The Global Language of Business

Exchanging Traceability Data with EPCIS

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GS1

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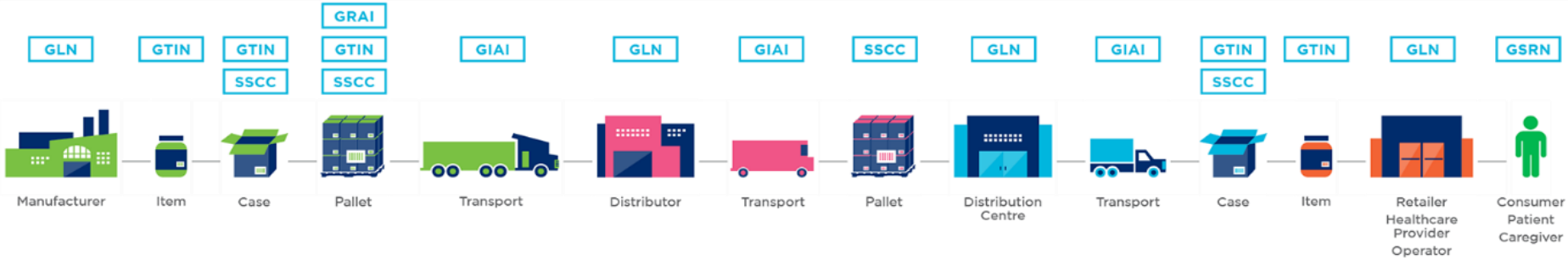
Identify: GS1 Standards for Identification

GLN Global Location Number **GTIN** Global Trade Item Number **SSCC** Serial Shipping Container Code **GRAI** Global Returnable Asset Identifier **GIAI** Global Individual Asset Identifier **GSRN** Global Service Relation Number



Capture: GS1 Standards for Barcodes & EPC/RFID

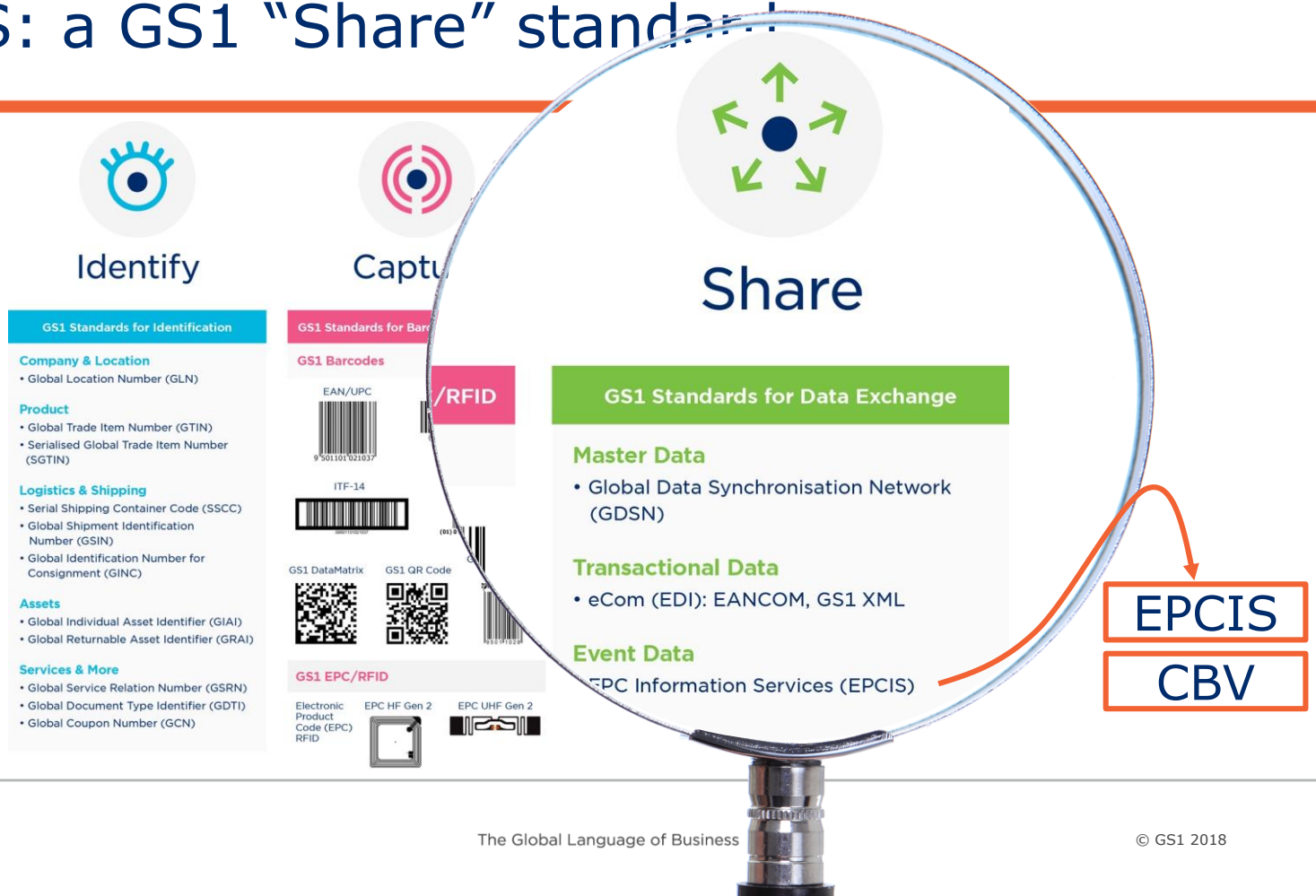
GS1 Barcodes **GS1 EPC/RFID**

EAN/UPC GS1-128 ITF-14 GS1 DataBar GS1 DataMatrix GS1 QR Code GS1 Composite Barcode EPC HF Gen 2 EPC UHF Gen 2

Share: GS1 Standards for Data Exchange

Master Data Global Data Synchronisation Network (GDSN) **Transactional Data** eCom (EDI) **Event Data** EPC Information Services (EPCIS)

EPCIS: a GS1 "Share" standard



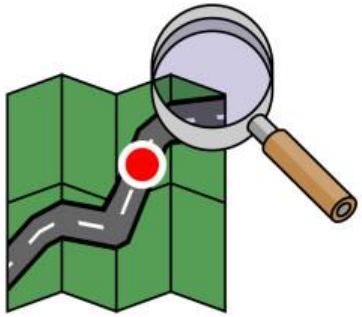
EPCIS, a GS1 and ISO open standard

- Helps **share visibility data** across & **between enterprises**
- Defines technical interfaces & framework data model
- Enabler for traceability solutions & services
- GS1 Keys identify the “what” & “where” of visibility events…
  - …encoded as data-carrier neutral EPCs
  - …even when used with GS1 barcodes (instead of RFID)
- published as ISO/IEC 19987

Core Business Vocabulary (CBV)

- companion standard to EPCIS
- defines specific data values to populate EPCIS data model
- ensures a common understanding of data semantics
- anchors EPCIS events to business process context
- **critical to interoperability of EPCIS implementations**
- published as ISO/IEC 19988

EPCIS enables supply chain visibility



- **Tracking**
  Where are the products we shipped?
- **Tracing**
  Where did this batch of products come from?
- **Chain of Custody (CoC) / Chain of Ownership (CoO)**
  Which parties had custody or ownership of these products?
- **Inventory Management / Inventory Maintenance**
  How many units are in stock? When does my available inventory expire?
- **Recall**
  Find all Product XYZ shipped from facility 133 on 9 November 2018...

The 4 data dimensions of an EPCIS event

- **What** objects are the subject of event?

  Individual objects (GTIN + Serial Number = SGTIN)

- **When** did this event take place?

  Date, time, time zone

- **Where** did this occur and where are the objects thereafter?

  GLN of physical location (expressed as an SGLN in EPCIS)

- **Why** did this event take place?

  Business step (e.g. "Shipping") and Disposition (e.g "in transit")

EPCIS event dimensions

"What"

- Specifies what objects participated in the event
- EPCIS allows for two kinds of object identification:
  - Instance-level

    (each identifier is unique to a single object)

  - Class-level

    (multiple objects carry the same identifier)

Batch/Lot vs. Serialized Visibility

Feature	GTIN	GTIN + Lot	GTIN + Serial
Low Precision Identification	✓		
Medium Precision Identification		✓	
High Precision Identification			✓
Additional data needs to be physically marked		✓	✓
Serialization required			✓
Traceable item exist in multiple locations at the same time	✓	✓	
Traceable item exist only at one locations at the same time			✓
Product Recall	All units of a given GTIN	All units of a given GTIN + Lot	Only specific units with matching GTIN + Serial
Enables anti counterfeit measures			✓
Enables to monitor products with finite shelf life		✓	✓

EPCIS event dimensions
"When"

- Date of event
  example: 2018-11-19
- Time of event
  example: 23:47:00
- Time zone in effect
  example: UTC +10:30
  (that's 08:17 in New Jersey, UTC -05:00)

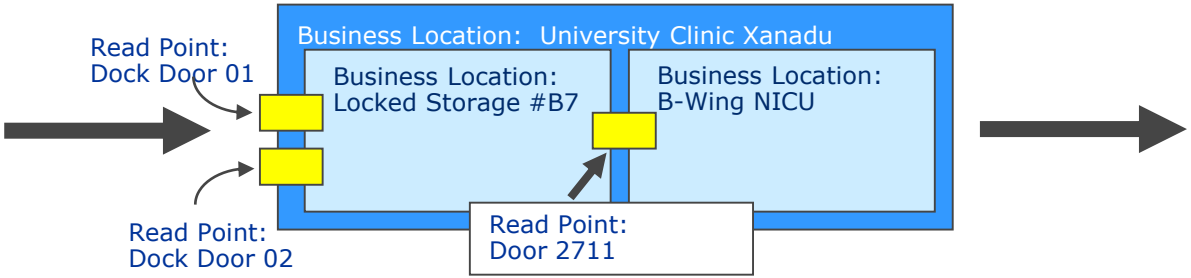
EPCIS event dimensions
“Where”

- **Read Point**

  specific place where an event took place, identified by GLN

- **Business Location**

  whereabouts of the object after the event, identified by GLN



*Read Points are often **doors**.*

*Business Locations are often **rooms**.*

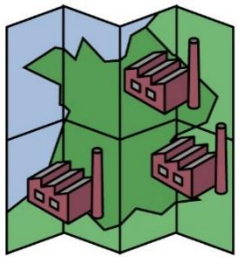
EPCIS event dimensions
"Why"

Business Step
- Business process context of event
  example: Commissioning, Packing, Shipping, Unpacking

Disposition
- Status of object subsequent to event
  example: active, in_transit, sold, expired, recalled

Business Transaction
- Link to transaction information

Source/Destination
- Transfer of ownership or possession



EPCIS event types

Object Event

- Observation of or assertion about objects

Aggregation Event

- Association between containing/contained objects

Transaction Event

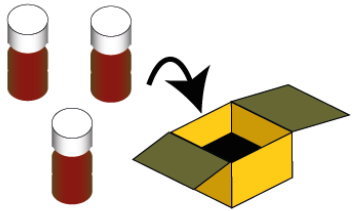
- Association of objects to business transactions

Transformation Event

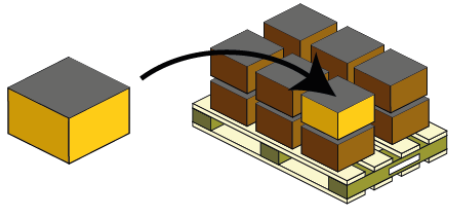
- Objects consumed as inputs, produced as outputs

EPCIS Aggregation Event

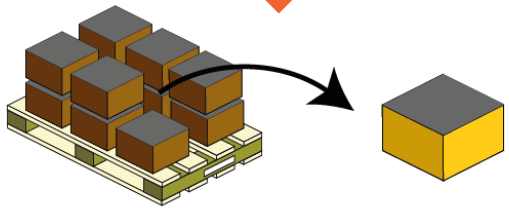
Parent-Child logistical hierarchy



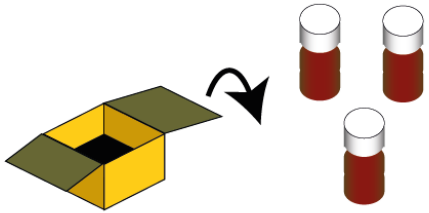
Aggregation of items into a case



Aggregation of cases onto a pallet



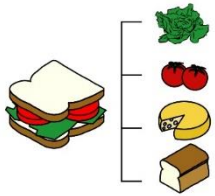
Disaggregation of cases from a pallet



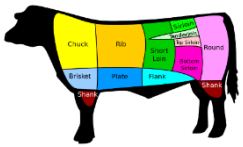
Disaggregation of items from a case

EPCIS event types
Transformation Event

- One or more objects are an input into a process
- This process irreversibly changes input object(s)
- Output has a new identity and characteristics
- Many to one
  - *Lettuce, tomatoes, cheese, bread -> sandwich*



- One to many
  - *Cow -> sides / cuts of beef*



- Many to many
  - *Multiple cuts of beef -> multiple packages of ground beef*

EPCIS Service Layer

The EPCIS Service Layer defines three interfaces:

- EPCIS Capture Interface
- EPCIS Query Control Interface
- EPCIS Query Callback Interface

EPCIS Query Interfaces

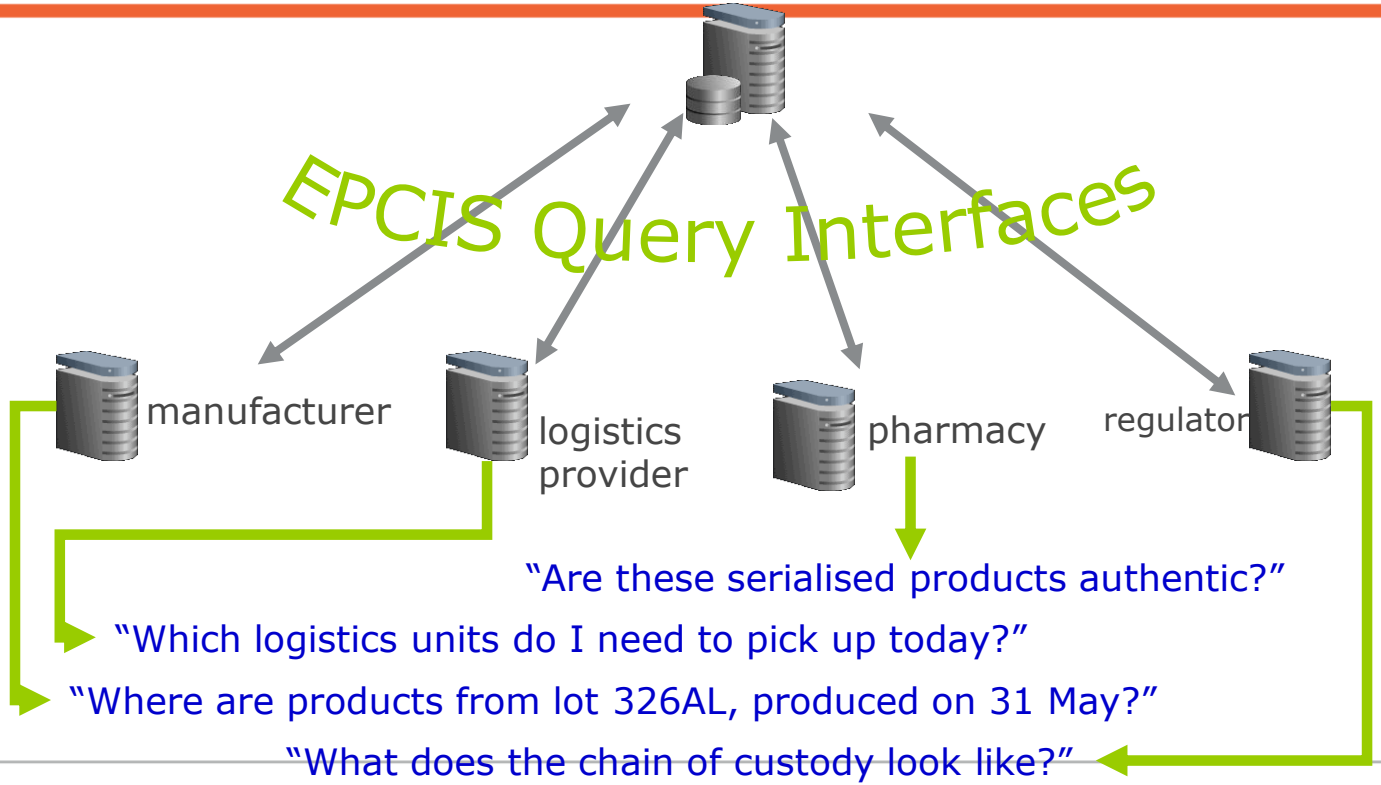
EPCIS Query Control Interface

- In **“on-demand”** mode, a client makes a request and receives a response immediately
- In **“standing request”** or mode, a client establishes a **subscription** for a periodic query

EPCIS Query Callback Interface

- “pushes” results each time a periodic query is executed
- can also be used to deliver information in real-time, immediately upon capture, **bypassing** the intermediate repository

Leveraging the EPCIS Query Interfaces



Visibility applications enabled by EPCIS

- Which parties have had contact with my shipment?
- When will the new products be delivered?
- (When) was my shipment received by the recipient?
- Where were products produced on July 11th shipped to?
- Which equipment is located where within a given facility?

EPCIS implementations 2018 and beyond

- Food / Fresh Produce Packaging and Distribution
- Fish Packaging and Distribution
- Rolling Stock Visibility in Rail
- Maintenance, Repair & Overhaul (MRO) in Rail
- Maritime / Port Planning
- Hospital procedures / Bedside treatment / OR
- **Pharmaceutical** chain-of-custody

USA – Drug Supply Chain Security Act (DSCSA)

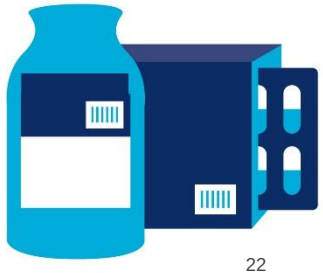
Packaging level:		Saleable units and homogeneous cases
Data elements:		NTIN, expiry date, lot/batch, serial number
Data carrier:		DataMatrix
Deadlines	2017:	Serialisation by manufacturers & repackagers
	2019:	Verification of saleable returns
	2023:	**Full traceability** back to manufacturer

US FDA draft guidance (Nov 2014) names **EPCIS** as a means of interoperably exchanging pharmaceutical traceability data

GS1 Standards for DSCSA & Traceability

GS1 US Rx Guideline www.GS1US.org/RxGuideline

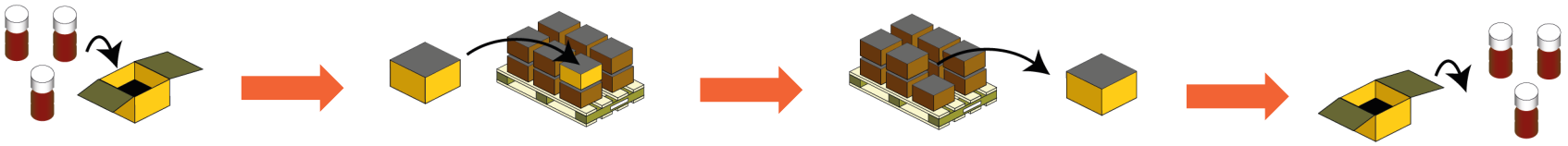
- Describes how GS1 Standards can best be applied to pharmaceutical supply chain business processes to support traceability
- Supports collaborative supply chain traceability solutions
- Participation from over 50 pharmaceutical supply chain organisations
- Updated as neccessary per requirements & industry feedback
  - V 1.0 (2012): satisfy California Pedigree regulations
  - V 1.1 (2014): align with DCSCA lot-level requirements
  - **V 1.2 (2016)**: align with DSCSA **item-level** requirements



EPCIS for Serialized Item-Level Traceability

- Events are captured at instance-level (GTIN + Serial, SSCC)
- ***Commissioning*** events enable validation of serial numbers
- DSCSA CoO transaction info integrated in ***Shipping*** event
- Events comprise Transaction Information (TI), Transaction History (TH)
- Transaction Statement (TS) is included in the EPCIS header
- Single XML document containing all DSCSA-required information
- ***Receiving***, ***Dispensing***, ***Decommissioning*** events
  - record product lifecycle beyond DSCSA compliance
- ***Packing*** & ***Unpacking*** events record packaging hierarchy
    - **Aggregation** of item -> case -> pallet

Aggregation
Leveraging the EPCIS Aggregation Event



Aggregation of items into a case

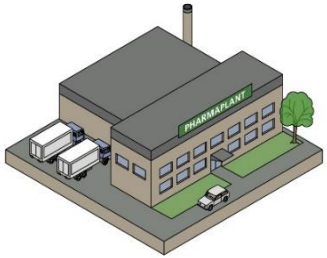
Aggregation of cases onto a pallet

Disaggregation of cases from a pallet

Disaggregation of items from a case

- Parent-Child logistical hierarchy
- Applied to a containing object and a set of contained objects
- Enables the practice of **inference**
- ADD an Aggregation (children aggregated to parent)
- OBSERVE an Aggregation (may be incomplete)
- DELETE an Aggregation (removal of subset or all children)

EPCIS events captured and shared by . . .



Party at <u>beginning</u> of the supply chain (e.g., manufacturer)

- Commissioning
- **Packing**
- Shipping

<u>Intermediate</u> parties (e.g., distributor)

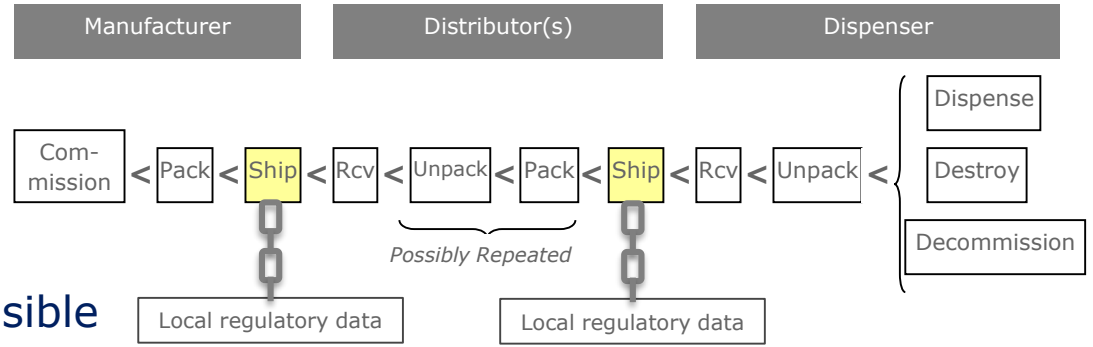
- Receiving
- **Unpacking**
- **Packing**
- Shipping

Party at <u>end</u> of chain (e.g., pharmacy)

- Receiving
- **Unpacking**
- Dispensing
- Decommissioning

Why use EPCIS-based traceability systems?

1 EPCIS is Flexible

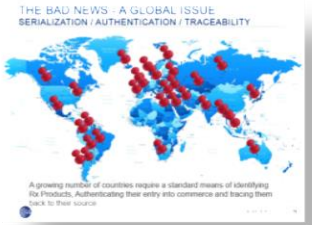


2 EPCIS is Extensible

3 EPCIS allows querying of information

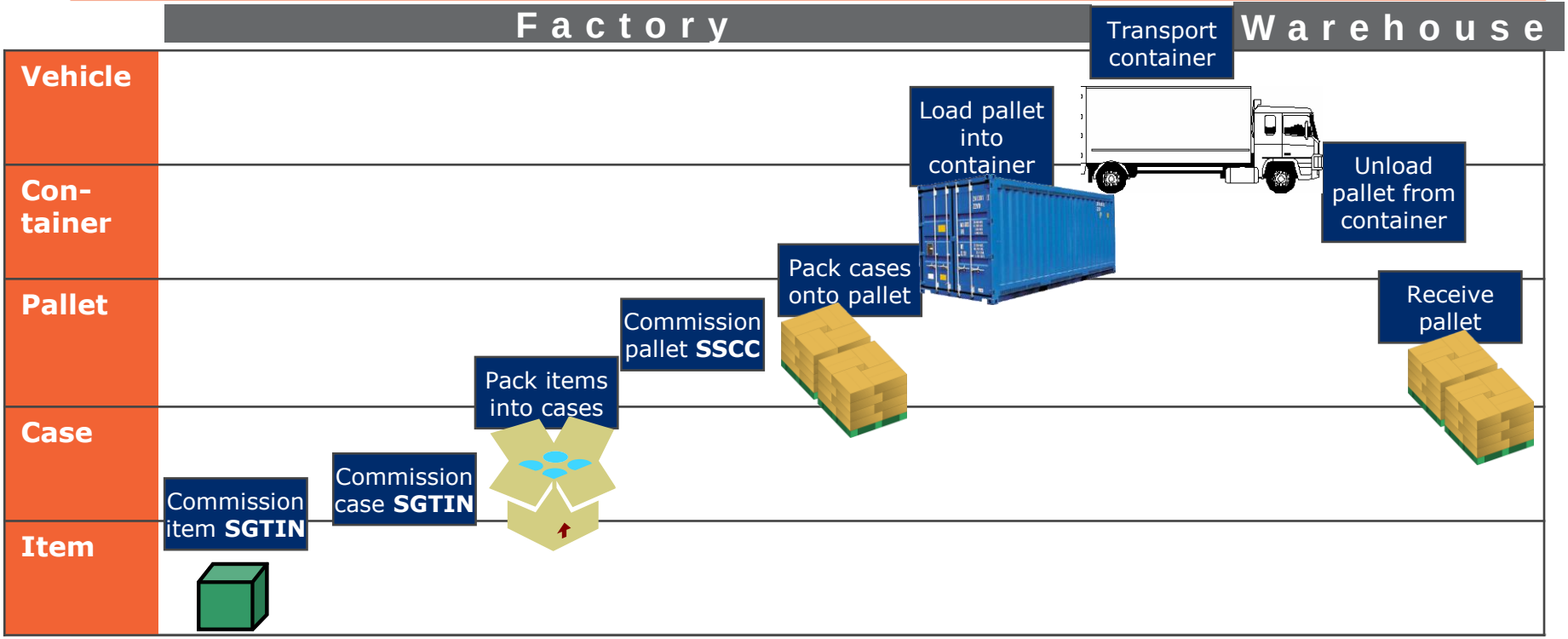
- Commissioning Event
- Packing Event
- Shipping Event

4 EPCIS is global !



Process Flow Example

Designing a Visibility System using EPCIS



Designing a visibility system using EPCIS

Implementation Guideline http://www.gs1.org/docs/epc/EPCIS_Guideline.pdf

1. Collect visibility goals and requirements
2. Document business process flows
3. Break each process flow into series of discrete steps

Process Flow Example

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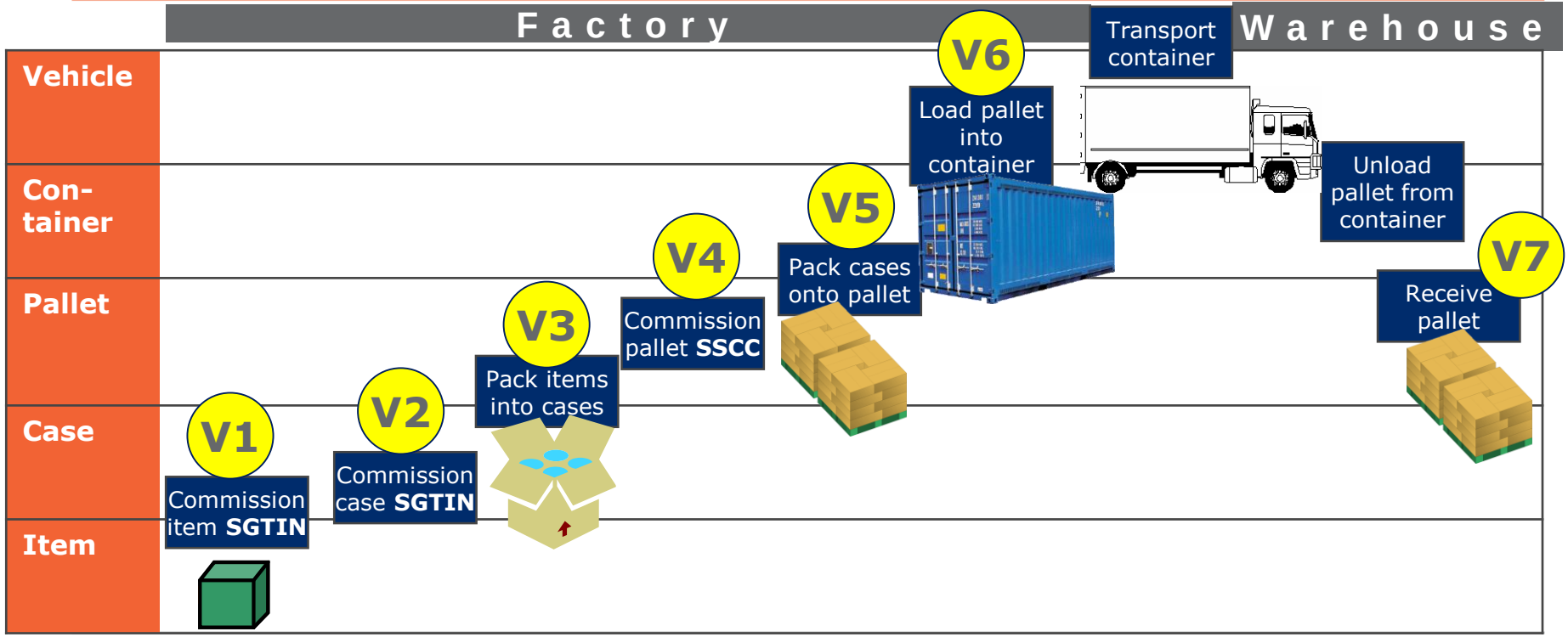

Designing a visibility system using EPCIS

Implementation Guideline http://www.gs1.org/docs/epc/EPCIS_Guideline.pdf

1. Collect visibility goals and requirements
2. Document business process flows
3. Break each process flow into series of discrete steps
4. Decide which business steps require visibility events
5. **Model completion of each step as a visibility event**
6. **Decide which data to include in the visibility event**

What info does the business application need?

Designing a visibility system using EPCIS

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5. Model completion of each step as a visibility event
6. Decide which data to include in the visibility event
7. Determine vocabularies to populate each data field
8. **Document visibility events in a visibility matrix**

Visibility Data Matrix

Designing a Visibility System using EPCIS

		Event **V1**	Event **V3**	Event **V5**	Event **V6**
		Commission items	Pack items into case	Pack cases onto pallet	Ship pallet
What	**Identifiers**	GTIN & Serial (**SGTIN**) of item	**SGTINs** of items into **SGTIN** of case	**SGTINs** of cases into **SSCC** of pallet	**SSCC** of pallet
When	**Timestamp**	24 Sept 2018, 11:27 CEST	24 Sept 2018, 14:09 CEST	25 Sept 2018, 10:24 CEST	25 Sept 2018, 15:19 CEST
Where	**Location**	packaging line 47	A-frame 21	palletiser 2	dock door 11
Why	**Business Step**	**Commissioning**	**Packing**	**Packing**	**Shipping**

Why align with EPCIS?

- EPCIS provides a standardised way of exchanging and requesting traceability event data in a way that enables the business context to be communicated
- EPCIS is an open standard supported by an increasing number of implementations and software products
- EPCIS and its companion Core Business Vocabulary (CBV) are designed to be applicable across multiple industry sectors
- EPCIS and CBV are recognized as ISO/IEC standards
  - EPCIS = ISO/IEC 19987
  - CBV = ISO/IEC 19988

What is EPCIS ?

EPCIS is . . .

- an open GS1 & ISO technical standard
- an enabler for traceability solutions & services
- data-carrier-neutral, suited to GS1 DataMatrix

EPCIS is not . . .

- an out-of the box solution
- a standalone answer to visibility issues

Serialization & event-based visibility will fundamentally change supply chain precision... **EPCIS will support this!**

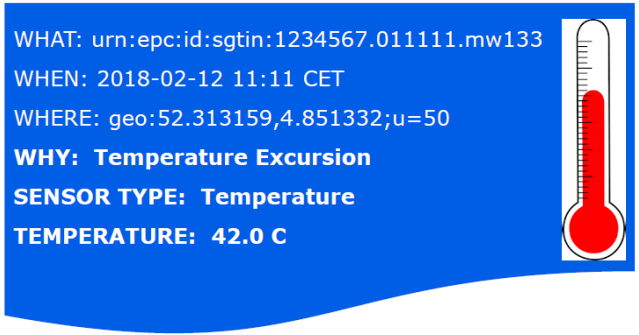
Resources: GS1 Standards & Guidelines

- EPCIS & CBV
  www.gs1.org/epcis
- EPCIS & CBV Implementation Guideline
  www.gs1.org/docs/epc/EPCIS_Guideline.pdf
- EPC Tag Data Standard (TDS)
  www.gs1.org/epc/tag-data-standard
- GS1 US DSCSA Guideline
  www.gs1us.org/RxGuideline

EPCIS & CBV 2.0 – under development

www.gs1.org/standards/development-work-groups#EPCISCBV

- Addition of **JSON(-LD)** syntax to EPCIS
- Addition of **REST** binding support to EPCIS
- Support for **sensor data** in EPCIS events



- Inclusion of **party certification information** in EPCIS data
- General overhaul of CBV as **Comprehensive** Business Vocabulary

For further info on event-based visibility with EPCIS…

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