illegitimately. The response to the alarm is retailer specific and is not covered in this document.

115  ■ For mobile external PoS systems (e.g. sidewalk or tent sales) information is removed from the database prior to going out of the store. No RFID-based EAS functionality will be available for these items since there is no EAS perimeter set-up.

118  **Important:** If a foreign tag enters the store, then an alarm will not be raised as this SGTIN is not part of the SGTIN database.

120  **Important:** If an item enters the store and the SGTIN is not available, then the item needs to be processed. GS1 has created a guideline, Missing Identification Resolution, to assist in this process at the refund counter or PoS.

4. **Implementation Options**

This guide is designed around the current GS1 Standards that can be universally used for reusable and disposable tags. At the time of this guide’s completion, tagging bits on a tag has not been GS1 EPCglobal standardized for EPC RFID-based EAS.

This implementation is for a store or facility that needs to implement a solution for local area network and information system. In traditional EAS systems, there is no LAN cable outlet required. In this implementation a wireless LAN can be used which sometimes is included with the readers.
Important: EPC numbers are used for Item Level Identification.

4.1. Stores with a standalone reader(s) containing a database of SGTINs

This implementation is for a store or facility that doesn’t have an existing local area network and an information system.

4.1.1. Minimum Requirements

These are the minimum requirements for the reader(s):

- **Memory**
  
  Sufficient resident memory to store and to act upon the number of items representing store inventory items (not sku, actual individual items)

  **Example:** If using a flat file, the memory required can be calculated as:

  \[ \text{Memory} = \text{individual items in store} \times (96 \text{ bits plus separator}) \]

- **Speed**

  The maximum allowable time for the information to go from PoS to PoE is determined by the minimum time it takes for a customer to reach the PoE after completing the sold transaction.

  **Note:** The assumption is that a minimum of two seconds is always available and sufficient though this timing should be confirmed upon installation.

- **Connectivity**

  Equipment that is capable of hosting an application that can communicate between the readers and is compliant with IEEE and IETF standard networking protocols.

---

2 Source: Sanjay Sarma, Checkpoint Systems
The IEEE 802 Standard comprises a family of networking standards that cover the physical layer specifications of technologies from Ethernet to wireless.

The mission of the IETF is to produce protocol standards that influence the way people design, use and manage the Internet in an efficient manner.

### 4.2. Reader(s) connected to local area network

This implementation is for a store or facility that has an existing local area network and an information system that can be leveraged.

#### 4.2.1. Minimum Requirements

These are the minimum requirements for the reader(s):

- **Memory**
  
  For PoE reader(s), two options are listed below:
  
  - Information sent back to the centrally kept database of SGTINs to confirm sold (pro: more affordable readers needed)
  
  - Information residing on the PoE reader (pro: faster response time). This option of information residing on readers is suitable, but not necessarily limited to small and medium enterprises.

- **Speed**
  
  The maximum allowable time for the information to go from PoS to PoE is determined by the minimum time it takes for a customer to reach the PoE after completing the sold transaction.

  ✔️ **Note:** The assumption is that a minimum of two seconds is always available and sufficient though this timing should be confirmed upon installation.

- **Connectivity**
  
  Equipment that is capable of hosting an application that can communicate between the readers and is compliant with IEEE and IETF standard networking protocols.

  The IEEE 802 Standard comprises a family of networking standards that cover the physical layer specifications of technologies from Ethernet to wireless.

  The mission of the IETF is to produce protocol standards that influence the way people design, use and manage the Internet in an efficient manner.

  ✔️ **Note:** Realize with the options of a centralized database, if the database goes down, then RFID-based EAS functionality will be lost although this loss is not obvious to a customer. It is assumed that the SGTINs sold during the downtime are captured and removed from the database at a later point.
5. **Flowchart**

The following simple flowchart is to be used as an example.

**GS1 EPCglobal RFID-based Electronic Articles Surveillance (EAS)**

<table>
<thead>
<tr>
<th>Receiving goods</th>
<th>Point of Sale (PoS)</th>
<th>Point of Entry/Exit (PoE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start Process</td>
<td>Start Process</td>
<td>Start Process</td>
</tr>
<tr>
<td>Receive Products</td>
<td>Receive Products at PoS</td>
<td>Receive Products at PoE</td>
</tr>
<tr>
<td>Read Tags</td>
<td>Read Tags</td>
<td>Read Tags</td>
</tr>
<tr>
<td>For each Tag</td>
<td>After the payment transaction has been completed</td>
<td>For each Tag</td>
</tr>
<tr>
<td>Product exists in the “SGTIN’s List”?</td>
<td>Yes</td>
<td>Product exists in the “SGTIN’s List”?</td>
</tr>
<tr>
<td>NO</td>
<td>Insert product in “SGTIN’s List”</td>
<td>NO</td>
</tr>
<tr>
<td>YES</td>
<td>More Products to read?</td>
<td>YES</td>
</tr>
<tr>
<td>NO</td>
<td>End Process</td>
<td>End Process</td>
</tr>
<tr>
<td>YES</td>
<td>Remove product from “SGTIN’s List”</td>
<td>YES</td>
</tr>
<tr>
<td>More Products to read?</td>
<td>No</td>
<td>More Products to read?</td>
</tr>
<tr>
<td>YES</td>
<td>End Process</td>
<td>End Process</td>
</tr>
<tr>
<td>NO</td>
<td>Generate Notification</td>
<td>No</td>
</tr>
</tbody>
</table>

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