



EPCIS (Electronic Product Code Information Service) Frequently Asked Questions

April 27, 2007

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Abstract

The purpose of this document is to provide some clarity and insight in to the EPCglobal EPCIS v1.0 Standard. Included here are many basic questions about the value of EPCIS, the functionality of EPCIS, how EPCIS may be implemented, and probably most importantly, addresses some common misconceptions about EPCIS.

Audience for this document

This document attempts to describe and clarify the EPCIS standard, but does not describe the specifics of EPCIS as well as the standard document itself.. It attempts to explain EPCIS to a wide audience within the EPCglobal Community at multiple technical and business levels.

EPC Basics

1. Q: What is an EPC?

A: An EPC, or Electronic Product Code, provides a unique, serialized identifier for any kind of object. Familiar identifiers can be encoded into an EPC format including:

- GTIN (Global Trade Item Number)
- GRAI (Global Returnable Asset Identifier)
- SSCC (Serialized Shipping Container Code)
- GIAI (Global Individual Asset Identifier)
- CAGE/DoDAAC (US Department of Defense Internal Numbering System)

The familiar EAN/UPC bar code, which encodes GTINs, provides identifying information for a class of item. EPC goes beyond this when a GTIN is encoded in an EPC by identifying an individual serialized item or instance of the item (sGTIN). Two cases of the same product will have the same GTIN, but will have different EPCs (sGTIN).

2. Q: What products and assets can use EPC?

A: Beyond being used at the item, case and pallet level for consumer products, an identifier such as GRAI, GIAI or others could be encoded in an EPC and used to identify returnable containers, checked baggage, electronic products for warranty and service needs, maintenance records on fixed assets, any level of container in national and international logistics, individually tracked vials of medication, or any other tangible object.

3. Q: Why use EPC standards over earlier RFID specifications?

A: RFID tags have been used for decades for mostly special purpose, proprietary tracking purposes. However, in modern commerce almost everything needs to move fluidly across enterprise boundaries. By providing open standards for tags, readers, and middleware EPCglobal has enabled the creation of a standards based industry where tags applied in one country can pass through many different organizations to their final destination and the identity of the object understood and authenticated. EPCIS is an additional EPCglobal standard that supports a detailed representation of the location and state of material as it moves between organizational boundaries and provides for sharing this in a technology supplier independent way between entities or partners. It should be noted that the EPCIS standard is data carrier neutral and can be used to exchange data found from RFID tags, barcodes and other data carriers.

4. Q: What is the EPCglobal Network?

A: The EPCglobal Network is a *community* of trading partners engaged in the capture and sharing of EPC-related data through use of EPCglobal standards based technologies. EPCIS is a one component of the EPCglobal Standards suite that supports the EPCglobal Network.

EPCIS and Your Business

5. Q: What is “EPCIS”?

A: Electronic Product Code Information Services (EPCIS) is an EPCglobal standard for sharing EPC related information between trading partners. EPCIS provides important new capabilities to improve efficiency, security, and visibility in the global supply chain, and complements lower level EPCglobal tag, reader, and middleware standards.

6. Q: What information can be shared via EPCIS standards?

A: The *What, Where, When, and Why* of events occurring in any supply chain is exchanged, safely and securely, via the EPCIS standard. This is important business information, such the time, location, disposition and business step of each event that occurs during the life of an item in the supply chain.

7. Q: How is supply chain information shared via the EPCIS standard?

A: The EPCIS standard provides interface specifications built on top of very widely used business and Internet standards. EPCIS facilitates internal data capture as well as secure external sharing of information about movement and status of goods in the physical world.

8. Q: Why should my company use EPCIS standards?

A: If your business involves handling physical goods – for example, if your organization is a manufacturer, distributor, logistics provider, reseller or large end user of tangible goods – then you probably already consume information internally or exchange information externally about the location and status of material. The EPCIS standard provides a path for cost-effectively sharing information with a much finer granularity of detail. Opportunities for better visibility and more efficiency are likely to draw many companies into adopting the standard which will complement identification and data sharing technology used today.. By using the EPCIS standard, your company is leveraging the experiences and learnings of other companies who created the specification and benefiting from the ease of sharing information when a single language is used.

9. Q: Why should I use the EPCIS standard if I do not wish to share data with other trading partners?

A: EPCIS is the bridge between the physical world and information systems. Many businesses have completely internal business processes that involve the handling of goods, and EPCIS provides a standard way of managing visibility into those processes. The benefits of giving business applications visibility into the physical world are as compelling within the four walls as they are between trading partners.

Using EPCglobal standards within the corporation will ensure a wide choice of vendors and interoperability between vendors and allow for the bringing together of disparate systems within an organization. The EPCIS standard can connect a factory to a warehouse to a store that may be using different systems to collect data about product movement and status. Clearly, if situations change and there is a need to share previously internal information with another subsidiary or trading partner, this will be greatly facilitated by using standards.

10. Q: Does the EPCIS standard replace EDI standards?

A: No. The EPCIS standard provides a way to share high volume, very fine grain information about material movement and status among cooperating partners. EPCIS does not address purchasing, forecasts, bidding, billing, etc. that are typically exchanged via EDI in a business transaction between two parties.

11. Q: How can EPCIS provide a single standard for so many different industries?

A: Despite widespread differences in how different businesses operate, all have processes that involve the physical movement of goods. All industries need to describe the physical movement of goods. The EPCIS standard at its foundation is universal language for describing information related to visibility of the physical world, incorporating common notions of What Where When and Why.

EPCIS provides the flexibility for industries, user groups, and/or individual end-users to specify vocabularies and minimum best practices for their trading communities, where there may be specific requirements that may not be a part of the core components of the specification. For example,

Business events all occur at a point in time. The meaning of time is universal to all industries and end users, and so the EPCIS core specification for “time” will serve all industries. Likewise, business events will happen at a particular place. All industries have a requirement to represent where an event took place by identifying its location, and so the EPCIS core specification has a place for “location” in the data model. However, each industry may have different conventions for representing location information, and so the EPCIS specification allows each industry to tailor location information to meet its needs. As a final example, all industries have a requirement to represent in which step of a business process an event occurred, but a particular business process step may not exist across all industries. The specification allows for industry specific data elements and core elements to co-exist, with the ultimate goal being to incorporate all commonly shared elements into the core specification.

EPCglobal is currently developing cross-industry standard vocabulary values for the key elements of EPCIS – business step, disposition (status), location master data, and business transaction.

12. Q: EPC is in early stages of wide scale adoption, how does EPCIS accommodate experimentation and new needs?

A: The EPCIS framework is extensible and therefore allows new industry requirements to co-exist alongside the core components of the standard. The extensibility allows for experimentation and new requirements development while still providing interoperability.

Common Questions based on Misconceptions about EPCIS

13. Q. Is EPCIS a large scale enterprise application designed by a committee?

A: EPCIS is not an application. EPCIS is a *standard* that defines interfaces for representation and exchange of data. The EPCIS interface standards support applications, by specifying a data and communication format. The EPCIS standard provides what is necessary to share data, but does not provide application level functionality.

14. Q: Does EPCIS have a sufficient level of functionality for an enterprise application?

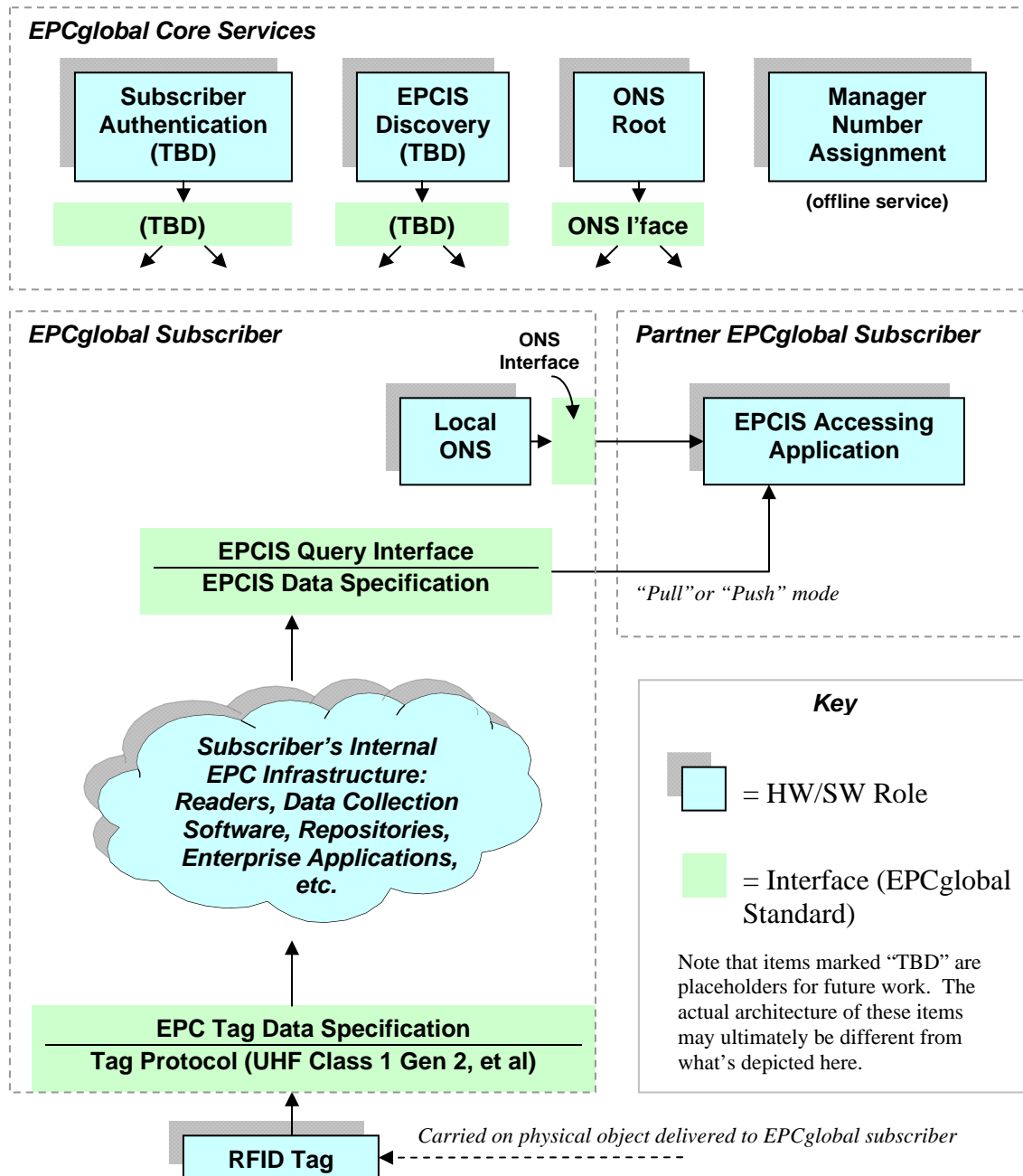
A: EPCIS is not an application. The EPCIS *standard* is a set of interfaces that support sharing of visibility data. This is similar to email protocols supporting the distribution of Internet mail. EPCIS defines a capture interface and a query interface to obtain and share business event information. The standard may be implemented by applications, but the applications themselves are developed by end users and solution providers – not EPCglobal. Those applications are expected to be quite diverse in their actual implementation.

15. Q. Is EPCIS a track and trace/visibility application?

A. EPCIS is not an application. EPCIS specifies a *standard* representation of and interface to visibility data, at a finer granularity than prior standards. EPCIS data may be used as input to track and trace or visibility applications, and that input will in all likelihood improve those applications due to the finer granularity of information offered by EPCIS.

16. Q. Is EPCIS the same thing as ONS?

A. No. Object Naming Service (ONS) can be thought of as a lookup service that takes an EPC as input, and produces as output the address (in the form of a Uniform Resource Locator, or URL) of an EPCIS repository designated and implemented by the EPC Manager of the EPC in question. EPCIS, on the other hand, provides the means to communicate further information about an individual EPC.



17. Q: Is ONS required to deploy EPCIS?

A: EPCIS can be deployed today without need for ONS or other discovery mechanism. . ONS or other discovery mechanisms become necessary when you do not know where to go to get information about a particular EPC. On the other hand, for many industries there are already established direct or indirect business relationships between trading partners, where partners are known to one another and secure exchange can take place without ONS or other discovery service. As EPC gets more widely deployed and used in industries with more dynamic routing, future EPCglobal standards based approaches to discover the identity of the relevant EPCIS will become valuable.

18. Q: Is there a master, centralized EPCIS?

A: There is no central implementation of EPCIS. EPCIS is not an application. No single organization or small set of organizations holds the data generated everywhere. EPC information is collected and owned by the organization collecting the data, by however manner they choose. For example this might be an individual carrier at an airport, a distributor with three warehouses, a manufacturer, a sea port, a bonded warehouse, or a large retail chain. If that organization wishes to share the data with trading partners they can choose to provide an EPCIS interface to that data. Each trading partner could then access, on request, any portion of the information for which they are authorized. No central repository is needed and the scale of sharing is unbounded in just the same way that new web servers can be added to the World Wide Web.

19. Q. Can EPCIS scale?

A. Yes. The standard is defined as a common way to express occurrences in the physical world. Because the EPCIS standard only defines interfaces, not implementations, the specification itself does not constrain implementations in any way that would affect scalability.

20. Q: Is EPC and EPCIS just for Consumer Packaged Goods (CPG)?

A: No: both EPC and EPCIS are designed for use by all industries, not just CPG. The consumer packaged goods industry has driven large scale demand for EPC compliant tags, readers and various layers of software. This has driven costs down rapidly. However from its inception, EPC was designed to be a technology that is very broadly applicable across multiple industries. The volumes driven from CPG make it more cost effective for other industries to adopt EPC. Even more important, all industry verticals involved in the movement of tangible material overlap at nexus points such as airports, distribution centers, customs processing, freight services, hazardous material regulations, etc. Thus, while different industries may have very different internal business processes, when products are unloaded from a truck, it is important that all the tags interoperate with the readers and that data can be exchanged freely independent of the origin of the material.

21. Q. Do I have to participate in the EPCglobal Network to use EPCIS?

A. No. The EPCglobal Network is a *community* of trading partners engaged in the capture and sharing of EPC-related data through use of EPCglobal standards based technologies. EPCIS is a component of the EPCglobal Network, but may also be used within four wall applications that may not require all EPCglobal standard components.

22. Q. Do I have to be an EPCglobal member to use EPCIS?

A. No. The EPCIS Standard is publicly available. Moreover, there are many solution providers that provide EPCIS compliant solutions, and EPCglobal membership is not required to purchase and use those solutions.

EPCglobal membership does have its privileges. As a member you are entitled to the following:

- Participation in the ongoing development of business-driven use cases and standards for the EPCglobal Network of Standards.
 - Links with other subscribers to create pilots and test cases.
- EPCglobal community management by working with government, industry associations and other standards bodies
- Intellectual property rights that are afforded to EPCglobal Subscriber
- Access to best practices regarding consumer privacy and public policy.
- Access to certification and compliance testing.
- Training and education on implementing and using the EPC and the EPCglobal Network of Standards through the GS1 Member Organizations
 - Access to GS1's 30+ year expertise
 - User driven and governed (all supply chain roles)
 - Global implementation support (103 offices)
 - Support large, medium and small companies
 - Not for profit standards organization

EPCIS in a Little More Detail

23. Q: What is specified in the EPCIS standard?

A: The EPCIS standard specifies two interfaces and a data model.

The EPCIS Data Model specifies a standard way to represent visibility information about physical objects, including descriptions of product movements in a supply chain. The main components of the data model include EPC, Event Time, Business Step, Disposition, Read Point, Business Location, and Business Transaction. The data model is designed to be extended by industries and end users without revising the specification itself. Some extensions that have been used in EPCIS pilots to-date include Expiration Date, Batch Number, and Temperature.

Visibility information in EPCIS takes the form of “events” that describe specific occurrences in the supply chain. An example event would be that EPC 123 (product) was Received (business step) in Non Sellable condition (disposition) at Distribution Center X (location) yesterday at 2pm EDT (time). A quick way to summarize the components of an EPCIS event are *what* (product), *when* (time), *where* (location), and *why* (business step and disposition).

The EPCIS Event Capture Interface specifies a standard way for business applications that generate visibility data to communicate that data to applications that wish to consume it. In many cases, the receiving side of the Event Capture Interface will be a repository, but this is not necessarily the case.

The EPCIS Query Interface provide a standard way for internal and external systems to request business events from repositories and other sources of EPCIS data using a simple, parameter-driven query language. There are two types of queries – Poll Queries for a synchronous, on-demand response, and Subscription Queries for an asynchronous, scheduled response.

24. Q: So EPCIS is a repository?

A: No. The EPCIS specification only specifies interfaces, not implementations. Many types of applications may implement the interfaces. A repository is certainly one such type of application, but not the only type. A pure EPCIS repository application might implement the EPCIS Event Capture Interface to receive events, store them in a relational database, XML database, file system, or other persistent store, and implement the EPCIS Query Interface to make those events available to other applications.

A Warehouse Management System application, in contrast, carries out many more functions than pure storage of events; nevertheless it may too implement EPCIS interfaces. For example, it might implement the EPCIS Capture Interface so that EPCIS data may serve as one of many sources of input data. Likewise, it might implement the EPCIS Query Interface to expose visibility information to other applications, where that visibility information was calculated from other inputs, though not necessarily exclusively from the EPCIS Capture Interface.

ERP systems, track-and-trace applications, visibility services, and others are all examples of applications that might implement one or both of the EPCIS interfaces. Nothing in the EPCIS specification limits its use to one type of application or another.

25. Q: What are the data elements in the EPCIS standard?

A: The data elements in the EPCIS standard data model define WHAT (product), WHERE (location), WHEN (time), and WHY (business step and status) for granular product movements in the supply chain.

WHAT

- EPC – can be a list (Object or Transaction Events) or parent/child (Aggregation or Transaction Events). It is possible to include any unique identity in the EPC field.
- Business Transaction – includes a type (e.g.: Purchase Order, Invoice, Bill of Lading) and a number. By including the Business Transaction number in a business event, it is possible to relate EPCs to a Business Transaction – e.g.: state that EPCs 1-5 are in Purchase Order CompanyA-123.

WHERE

- Read Point – indicates the location where an event took place – e.g.: DC X conveyor belt #2
- Business Location – describes where the object is immediately after the event occurs – e.g.: DC X Shipping Area

WHEN

- Event Time – states when an event took place
- Record Time – indicates when the event was received through the EPCIS Capture Interface

WHY

- Business Step – indicates what business operation was taking place at the time of the event – e.g.: Receiving, Picking, Loading, Shipping
- Disposition – describes the status of the product immediately after the event occurs – e.g.: Sellable, In Progress, Non Sellable, Destroyed

The final standard field is Action, which has three values:

1. Add – indicates the first event in a product’s lifecycle for an Object Event, or indicates joining child EPCs to a parent EPC in an Aggregation Event
2. Observe – indicates an event between beginning of life and end of life for an Object Event
3. Delete – indicates the last event in a product’s lifecycle for an Object Event, or indicates removing child EPCs from a parent EPC in an Aggregation Event

26. Q: How can implementers extend the data elements in the EPCIS standard?

A: Implementers can freely define field names in the Extension section of the XML data model. It is readily possible to capture and query for extension fields. Many pilots to-date have successfully used the extension capability – with examples including Expiration Date, Batch Number, Temperature, Receiver Name, and Shipper Name.

27. Q: What are the appropriate values for the data elements in the EPCIS standard?

A: The EPCIS specification does not define required values for many data elements. Instead it leaves the definition to trading partners.

Within the EPCglobal Data Exchange Joint Requirements Group, we are well-underway in defining standard values for the data elements involved in sharing business events between trading partners. These data elements are Business Step, Disposition, Business Location, and Business Transaction Type. This Joint Requirements Group currently has membership from the Retail, Consumer Products, Health Care & Life Sciences, Transport & Logistics, and Aerospace industries.

EPCglobal defines the standard values for the EPC code within the Tag Data Standards specification.

28. Q: What are the business events specified in the EPCIS standard?

- A: There are four business events defined in the EPCIS 1.0 specification.
- Object Event – describes an event pertaining to an EPC as it moves through the supply chain – from birth (ADD) through midlife (OBSERVE) to death (DELETE).
 - Aggregation Event – describes an event pertaining to a physical aggregation of child EPCs to a parent EPC, such as cases aggregated to a pallet. It is possible to

include EPCs in an aggregation (ADD), see EPCs in an aggregation (OBSERVE), or remove EPCs from an aggregation (DELETE). It is possible to express any number of levels of aggregation – e.g.: Unit to Inner Case to Outer Case to Pallet to Shipping Container.

- Transaction Event – describes the definitive association or disassociation of one or more EPCs to a Business Transaction. It is possible to include a hierarchy in a Transaction Event – e.g.: Pallet EPC 1 with Case EPCs 10-20 are in Purchase Order CompanyB-4567.
- Quantity Event – describes events pertaining to products without serialized EPCs. These events include a Product Class (e.g.: GTIN), a Quantity, a Business Location, and Time. These events can be used for capturing inventory or point of sale data – e.g.: one hour ago there were 10 units of Product X in Storeroom Y or yesterday Store A sold 5 units of Product B.

The specification enables adding other business events as required in the future.

29. Q: How is EPCIS data secured?

A: There are two forms of data security described in the EPCIS specification – authentication and authorization.

1. **Authentication** – the EPCIS standard enables the use of multiple message transport bindings that include authentication – including SOAP over HTTP with TLS (web services) and XML over AS2. The implementation of the bindings are defined outside the EPCIS standard.
2. **Authorization** – an implementation of the EPCIS Query Interface may use the authenticated identity of the requester, together with arbitrary business rules, to decide which events to deliver to the requestor and which information to include within those events. The EPCIS specification itself does not specify what those business rules are – it is up to each implementation to use authorization rules that are appropriate given its own business situation. The specification defines what types of data may be withheld, and includes a standard error message to be provided when the EPCIS wishes to deny access to data entirely – i.e.: SecurityException.

30. Q: How does the EPCIS standard define error conditions?

A: The EPCIS standard provides a range of standard errors that can be raised by an implementation when responding to a query. These errors include Query Parameter Exception (a query parameter is invalid), Query Too Large Exception, Subscription Controls Exception (invalid control definition for a subscription query), Validation Exception (query syntax not correct), Security Exception (query not permitted), and Implementation Exception (implementation had a failure).

31. Q: How did you test that the EPCIS standard works?

A: Twelve large and small solution providers from Japan, Korea, and North America met in July 2006 to thoroughly test their ability to interoperate using the prototype EPCIS specification. We used test cases from the EPCglobal EPCIS pilots. Based on the successful interoperability event and the minor changes that we made to the EPCIS standard to further ease interoperability, we are confident that the final EPCIS standard will work well in deployments.

EPCIS and Implementation

32. Q: How might a sample implementation work for a small company?

A: There is no standard definition of an EPCIS implementation. But based on our experience from the EPCIS pilots, we can provide some thoughts.

A small company could first determine how it would like to capture and share EPCIS business events. For data capture, the company could set up EPC readers and middleware. For data sharing, the company could make arrangements with its trading partners to monitor shipments and receipts of EPC-tagged products.

The company would need to compile master data for the products and locations in its supply chain.

Then the small company could set up an EPCIS repository application with help from a solution provider. The company would load the master data into its repository. The company could route its captured EPCIS events from its middleware to its EPCIS repository via the capture interface. Then the company could set up subscription queries with its trading partners to track all shipments and receipts.

There are many known use cases for EPCIS based on our current pilots. These use cases include electronic proof of delivery (e.g.: tracking receiving & shipping between trading partners), electronic pedigree (e.g.: tracking which trading partners had custody of an EPC in the supply chain), product authentication (e.g.: verifying the manufacturer of an EPC), promotional compliance (e.g.: ensuring that displays of sale product are setup on time in stores), and inventory management (e.g.: detecting when a product goes out of stock). A company will typically enable these use cases by building applications on their base EPCIS infrastructure.

33. Q: How do I integrate the EPCIS interfaces with my existing systems?

A: The EPCIS standard does not mandate any implementation or repository. So it is possible for an end-user to build the EPCIS interfaces and data model themselves on top of an existing enterprise system. But it may be simpler for many organizations to buy an EPCIS repository application from a solution provider, or obtain EPCIS-compliant application enhancements from their existing application providers. A company could leverage their EPCIS repository for capturing business events from middleware, integrating the EPCIS repository into the enterprise architecture via web services, and allowing trading partners to access data in the EPCIS repository in a secure manner via the query interface.