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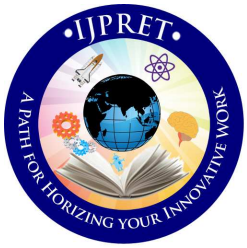

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A PATH FOR HORIZING YOUR INNOVATIVE WORK

RFID BASED WAREHOUSE STRUCTURE DESIGNING USING EMULATOR

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Abstract

It is often hard to predict the future as it tends to occur very differently than what we imagine. There are many predictions today on the impact of RFID on everything from complete supply chain visibility to the creation of context aware networks. The supply chain is a uninterrupted set of resources and processes that starts with the sourcing of raw material and finishes through the delivery of end items to the final customer. This paper basically deals with the RFID designing for the warehouse using the RIFIDI Emulator system. The emulator shown is a complete middleware platform for building all facets of an RFID application. It can take an RFID Idea to a production application.

I. INTRODUCTION

RFID is a technology that tags items with electronic transmitters that contain a unique ID and potentially other information. Readers and antenna can be placed in warehouses, on trucks and in retail stores to report the "sighting" of an item back to a central system. The obvious advantage of RFID is that one knows exactly where your goods are at any given point of time and can develop processes to act on this information accordingly. The observer may have noticed that this can be accomplished with many other tracking technologies such as barcodes or simple word-of mouth communication. [3]. However, if the number of uniquely-identified components grows exponentially, traditional tracking methodologies will soon become expensive and thus unattractive. RFID technologies allow you to capture literally thousands of things in just a few seconds without human intervention. These new-found capabilities lead to both challenges and unparallel benefits.

II. RFID DEVELOPMENT AND ERRORS

Anybody's first reaction in evaluating RFID may be that one really do not want or need all of this extra information. This is a very logically acceptable notion and one that is very important. RFID technologies, while generating an unprecedented amount of data, are only as valuable as the resulting information, knowledge and wisdom that can be created. The mere data is of little to no value. This is exactly the reason why so many companies are struggling with extending their field trials and pilot implementations.

It is easy to plug an antenna and a reader together and to connect both to a PC in order to declare "We are doing RFID!" Yet, it is a completely different matter to deploy hundreds of readers and antennas across multiple locations, intelligently transform RFID data into useful information, and then interact with upstream systems such as ERP or supply chain software. This is the main challenge for companies implementing RFID today and emerging RFID technologies tomorrow.

Core RFID systems, architected in the early 70s to 80s, were not intended to take on huge amount of real-time data. Most of these systems were designed to handle basic data such as the line items on a

purchase order, but not transactions on a unique-item-level.

What can one do about this problem? First and foremost, as with any technology, its usage is mainly determined by the way it is implemented. Quick fixes generally lead to compromise between immediate gratification and long-term benefits. Secondly, we have to ask ourselves if and how our existing information systems will make sense out of the data once we have implemented RFID.

III. Data Management Considerations for Implementing RFID in Supply Chain

(1) Manage Data Volume

As mentioned that RFID technologies will generate a vast amount of data. What is important is that a new paradigm is needed to manage the raw data generated by an RFID network. One option is to implement a Middleware between RFID hardware and enterprise systems. Middleware is a software platforms specifically designed to manage RFID networks and handle the resulting sets of data before they are passed on to interfacing systems. Among many other features, Middleware filters redundant data and only passes information along that is requested or constitutes a change of the situation.[4]

(2) Determine Need for "Local" Intelligence

The easiest, fastest and most secure way of handling the transaction is to store reconciliatory data locally at the point where the transaction takes place. This implies that it is necessary to have local intelligence at the edge of supply chain. It enables intelligent RFID data processing at the point of reconciliation takes the onus away from centralized systems and allows for immediate reactions to unplanned events before these situations become more difficult to resolve and are also more costly to handle.

(3) Define Need for Configuration Flexibility

How many different business process scenarios are to be handled? One should be able to easily configure RFID network for different business scenarios that are specific to an item, a location, and other criteria. Again this is where a middleware layer comes into play. By defining workflow scenarios, one can effectively create as many different process scenarios as needed. This functionality also enables to

treat individual suppliers and customers differently.

(4) What Else Do You Need? Data Attributes!

In addition to item-level IDs there is a package of other data that will be needed to carry along. One may need to know when an item was read for the first and the last time and also need to know which reader and antenna processed the read. This is equally important when anybody is assessing inventory and would like to conclude based on the antenna location.

(5) How do you Manage Historical Data

If just one of the customers relies on RFID and inquires about a specific item by unique ID, then system has to be able to pull the information by that ID rather than PO or invoice number. Equally important are cases where products recall or returns management. The integration towards enterprise systems is not an easy task and requires extensive data synchronization. New data formats from evolving standards make this thing even more difficult. One needs the ability to pull up a record based on a unique ID and be able to share this information with trading partners.

(6) Assess Need for Reverse Read Loops

Reverse read loops are phenomenon occurs most of the time. In normal working conditions, the process comes to a halt when something goes wrong and an operator determines what to do next on a case-by-case basis. With Auto-ID in place, the system itself will handle some or all of the decision-making based on built-in business intelligence. However, exceptional conditions have to be built into the system for efficient working, for example handling of missing items, damaged items or discrepancies between documents.

Earlier application includes the integration of 802.11 wireless devices into the RFID network so that an operator can follow the process from anywhere in a facility. For process designers this means that they can build reverse read loops into the workflow right away. A second and equally important feature is that of notifications and alerts. Once someone encounter exceptional condition that is to be sent such as immediate alerts automatically as opposed to an operator taking the initiative. These alerts will be sent to everyone who needs to know about the occurrence of exceptional

conditions, messages, alerts and notifications, need to be directed to the correct person at the correct time and in the correct place. In essence, Middleware can easily give the ability to generate actionable alerts and notifications.

(7) How To Enable Collaborative Processes

Lastly one needs to consider the impact of RFID on enhancing information sharing capabilities. With RFID data, for example, one can collect and use data on performance basis such as on-time deliveries or in-transit time by case/item. These can be shared among supply chain partners to enable everyone to improve their efficiency. In addition, the sharing of uniquely tagged case/item inventory data as well as triggering alerts and messages directly to business partners will make the whole process faster and more efficient. For suppliers this means that they could receive immediate notifications when their own products are in low supply and need replenishment, identify theft situations and prevent counterfeit products from flowing into your supply chain.

IV. LAYER

Fig.1 shows the three conceptual architectural layers that data passes on its journey from sensors to whatever endpoint the user chooses.

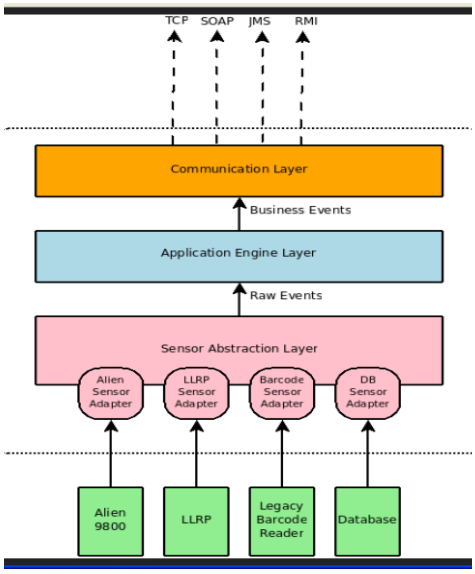

FIG.1 DATAFLOW THROUGH THE THREE ARCHITECTURAL LAYERS

1. Sensor Abstraction Layer:

The purpose of the edge server is to connect to various kind of sensors (e.g. RFID readers, Barcode readers, Mobile Devices) and gather information from them. In many applications, this consists of connecting to a Gen2 fixed reader and collecting EPC information. However, the edge server is designed in such a way that the edge server

collects many kind of data (active, passive, etc) from different devices. This layer allows users to connect to devices in a sensor-agnostic way to collect required data for the application.

2. Application Engine Layer:

For numbers of applications it is not sensible to save every event that the sensors produce. Many sensors can send 1,000 of events in a second, out of which large number might be duplicates. In many applications events that are one-level higher are more essential than the raw events produced by sensors. For examples, an ERP system is probably interested in the event of a box arriving in area 1, and it is not desirable for the ERP system to do the work of filtering and processing all of duplicate reads produced by the sensor.

Complex Event Processing (CEP) is a example of viewing data as an event stream and identifying meaningful events from the stream using rules.

One of the most important aspects of CEP is to incorporate temporal knowledge into the queries. This allows to phrase queries like "Send an order complete event when an item A event is followed by an item B event" or "send an order cancelled event when an item B event is not seen within 5 min of a item A event."

3. Communication Layer:

Once data has been processed, it needs to be handed up to some kind of application-dependent system. For example, some users might want the data to be stored, others might want it to be pushed into an ERP system. The edge server has several inbuilt connectors to use, namely JMS and Web Services. However, as this is application based, it is possible to write your own connector (such as a TCP/IP socket connection) if the application needs it.

In addition, the edge server also provides built-in web container and MVC framework so that web applications can be deployed directly. [1]

V. System Implementation

The core of RFID Toolkit is an Emulation engine that can simulate an RFID reader down to its communication protocol and its tag reads. This enables the ability to create scenarios and simulate the type of RFID data that is usually only reserved for large scale real life RFID implementation. Toolkit

is built on this emulation engine and provides three distinct products that work together to help perform complete RFID prototyping. [2]

1. Emulator:

It allows the ability to emulate readers and tag reads and provide fine grain access to the hardware. It also incorporates a scripting engine to create quick scenarios for tag creation and tag reads. Fig.2 shows the tags and antennas selected and their properties in the working environment. The selected tags can be dragged and placed in the read range of antennas. As it shows the reader named "Kashish" has two antennas while antenna1 has two tags .The properties of Kashish reader are shown in reader window at the top.

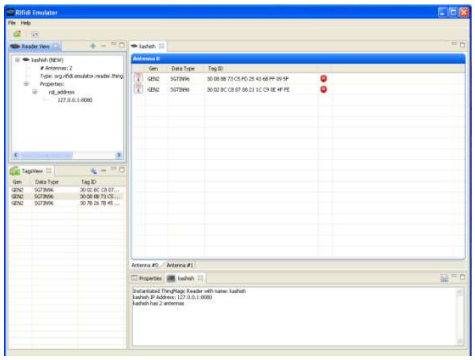

Fig.2 EMULATOR WORKBENCH

2. Designer:

Designer is a usual behavioral presentation tool built on top of the emulation engine to build custom 3D scenarios that can be used for impact presentations and beneficial to built up the real time system.

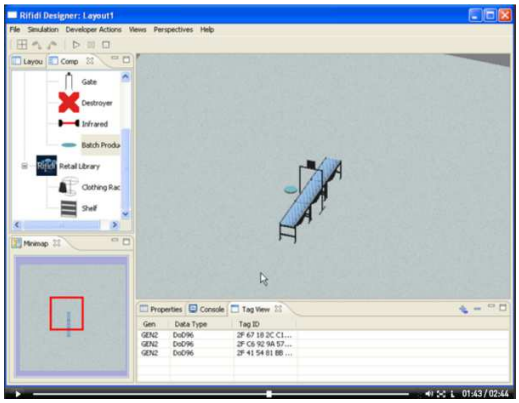

FIG.3 RFID DESIGNER 3D SCENERIO

3. Tag Streamer:

It is a load testing tool that allows to generate large numbers of imaginary readers and tags to test RFID system.

VI. RFID FULL DEPLOYMENT

Once the designing of RFID system is achieved successfully under a variety of conditions, it will be the time to transition from emulator phase to full deployment. Here, in this phase, the RFID system is implemented inside the organization. The studies made from the previous phases should be heavily leveraged. Implementation once achieved should be verified with the vendor to ensure help,

especially when the system is utilized for new facilities or applications. As technology is evolving and protocols will Change, one has to choose a vendor that offers up gradable firmware and scalable solutions It is for sure that success with the software simulation using emulator and designer doesn't guarantee success with the rest of the rollout. Enterprises usually face a whole different set of problems at each warehouse. Lack of leadership and strong execution skills can lead to a slow working, limited benefits and adding uncertainty thought the chain.

Also a successful deployment doesn't indicate the end of the project. RFID programs should be evaluated after the implementation .Based on this evaluation, strategy and requirements may be needed to be refined and thus the cycle begins again. This helps in pin pointing which process is working well while which needs the improvement. Thus the resulting output is feed backed to the internal system for the further use in process improvement.[7]

VII. CHALLENGES

The challenges of physical RFID deployments beyond compliance are vast and of great value. The cost of managing physical network is a large part of total cost of ownership. Think about it! Using a highly sensitive and fragile technology itself poses a whole new set of challenges. Examples are that one has to constantly monitor readers and antennas, ensure readers are performing and networks are up.

In essence, it is not very different from managing a 1940s computer. As we progress into the real scenario of RFID, we will see many more applications for the technology that we can anticipate today. All of these will require more highly developed device and network management.[3]

VIII. CONCLUSION

Through this paper I tried to demonstrate that the main benefit of RFID technology is in information sharing. It is not just using tags or having the right readers rather it comes from the ability of partners to share information.

RFID technologies have already begun to revolutionize, objects tomorrow will be smarter than objects are today, with an edge layer in place, process networks will be configurable in minutes rather than hours, and new and innovative ways of

doing business will emerge as organizations better understand RFID technologies. At the end of the day, we as consumers and users will reap the benefits through extreme convenience and freedom from routine, time consuming tasks.

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