IoT enabled Smart Warehouse Solution
Agenda

- Business Challenge
- IoT Smart WM Solution
- Technical Solution
- Benefits
Traditional Inventory Management (Business Challenge)

1. Longer turnaround time for the picking and packing process
2. Mismatch between inventory data in ERP and actual inventory in warehouse
3. Wasted warehouse space due to lack of oversight into space allocation
4. Manual Effort and Labor management
5. Real Time data gathering for shipment is not tracked
6. Wrong order/shipment/delay will badly affect business
7. Lack of end-to-end visibility on inventory
Use cases

Use case for complete IoT enabled Warehouse solution like
• Space Allocation Optimization (3)
• Automatic navigation to the inventory storage (4)
• Inventory management and control (1, 2 and 5)
• IoT Enabled Smart Shipping (5)
• Monitor Fork Lift Truck Usage and Health
1. Real time data received from sensors/beacons ensure that actual inventory levels are measured.
2. Real-time updates on inventory count, alerts for mismatch between inventory data in ERP and actual inventory in warehouse
3. Restocking process becomes more efficient and stock out losses are avoided
4. Automated Navigation within Warehouse
5. End-to-End visibility on inventory
IoT Architecture

- SAG Device Integration Platform
  - Device Connectors
  - Data Ingestion
  - Edge Analytics

- SAG Analytics Platform
  - Event Streaming
  - Event Processing
  - Event Store
  - Event Analytics

- SAG Application Integration Platform
  - Service Bus + Application Connectors

- REST API

- Warehouse(s)

- Application(s)
Solution Details

Derive Inventory count in each rack by count of beacon stickers detected

Mobile App/Agent to publish Inventory Update Events to DIP

Device Metadata, Model, Hierarchy, Measurements, Events

Dashboards, Notifications, Alerts

Gateway Device(Mobile)

SAG Device Integration Platform

SAG Analytics Platform

SAG Integration Platform

IOT Platform

Mobile Device

Forklift Operator

Fork Lift Scanner to detect items picked via beacon sticker identifiers

Warehouse map with item locations pinned (Act as Indoor Positioning System[IPS])

Get Work Order and Pick List Details

Get Indoor Location Coordinates assigned to each Items/products

Integrate with Enterprise ERP and Warehouse systems

BLE Events Data Flow

EWM

TMS

ERP

Solution Details
Warehouse and Devices - Perspective

- Estimote Location/Proximity Beacons – Attached to rack/bay to identify Location
- Estimote Beacon Stickers - Attached to Items/pallets to identify inventory in each rack
- Beacon Tracking (Fixed) – To track inventory in each rack (Using Raspberry PI kind device as gateway)
- Beacon Tracking (Mobile) – While Item Loading on Forklift (Using Mobile/Tab as gateway)
- Beacon Tracking (Fixed) – To validate item loading on truck (Using Raspberry PI kind device as gateway)

- BLE integration with all beacons
- Location Beacons coordinates mapped to warehouse loading bay/item locations
- Beacons Stickers with unique id tagged to each Item
- Operator forklifts equipped with beacon tracking device to identify – Items and locations
- Operator forklifts equipped navigation device to display navigation route to Item/Loading bay
Work Order: WO1
Product1 >> ReqQty - 2>>
Product2 >> ReqQty - 1>>

Work Order: WO1
Product1 >> ReqQty - 2>> Picked - 2
Product2 >> ReqQty - 1>> Picked - 1
Mashzone NextGen Real Time Dashboard

Real Time Inventory Count
Real Time Inventory Status

Pick Item Locations Pinned

Assigned Work Order Details

<table>
<thead>
<tr>
<th>Product</th>
<th>ReqQty</th>
<th>PickQty</th>
<th>PickStatus</th>
<th>InventoryStatus</th>
<th>CurrentInventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Product2</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

Work Orders By Status

Completed Work Orders

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MOBILE GATEWAY - SMART WAREHOUSE

- Work Order: WO1; Picked Product1 of count - 2
- Work Order: WO1; Picked Product1 of count - 1
- Work Order: WO3; Picked Product1 of count - 1
- Work Order: WO2; Picked Product2 of count - 1
Solution Components

- Software AG Apama and DIP Connector
- Software AG Device Integration Platform
- Software AG MashZone Nextgen
- Terracotta In-Memory Fabric
- Universal Messaging
- Software AG -webMethods Integration Server
Our Solution

How the real time, automatic stock / inventory can take place

It is possible to achieve this in 3 ways..

1. Using Automated guided vehicle fitted with device to scan/read the items
2. Using drones fitted with device to scan and read the items
3. Using Mobile readers to scan / read the items and move around the warehouse to capture the information

Based on the warehouse floor design, budget, type of industry and materials, suitable option or combination of options possible to choose
IoT in Inventory Management Using Bluetooth Low Energy (BLE)

BLE allows bidirectional transmission of data

BLE allows simultaneous integration with various sensors

BLE is more versatile than RFID, Barcode and QR Code

BLE Beacons Transmitters are attached to the inventory/pallets

BLE Beacons Transmit Inventory Data to Fixed/Mobile Receivers

Real Time Inventory Data is available to user over his smartphone

The Aggregated Data is processed by ERP to verify inventory

scenario 1
Beacons as a constant and receivers as a variable

scenario 2
Beacons as a variable and receivers as a constant

scenario 3
Beacons and receivers both as a variable
Business Challenge

This presentation focuses on use case of Smart Inventory and Shipping aspects of Warehouse Management

Some of the business challenges with respect to inventory management

• Lack of end-to-end visibility on inventory
• Mismatch between inventory data in ERP and actual inventory in warehouse
• Daily stock taking is virtually impossible
• Errors in order processing resulting in missing items
• Wasted warehouse space due to lack of oversight into space allocation
• Longer turnaround time for the picking and packing process
• Inefficient allocation of resources and equipment due to non-standardized processes
IOT enabled Smart Warehouse – Virtual warehouse - Overview

WAREHOUSE PROCESS

Automatic navigation & Space Optimization
- IoT identifies the right location for the inventory and assigns the available physical storage location.
- IoT updates Virtual Warehouse and ERP

RECEIVING
- Unload Vehicle
- Inspect for damage
- Record the inventory

Put-away
- Identify Inventory
- Identify Storage Location
- Move Products
- Update Records

Storage
- Stock Location
- Space Utilization

Order Picking
- Order Information
- Navigation Guidance
- Order Picking

Shipping Preparation
- Packing
- Labeling
- Stacking

Smart SHIPPING
- Schedule Carrier
- Load Vehicle
- Bill of Loading
- Record Update

Outbound Shipments

Material Flow

Information Flow

Inventory management
- IoT verifies accuracy of the order before packing
- IoT tags the packages with correct delivery information

Space Optimization UseCase
- IoT very frequently tracks Class A inventory with drones and AGVs. Class B and C inventory are tracked with Bar Code/QR Code scanners on Weekly and Monthly basis respectively.
- IoT sensors record physical space utilization

Automatic navigation
- IoT looks up Virtual Warehouse for ordered inventory and provides the labor/AGV with navigation data.
- IoT guides the labor/AGV to pick right inventory

IoT• Sensors at the receiving conveyor capture the inbound inventory data and feed the same into IoT Cloud.

- IoT identifies the right carrier vehicle for each order
- IoT tracks the movement of shipments using GPS and updates the data into tracking database
Solution Benefits

Benefits of IoT enabled Inventory Management

• End-to-End visibility on inventory
• Real-time updates on inventory count
• Real-time alerts for mismatch between inventory data in ERP and actual inventory in warehouse
• Real-time data received from sensors/beacons ensure that actual inventory levels are measured
• Restocking process becomes more efficient and stock out losses are avoided