

LABEL
ACADEMY

WORKSHOP

RFID IN LABELS AND PACKAGE PRINTING

Chip Programming and Data Management

12 Sept 24

Mike Weinhammer, Global Product Manager RFID Supplies

ZEBRA TECHNOLOGIES

RFID Fundamentals

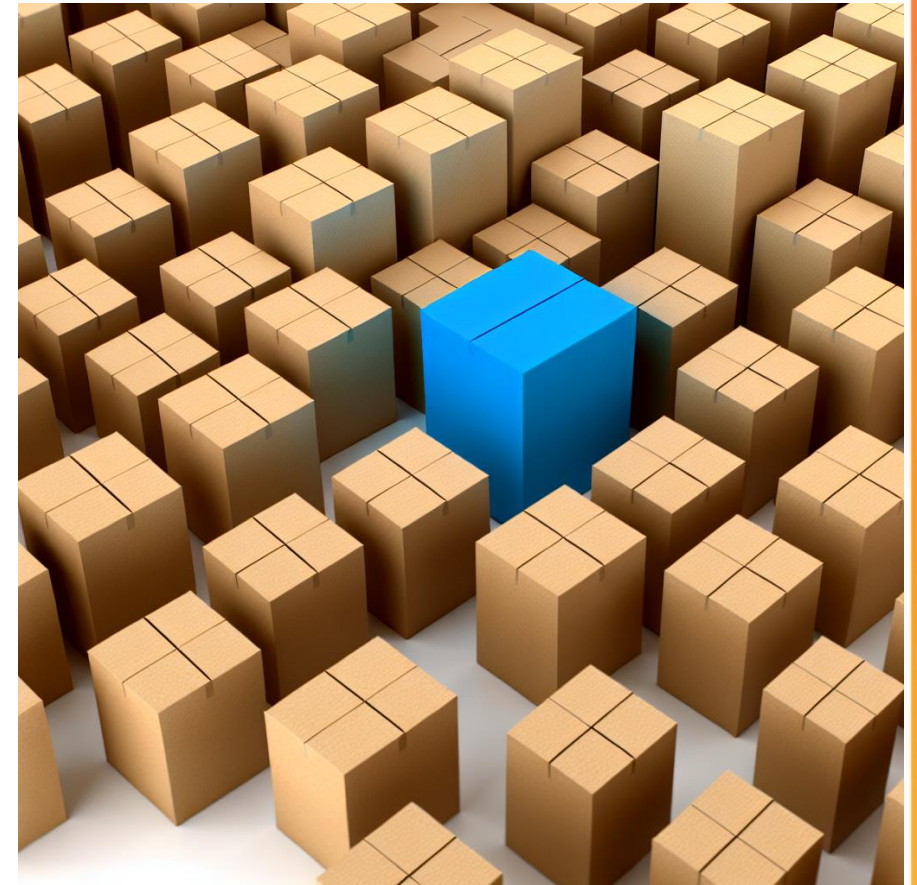
RFID technology works because...

tags are **UNIQUE**

RFID tags can be tracked through

read events...

unlocking their **VALUE**



RFID Memory Elements



Memory Bank	Writable?	Notes	Most Common Usage
Reserved	Yes	Contains Kill and Access Password	Permalocking
Tag ID (TID)	No	Unique ID Used to generate Chip-based serialization (^RU in ZPL)	Identifies chip, manufacturer, unique serial number
EPC	Yes	Primary memory bank for encoding	Encoding 96 bit SGTIN or license plate data
User	Yes...if available	Custom data elements	Not commonly used

Chip Programming

There are many ways to encode an RFID chip:



Encoding Considerations

Most RFID tags contain **96 bits** of EPC memory

This is enough to fit:

- 24 Hexadecimal (0-9, A-F) **12345678901234567890ABCD**
- 12 ASCII characters (0-9, A-Z, a-z, -\$#, etc.) **LABELEXPO_24**

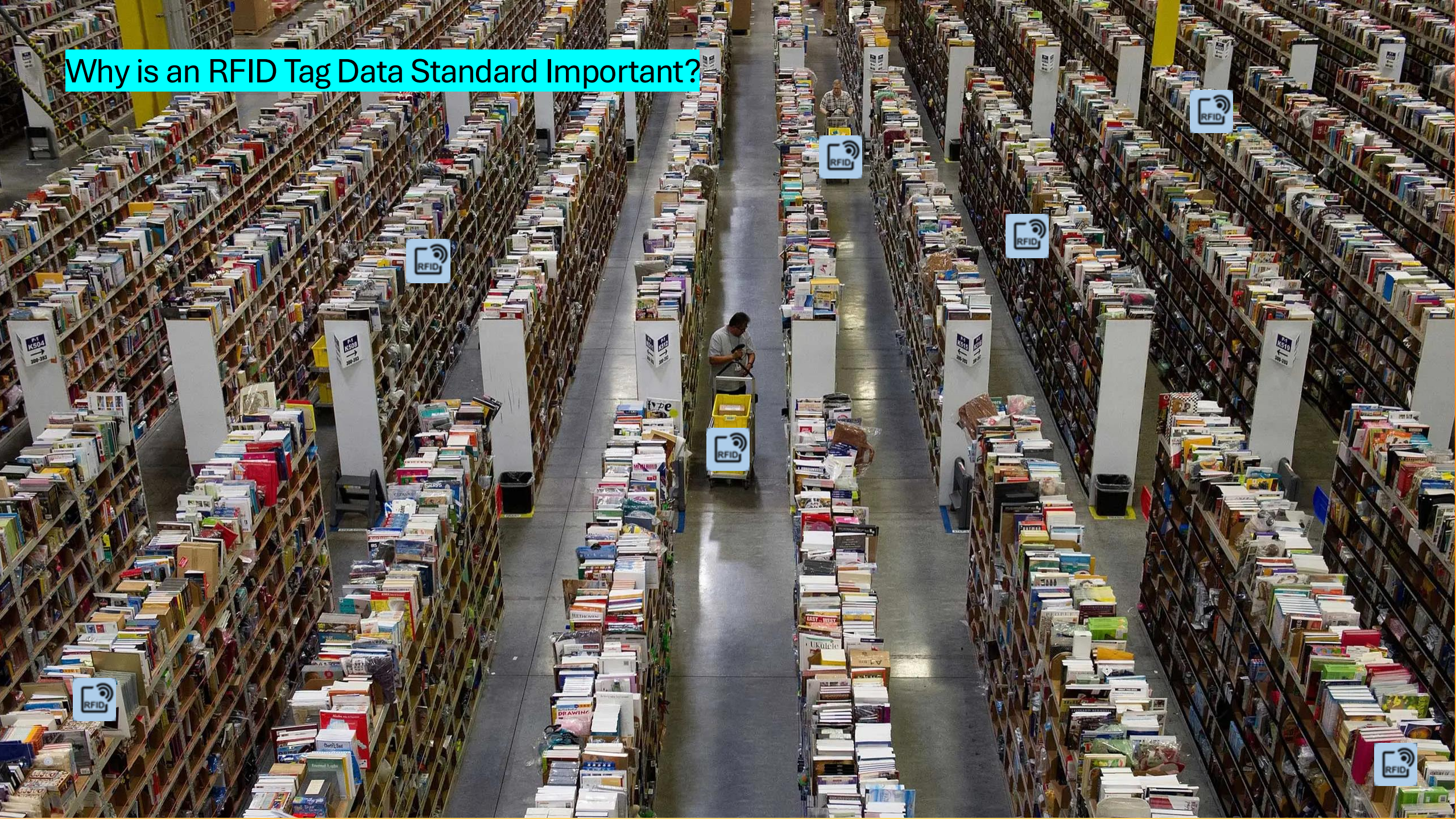
Or....

A Serialized GTIN (SGTIN) with **274 billion** serial numbers

Things I've heard from users and integrators that make me cringe...

- I'm going to encode everything on my barcode label into the RFID label
- Aren't all tags pre-encoded today?
 - I'm just going to use the pre-encoded tag data.
- Why can't I just use the TID as my data standard?
- I'll just encode ABC123 as a prefix on my tags and filter on that...
 - ...but that takes up too much space, how about I just use "AA" ? Or just "A"
- The GS1 system is great, but I don't want to "pay for it"...
 - ...so I just made up my own company prefix and will use SGTIN-96.

Why is an RFID Tag Data Standard Important?



Why Should an RFID Tag Data Standard be used?

- Ensures interoperability between RFID use cases
- Allows readers to easily filter tags
- Provides scale for open-loop applications
 - 10+ Billion tags/year are encoded with SGTIN 96 for retail items
- Usually focused on the EPC / Ull (memory bank 01)

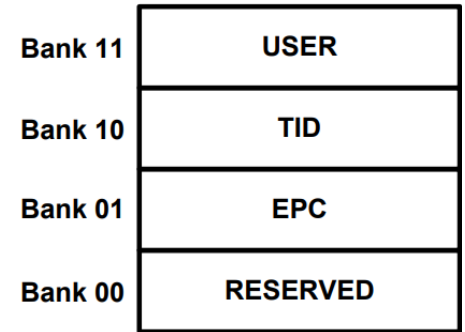


Image Source: EPC Gen2 Air Interface Standard

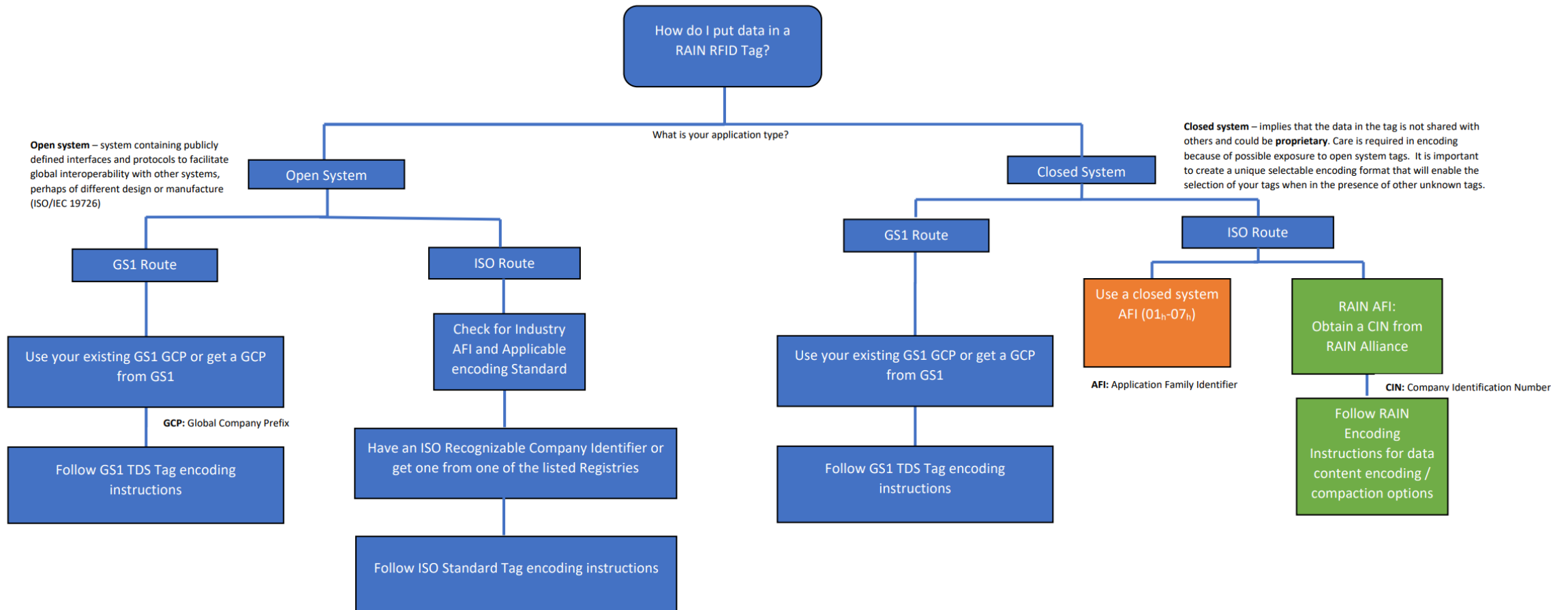
SGTIN-96 Example

urn:epc:id:sgtin: **CompanyPrefix**.**ItemRefAndIndicator**.**SerialNumber**

urn:epc:id:sgtin: **0614141**.**112345**.**400**



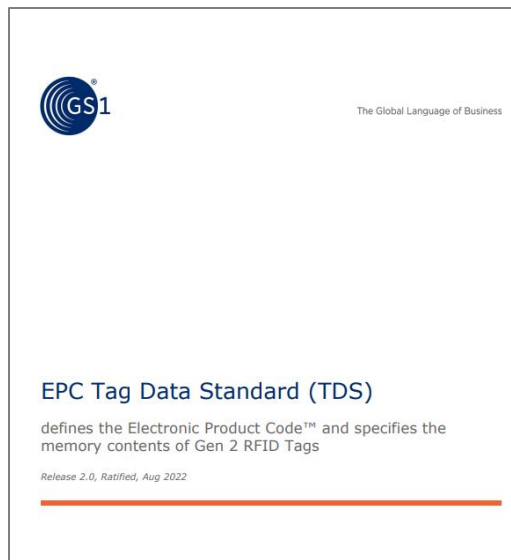
Selecting a Tag Data Standard



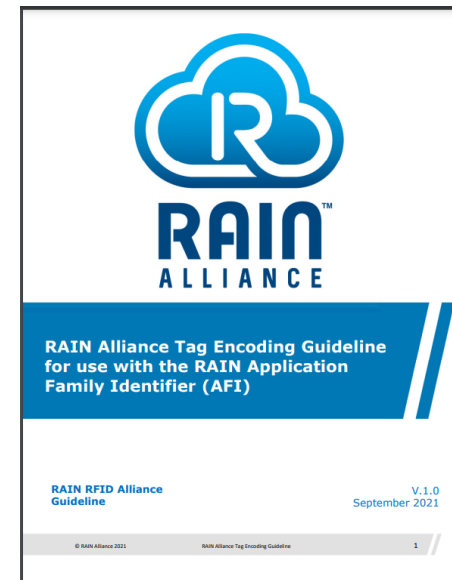
Flowchart Source: <https://rainrfid.org/cin/>

Selecting a Tag Data Standard

- If there's an appropriate GS1 standard for your application space – follow it.
- Next, look to ISO-based industry specific organizations – IATA, VDA, MIL-STD-129, etc.
- Use the *RAIN ISO numbering system for anything else* - assets, closed-loop logistics, etc.

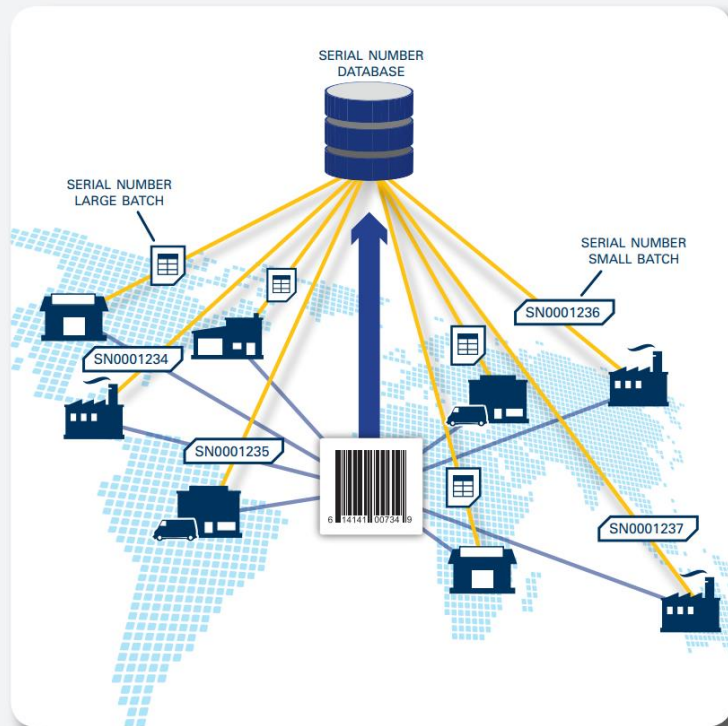


VDA	Implementation Recommendation for Global Transport Label - GTL	4994
<p>This non-binding VDA Recommendation provides guidelines for the labelling of packages (shipping units and individual packages) used in the automotive supply processes, taking into account modern logistic concepts. The printed labels (product tags) facilitate unambiguous and consistent recoding and tracking of the packages in the systems of all partners involved in the process, including transport companies, and allow for efficient incoming goods processes.</p> <p>The specification is based on the Global Transport Label (GTL V3.0) devised by Odette, AIAG and JAMA/JAPIA and can be used in both national and international transport processes along the supply chain.</p> <p>Version 1.1 of July 2018</p>		
AK KIT		
Publisher:	Verband der Automobilindustrie Behrenstr. 35 PO Box 8 04 62 10004 Berlin Phone Fax	Copyright Reprint, also in extracts, only with the approval of the publisher. +49 (0)30/897842-221 +49 (0)30/897842-606
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Serialization Methods

IT-based Serialization



Dynamic assignment

Serial numbers assigned by IT as needed

Challenges – Real time assignment depends on robust IT infrastructure

Static assignment

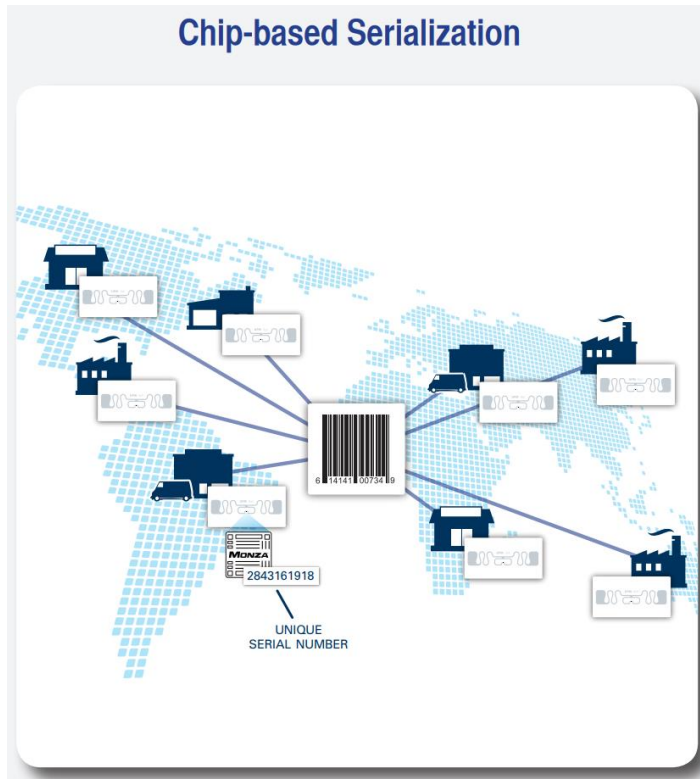
Serial numbers assigned in batches

Challenges – Tracking and reassigning serial numbers as business changes

Source – RFID Chip-Based Serialization for Retail

<https://www.zebra.com/content/dam/zebra/white-papers/en-us/rfid-serialization-en-us.pdf>

Serialization Methods



Chip Based Serialization

RFID printer generates serial number from the **Tag ID** serial number (48 bits)

Tag ID is unique and may not be changed

Serial numbers lists do not need to be maintained

Elements of a Successful Encoding Scheme

- Understand what absolutely **needs** to be encoded vs. what could be pushed to the cloud
- Make sure a **data standard** is being used
- Encourage a serialization scheme that is **scalable**

Thank You

