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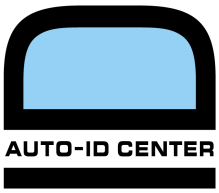

TECHNICAL MEMO

Auto-ID Business Use-Case Framework (A-Biz)

Despatch Advice Use-Case

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ABSTRACT

The Auto-ID Business Use-Case Framework (hereafter referred to as a-Biz, short for "Auto-ID Business Use-Cases") provides the foundation for the integration of Auto-ID technologies with existing Business Information Systems (BIS). This document outlines the Despatch Advice (DA) or Advanced Shipping Notification (ASN) Use-Case. The use-case for Auto-ID enabled shipping and receiving is outlined, as well as a summary of benefits given.

For more information about a-Biz, please refer to the document entitled **Auto-ID Business Use-Case Framework (a-Biz) Background**.

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Biography

Timothy P. Milne
Masters Candidate, MIT Lab

Timothy Milne received Bachelor's and Master's Degrees from Brigham Young University where he graduated with honors from the Department of Mechanical Engineering. At BYU he was involved in the Computer Aided Design (CAD) and Computer Aided Geometric Design (CADG) labs. His Master's thesis presented a new method for topologically mapping arbitrary N-Genus surfaces to single planar domains. Mr. Milne later developed CAD software for various industries including the Aerospace Corporation, Rhythm and Hues Studios, and Varimetrix Corporation. Most recently he worked for Corrpro, a corrosion protection consulting firm, writing a software package for corrosion protection management.

Mr. Milne will receive a Masters in Engineering from MIT in Spring 2003. His work at the Auto-ID Center includes the Physical Markup Language, which describes physical things in a platform neutral format that can be used by companies and people involved in all aspects of supply chain management.

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1. INTRODUCTION

1.1. Purpose

[1] UCC's web site detailing the SSCC: http://www.uc-council.org/news/ne_sscc_modification.html

The Auto-ID Business Use-Case Framework (a-Biz) Despatch Advice (DA) Use-Case will focus on the process by which the composition of a pallet is checked by the staff at the receiving party's warehouse to verify that the pallet has been assembled according to the product specification or order. This process currently falls somewhere in the range from fully manual (breaking down mixed pallets for a hand count) to semi-automatic (manually scanning the Serialized Shipping Container Codes (SSCC)[1] and any product codes). We propose using the EAN.UCC business message item standard to specify and electronically convey the configuration of the pallet in a DA to the receiving party, which can then use the Auto-ID infrastructure to automatically detect the actual configuration. This would move the current manually intensive validation process towards full automation.

In the larger context, the goal of this project is to demonstrate the benefit of combining the static information contained in the EAN.UCC business messages with the dynamic information gathered by the Auto-ID infrastructure. The EAN.UCC business messages are used to describe the required configuration, whereas the Auto-ID data are used to automatically verify that the actual configuration agrees with the required configuration. There are benefits for both the sending and receiving parties, particularly as the use of mixed pallets increases, which are currently even more labor intensive.

1.2. Scope

For more information on how this fits into the a-Biz project, please refer to the background document titled **Auto-ID Business Use-Case Framework (a-Biz) Background**.

The scope of this project is to demonstrate how the Auto-ID infrastructure can detect unintentional errors. It is beyond the scope of this work to try and address malicious activity taken by one party in an effort to intentionally defraud another.

1.3. Problem Statement

The challenge of validating the configuration of a pallet affects both the sending and shipping party in a typical transaction. The impact of this largely manual process is cost-intensive and error-prone. A successful solution would find ways to automate and streamline the validation process to improve the overall accuracy of the shipping process, which may also include the transmission of financial information during the billing cycle to complete the transaction.

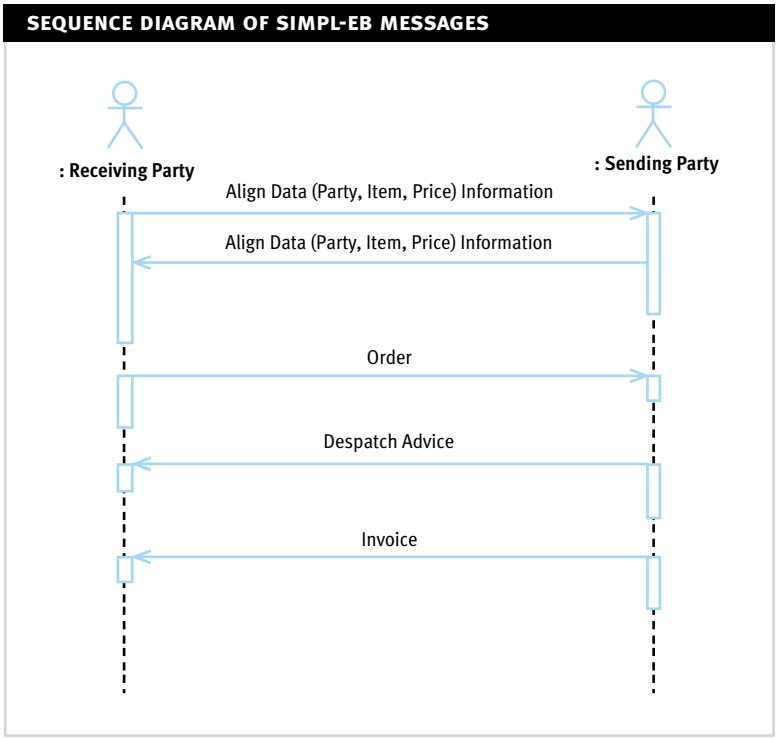
2. BACKGROUND

2.1. Perspective

The UCC began modeling the transactions necessary for business messaging by putting together a basic framework for a business transaction between a buyer and a seller, which they call Simpl-eb . The core sequence of messages includes: party introductions, exchange item request and price, place an order, dispatch advice (DA), and invoice. The first two messages are grouped under alignment, and the last three under trade or commerce with the DA being the second trade message. The DA gives detailed information on the content of a shipment and date of movement to the receiver of that shipment. This message is kept simple by aligning the data prior to the sending of the advice message. Figure 1 is a UML sequence diagram that puts all of these messages in context.

Figure 1: Courtesy UCC

* Data examples: Party, Item, Price



2.2. Collaboration Model Diagrams

Figure 2 shows three primary activities associated with the DA from the collaboration model, along with the flow of information goods:

Whereas Figure 2 is a generalization of the shipping process, Figure 3 shows a particular instantiation of the direct process between a manufacturer and a retailer. Figure 4 shows an indirect instantiation of the transaction through a third party, like a wholesaler or distributor, and illustrates that the upstream and downstream transactions between the wholesaler's trading partners are simply instances of the same general transaction shown in Figure 2.

Figure 2

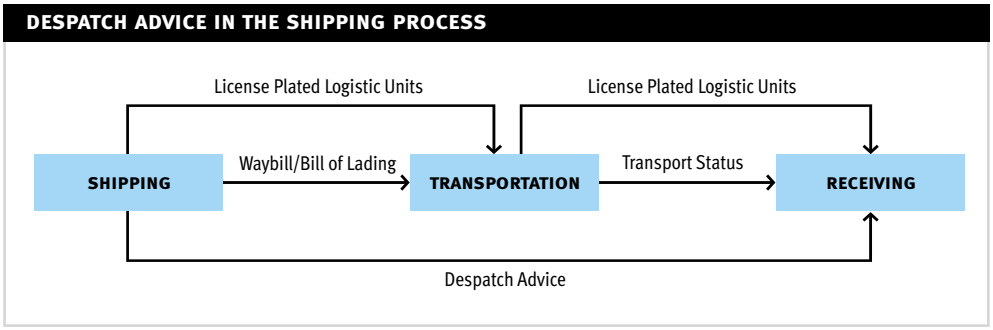


Figure 3: Specific Instantiation of the Shipping Process in the Supply Chain

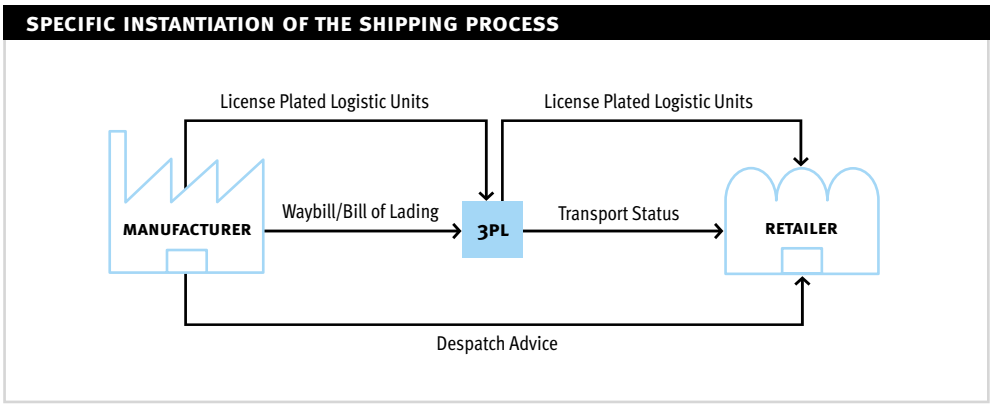
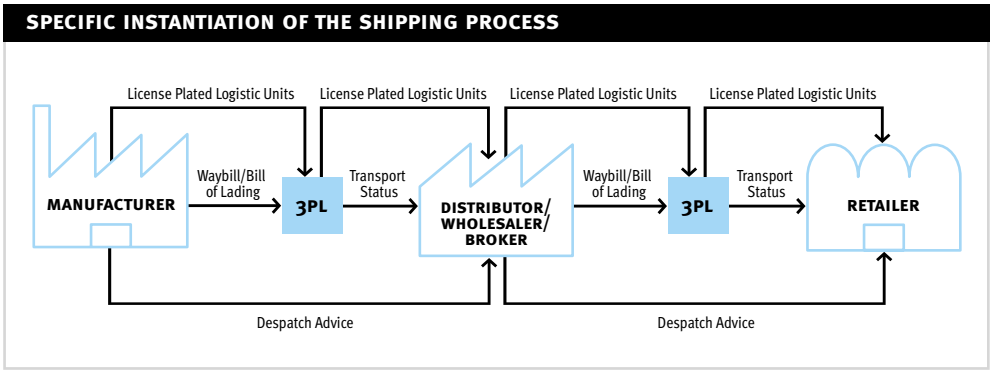


Figure 4: Specific Instantiation of the Shipping Process with an Intermediary in the Supply Chain



In the second case illustrated in Figure 4, if the retailer does a lookup using the Auto-ID infrastructure based on an EPC™ [2] that it has received, they will be directed by the ONS[3] to the original manufacturer's PML[4] server and get information about the product (See Figure 5). If the retailer actually wants information about what the distributor has done with the product, they will have to set up a transaction using an existing BIS[5], augment an existing transaction, or apply a unique EPC™ to the modified product. The a-Biz project will consider all of these approaches as well as possible extensions to the ONS and PML to handle this situation, including a redirection from the manufacturer's PML server to the appropriate server.

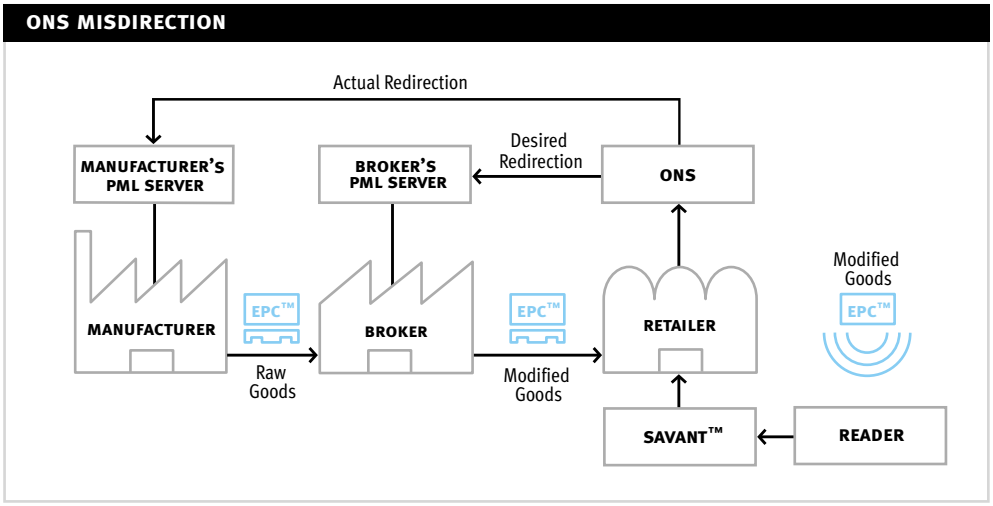
[2] The EPC™, or Electronic Product Code™, is the unique object identifier in the Auto-ID framework

[3] The ONS, or Object Naming Service, is a component of the Auto-ID framework

[4] The PML, or Physical Markup Language, is used by the Auto-ID framework to markup information related to physical objects

[5] Business Information System, or BIS, is the system used to handle information about commerce transactions

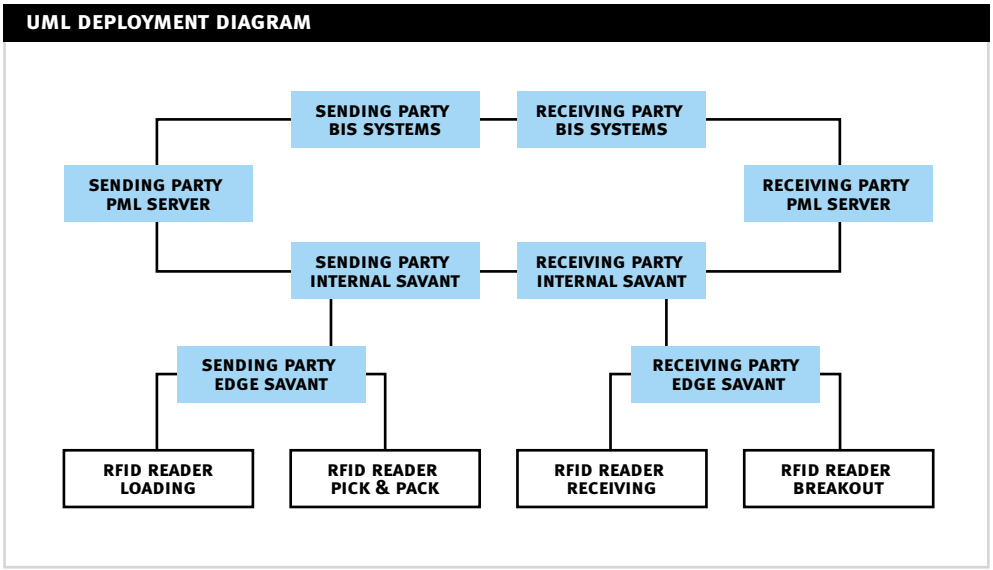
Figure 5



[6] The Savant is the part of the Auto-ID framework that serves as a data router performing the functions of data capturing, data monitoring, and data transmission.

This brings up an interesting point. The a-Biz project could simply augment existing messages sent between BIS's with Auto-ID data. This works because one need not request detailed product information from the manufacturer just to reconcile a shipment. The receiving party can simply read the EPCs™ with the Auto-ID reader network then check them against those sent in the DA. Another approach would be to subsume the UCC messaging in the Auto-ID framework and send the DA directly from a Savant™ in the sending company to a Savant™ [6] in the receiving company via PML. This approach could eventually enable other operations besides the DA to be incorporated into the framework. Both approaches are shown in the deployment diagram in Figure 6 and will be considered.

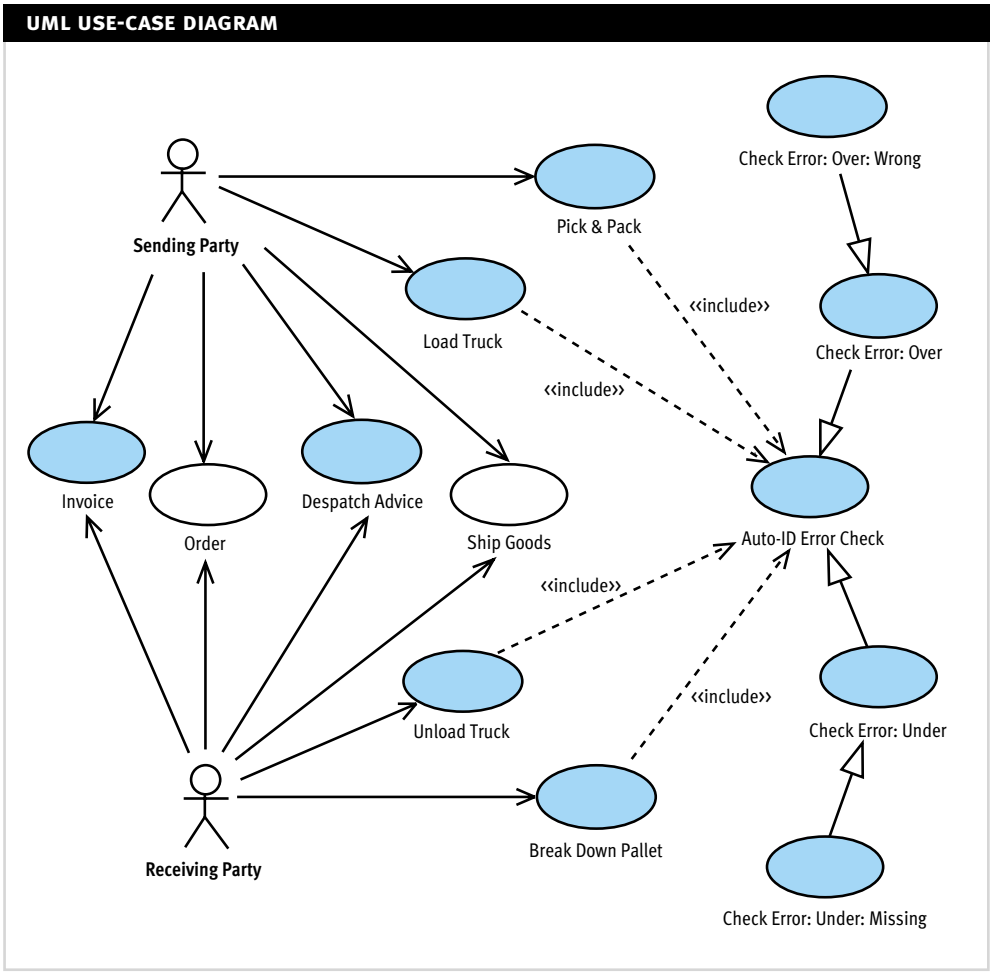
Figure 6



2.3. Use-Case Diagram

A more detailed Use Case diagram is shown in Figure 7, which shows the relative activities for the sending party and the receiving party with the Auto-ID affected use cases in blue. Note that the error checking function has been abstracted and is included in the relevant Use Cases. The types of errors have also been generalized as shown.

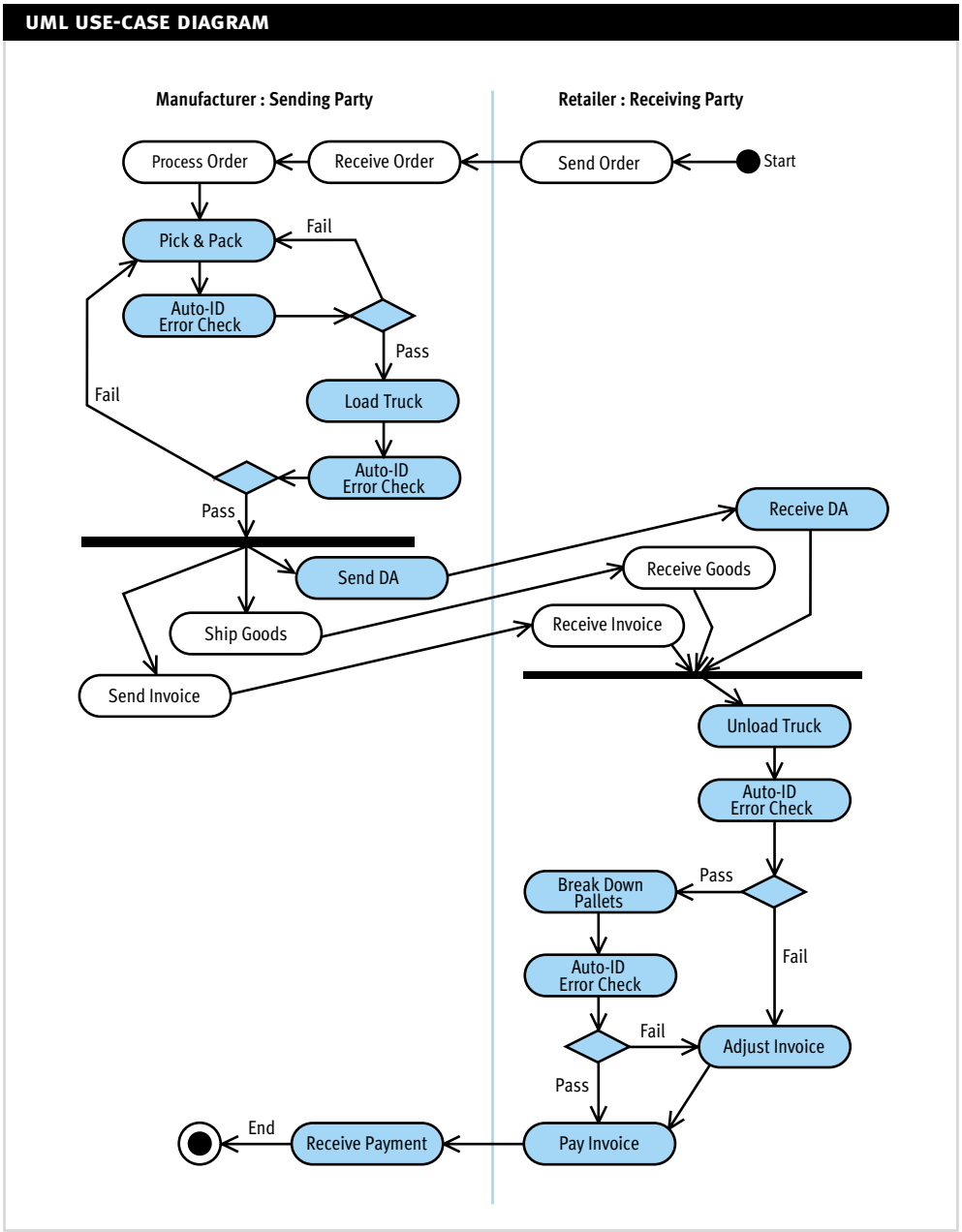
Figure 7: UML Use-Case Diagram of Business Processes Considered Here



2.4. Activity Diagram

Figure 8 shows a detailed activity diagram for the entire order process with the Auto-ID affected activities highlighted in blue. The alignment operations are not represented, but the movement of goods parallel to the information messages is. Please note where the Auto-ID error checking operations take place within the sending party, and the feedback loops they form with the Pick & Pack operation until the order is correct. Also of particular interest is how the error checking at the receiving party will interface with their invoicing system, as an adjusted invoice is the only mechanism by which an error will be conveyed back to the sending party.

Figure 8: UML Activity Diagram



2.5. Summary of Capabilities

Table 1

SUMMARY OF CAPABILITIES	
BENEFIT	**SUPPORTING FEATURES**
Reduced labor costs at receiving party	Auto-ID infrastructure at the receiving party **automatically** identifies cases and pallet and checks pallet configuration against required configuration, no breakdown necessary
Reduced labor costs at sending party	Auto-ID infrastructure at the sending party **automatically** identifies cases and pallet and checks pallet configuration against required configuration as pallet is being built
Decrease number of "incorrect" shipments	Auto-ID infrastructure validates pallet configuration before a shipment leaves a location
Reduced gap between physical and system inventory levels	**Automatic** validation is less error-prone than manual checking, and much faster
Cost-efficient solution because of reliance on existing standards work	Using the EAN.UCC item business message specification guarantees interoperability between the two parties

2.6. Assumptions and Dependencies

– All RFID case tags can be detected or there is an alternate procedure to handle omissions
– All RFID pallet tags can be detected or there is an alternate procedure to handle omissions

It is important to keep in mind that 100% accuracy levels may not make sense for all products (paper towels vs. aircraft engines).

3. DETAILED USE-CASES FOR DESPATCH ADVICE

The following use-cases outline the processes of shipping and receiving that are affected by the Auto-ID infrastructure in more detail. The items **highlighted** show the advantages of Auto-ID that are not currently available.

3.1. Process Order

1. Sending party receives a Purchase Order (PO) from the receiving party
2. The PO is entered into the internal information system (manually or electronically)

3.2. Pick & Pack

1. Sending party generates a picklist (manual or electronic)
2. Staff assembles the required cases on a pallet as per the picklist
   a) A pallet can be homogenous
   b) A pallet can also be mixed for Direct Store Delivery (DSD)
3. RFID infrastructure automatically updates the inventory of the sending party
4. RFID infrastructure registers which cases are located on a certain pallet during the building process
   a) In the staging area
   b) In the pick lanes
5. Staff checks with IT system whether the pallet is correctly composed (see use-case Auto-ID Error Checking for details)
6. RFID infrastructure aides in the update of the order
7. Pallet is positioned at the end of the pick lane for shipping and is wrapped/marked

Assumptions:

1. Read all tags on cases and pallets in step 4
2. No broken tags, or allow for manual intervention in step 5 to handle broken tags.

3.3. Load Truck

1. Sending party staff generates a Bill of Lading (usually at the time the pick list is generated)
2. Staff picks up pallet from a staging area pick lane with a fork lift
3. Staff moves the pallet past the RFID readers
4. Staff checks with IT system whether pallet is correctly composed (see use case Auto-ID Error Checking for details)
5. Staff loads pallet into truck
6. Staff returns a copy of the automatically verified Bill of Lading to QA
7. QA generates a DA with Auto-ID augmented data and sends it to the receiving party
8. The goods are shipped

Assumptions

1. Read all tags on cases and pallets in step 3.
2. No broken tags, or allow for manual intervention in step 4 to handle broken tags.

3.4. Receive DA

1. DA arrives at the receiving party in advance with the Auto-ID information
2. Receiving party stores it (manually or electronically) and prepares to receive shipment

3.5. Unload Truck

1. The shipment arrives
2. Receiving party staff unloads the truck
3. Staff moves pallets past the RFID readers
4. IT system automatically verifies whether pallets are correctly configured (see use-case Auto-ID Error Checking for more details)
5. If adjustments are necessary, QA is notified (see use-case Payment Sent to Sending Party)

3.6. Break Down/Reconfigure/Store Pallets

1. The receiving party staff can break down the pallets, reconfigure them, or store them
2. IT system automatically verifies whether pallets are correctly configured
   (see use-case Auto-ID Error Checking for more details)
3. RFID infrastructure automatically updates inventory of the receiving party

3.7. Payment Sent to Sending Party

1. As the pallets are received and broken down, QA gathers the following information about the order:
   a) If the order was correct, no adjustments necessary
   b) If the order was incorrect, and the errors
   c) The EPCs™ of the items received
   d) If unordered goods were shipped, those EPCs™ will be sent as well
2. QA makes any necessary adjustments to the invoice and remits payment to the sending party

3.8. Auto-ID Error Checking

1. Savant™ receives EPCs™ of cases and pallets in read range of RFID reader
2. Savant™ retrieves EAN.UCC XML Business Message Standard based item specification of the pallet from the item information repository using the EPC™/GTIN number as a global key
3. Savant™ compares quantity of cases and type of cases against specification
   a) Savant™ indicates whether composition of pallet is correct or incorrect
   b) If it is incorrect, it lists the missing/wrong cases
   c) No manual intervention is necessary
   d) No breakdown of the pallet is necessary

Assumptions

1 Mixed pallets have their own GTIN
2. Mixed pallets have an EAN.UCC XML business Message Item description
3. The system will allow manual intervention, should a tag or system fail

4. NEXT STEPS

- Exception Handling on the use-cases
- Participating Companies
- Products
- Conduct a systematic overview of a real-world DA process and generate a list of the errors that occur today as well as how they may potentially be addressed with Auto-ID technology

For Example

- Pick & Pack according to pack list:
  - **Today:** wrong product/quantity
  - **Auto-ID:** automatic feedback and opportunity to take corrective action

5. GLOSSARY

5.1. a-Biz – Auto-ID Business Use-Case Framework

a-Biz is the Auto-ID project that will eventually consider the integration of Auto-ID technology with many real world business use-cases, thus enabling "Automated Business", or a-Biz.

5.2. ASN – Advanced Shipping Notification

Also referred to as Despatch Advice (DA). This electronic document is sent ahead of the shipped goods to give notice that they are in transit and to convey the composition of the shipment.

5.3. BIS – Business Information System

Business Information System, or BIS, is the system used to handle information about commerce transactions.

5.4. DA – Despatch Advice

Also referred to as Advanced Shipping Notification (ASN). This electronic document is sent ahead of the shipped goods to give notice that they are in transit and to convey the composition of the shipment.

5.5. EAN – European Article Numbering

The system founded in 1974 when manufacturers and distributors of 12 European countries formed an ad-hoc council. Its brief was to examine the possibility of developing a uniform and standard numbering system for Europe, similar to the UPC system already in operation in the USA. As a result, a UPC compatible system called "European Article Numbering" was created. http://www.ean-int.org

5.6. EPC™ – Electronic Product Code™

The Electronic Product Code, or EPC™, is the unique code used to identify an object in the Auto-ID infrastructure. It is similar in purpose to the GTIN, UPC and others.

5.7. ONS – Object Name Service

The Object Naming Service, or ONS, is a component of the Auto-ID framework, and performs a name resolving function similar to the Domain Naming Service employed by the Internet today.

5.8. PML – Physical Markup Language

The physical markup language is used by the Auto-ID infrastructure to communicate information about physical objects.

5.9. Savant™

The Savant™ is a part of the Auto-ID framework. It is a globally distributed server that serves as a data router performing the functions of data capturing, data monitoring, and data transmission.

5.10. UCC – Uniform Code Council

The mission of the Uniform Code Council, Inc., is to take a global leadership role in establishing and promoting multi-industry standards for product identification and related electronic communication. The goal is to enhance supply chain management thus contributing added value to the customer. http://www.uc-council.org

5.11. UML – Unified Modeling Language

The Unified Modeling Language, or UML, is a descriptive modeling framework for modeling the requirements and business processes via Use-Cases, Activity Diagrams, etc.

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