RFID based Cloud Supply Chain Management

B.Andal Supriya, Ilango Djearamane

Abstract— Radio Frequency Identification (RFID) is a key enabler for our proposed Cloud based supply chain management service. The problem area introduced here is to experiment and figure out the less expensive passive RFID in the global supply chain process using the latest cloud based software infrastructure. This paper embraces briefly the underlying principle of RFID, introduction about supply chain management process and our proposed solution RFID based cloud based SCM services. The purpose of this wok is to provide clarity on how RFID can be used in supply chain management with modern cloud based platforms by reducing cost overhead to the business. The primary target audiences are actors in the manufacturing, logistics, warehouse and retail industries who are interested in finding cost effective solution for managing their supply chain inventory management system.

Index Terms— Cloud Computing, EPC, Inventory, Logistics, Manufacturing, RFID, Retail, SCM, Supply Chain Management, Tracking, Warehouse Management.

1 INTRODUCTION

THE purpose of this paper is to review key points about the radio frequency identification (RFID) ,the fundamental concepts of cloud hosted supply chain management (SCM) and to related them with our proposed RFID based Cloud Supply Chain Management Service. RFID is an emerging technology, which has gained increased attention from academia and practitioner's. This technology enables an automatic acquisition of data about an object without necessitating a straight line of sight of transponders and readers. RFID technology provides the visibility and traceability with a high potential to streamline the cloud based supply chain thereby improving efficiency and effectiveness during the entire inventory management and supply chain management process.

Most of the organization started implementing RFID, while at the same time they require the suppliers to adapt to this RFID tags with the standards like EPC standards in storing the products specific data to seamlessly integrate with their entire supply chain management systems.

Successful RFID applications in logistics and supply chain management bring benefits such as rationalization of inventory management by having the data in a centralized CLOUD based repository. Corporate executives use RFID and Cloud as a technological means to achieve cost savings, efficiency gains and unprecedented visibility in supply chain [1].

2 BACKGROUND

2.1 Basics of RFID based Cloud SCM

RFID based system is an emerging technology in the identification field. This technique offers the ability to store the identifier in tag and the other relevant data about the products in cloud based database with IDENTIFIERS as a KEY. This RFID system enables the possibilities for detection, identification and tracking of items and persons with the centralized database [2] in any locations across the world. RFID system integrates with the cloud based centralized data management system to deliver the global identification and tracking of any items or goods across the global supply chain management lifecycle. This article enumerates the detail study of each and every components of RFID based cloud SCM system.

2.1 Basics of Cloud Computing

Cloud computing is an emerging technologies and trend in the IT infrastructure management system with the used of computing resources (hardware and software) that are delivered as a service over a network typically the internet.

Cloud has 3 basic components. They are Infrastructure as a Service (IAAS), Software as a Service (SAAS) and Platform as a Service (PAAS). Traditionally any corporate or companies interested in developing and maintaining their own software and systems by investing millions of dollars to do their day to day business operations. But with adapting to the current cloud based solutions, the organizations improved the operation cost of their IT spend by 50% when compared to their traditional IT model. With the introduction of CLOUD based solutions, the customer has the power to chose their best solution providers, can subscribes for their required services only and pay for what they use the solution providers infrastructures.

For example, in traditional IT solutions the customer were asked to buy servers, operating systems like windows/Linux, software product like SCM, CRM, MIS, ERP and other software and install in their own hardware ends up by spending lots of their budgets in procuring new hardware, maintaining and enhancing their existing software, human resources etc. But with the modern cloud based solution, the customer has to just subscribe to their required software services without procuring or managing their own hardware, software and manpower. The customer has the power to choose and use what they want to use. The rest of the resource management and maintenance cost will be borne by the service providers.

2.1 Basics of Supply Chain Management

Although SCM is a popular term both in theory and in practice, there is some confusion about its wider significance. Some see SCM as a directly applicable method to streamline the material flow; some see it as a flow philosophy and as an industrial process. The globalization that has occurred in the world in recent decades has led to intense com-

petition among suppliers which has increased the need for close relationships between supplier-customer, thereby providing an opportunity for the customer to set higher demands on their suppliers [4]. To deliver the right product at the right place at the right time and in the right condition is no longer a market advantage, but a must for the company to be competitive [5]. SCM is one of the tools to achieve this objective.

3 RADIO FREQUENCY IDENTIFIER (RFID) SYSTEM

An RFID system consists of either two or three components, depending on who defines the system. A system consisting of two components includes a transponder and a reader and in a third component of the system also includes software which processes the information in (*Figure 1).*The reader consists of a transmitter and a radio receiver, a control and a connection to a database. The reader can be read or type of read / write type except that a reader of the read / write type not only can read information but also overwrite information. The transponder, also called *tag*, in turn, consists of an antenna, a microchip, and any type of casing. System operates by the reader emits a radio wave. If a tag is in the field of radio wave, the antenna in the tag absorbs this energy. The tag then uses this energy and sends its identity (EPC code) with a new radio wave. This is captured by the reader, which is transferred into a readable format and updates the data into the cloud database through the internet. Different RFID systems operate at different frequencies [3].

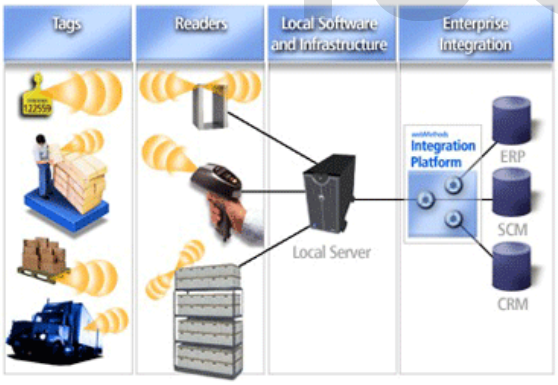

Figure 1. RFID with SCM in Cloud

4 RFID IN SUPPLY CHAIN MANAGEMENT (SCM)

The supply chain starts with a material in the form of raw materials which ends up with the chain enhanced material discarded or recycled. (Figure 2) illustrates a supply chain for material and information flow in the RFID based manufacturing, logistic and retail industry in line with EPC Information Services. The foundation of Supply chain management (SCM) is to focus on the entire supply chain rather than just concentrating on individual chain actors. SCM should disregard the boundaries between companies in favor of a holistic approach with great transparency. The supply chain should be seen as an entity, not its constituent parties. The concept of SCM is characterized in three points:

1. Ensure the supply chain as a whole and control inventory flows through the pipeline.
2. Have a strategy to synchronize and combine internal and external systems to a choral mass.
3. Have a customer focus that leads to increased customer value.

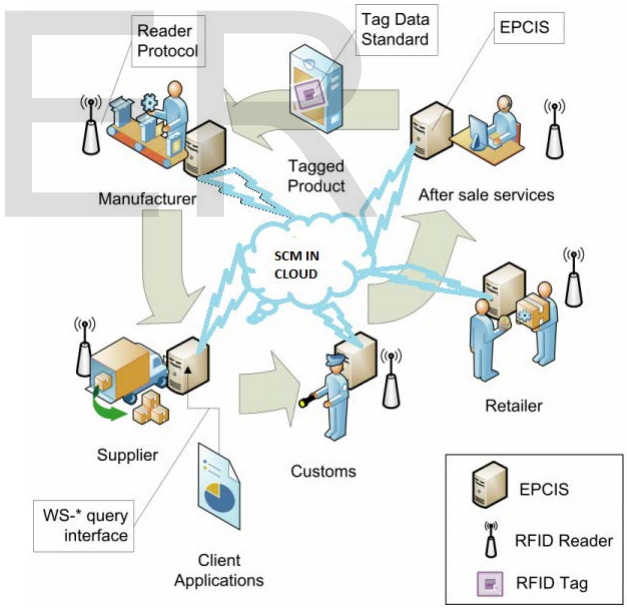

Figure 2. Suppy Chain Management

5 PROPOSED SOLUTION

The problem area under our perusal is to provide an effective and efficient solution to the current global supply chain management challenges where there goods manufactures in one end of the world, shipped across the globe and sell them in other parts of the globe. To achieve this many stakeholders uses different infrastructures by investing huge budgets.

Our proposed solution provides the best integration mechanism for the entire supply chain management by cost

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effective solutions. As part of the solution, we are introducing the RFID as a primary component involved in storing the product data, tracking the product across the supply chain, inventory control, warehouse managements, Retail store management, delivery and billing in Point of sale terminal. Let us discuss each of the process in details in the upcoming area (Figure2).

The product manufacturer fabricates the product and infuses the appropriate Electronic Product Code (EPC) into the tag attached to the products. The EPC code and with the details of the products has to be uploaded into the centralized global database which has been hosted in CLOUD infrastructure with the EPC code as a KEY for the product. This product information can accessed to Manufacturer, Logistics agents, Warehouse operators and the retail merchants through internet from CLOUD database.

This unique EPC stored in RFID tag is the catalyst for the logistics agents to track the products across the global while the products are in transit.

Once the products\containers reaches the warehouse, the warehouse uses the EPC tag to manage and bi furcated the products to deliver it to the specific retails mechanize.

In Retail store, the RFID EPC will be used to expedite the shelf management process as well the quick check-out and billing process.

With the introduction of CLOUD based infrastructure in our solution, it reduces the IT spending by eliminate the redundant software and hardware which has been maintained and managed by different trading partners across the supply chain by making into a single and centralized Hardware (IAAS) and Software (SAAS) (Figure 3).

This solution avoids the customer to purchase, maintain and train IT staff on expensive hardware and proprietary software. Cloud computing implementation in SCM enhances the instance data flow across the entire value chain thereby increasing the profits by cutting the cost on unnecessary IT spending.

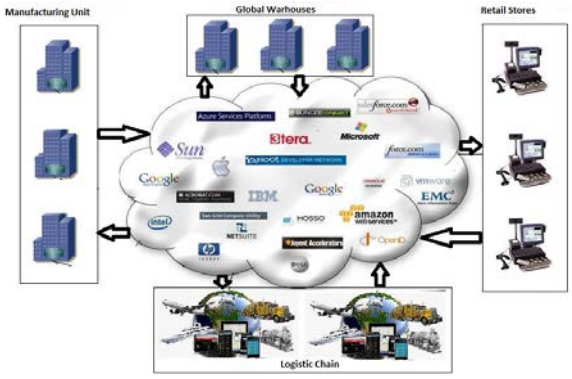

Figure 3. Cloud Based Supply Chain System

4 Conclusion

This proposed Cloud computing architecture provides a unique direction for the RFID based supply chain Management. Our proposed cutting edge technologies addresses the customers pain points, allow them to optimize the IT cost and access the information from any where across the world by providing double fold advantages. Our analysis also illustrates that RFID/EPC Network applications will form an excellent platform for cloud based SCM solution.

There are many other applications in line with this article are as below

1. Asset tracking
2. Inventory Management
3. Health Care Services
4. Library Management
5. Attendance tracking services and many more

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