Minimizing Cost using Cloud Computing with RFID Based Supply Chain Management

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ABSTRACT

Cost sharing of the technology at the item-level RFID has become an important issue. According to different qualitative studies conflict arises in decentralized supply chains, as the profit and costs resulting from item-level RFID are not symmetrically disseminated among supply chain associates. This paper aims at providing transparency in RFID and preamble of cloud based services technique used in supply chain management by minimizing cost in the business. The prevailing application covers stock administration logistics and shipping, assembly and developed, asset tracking etc. A number of sectors like healthcare, fabric, automotive and luxuriousness goods industries have more scope to reap benefits from the various RFID based cloud based applications.

Keywords: RFID, Cloud computing, EPC, Inventory, Logistics, Manufacturing

1. INTRODUCTION

Radio Frequency Identification (RFID hereafter) works for collecting and identifying data that combines both radio and microchip technologies to locate objects. It is a technology that identifies the data automatically. It consists of Reader, Tag and a Middleware. A Tag is connected with an antenna while a reader emits radio signals and receives answers from tag in return. A middleware bridges RFID hardware. The chip memory contains an Electronic Product Code (EPC) which identifies each product in a unique way. The objective of the paper is to provide the reader a brief introduction to cloud-based services and radio-frequency identification (RFID) and how the combination of these can be used in providing a cost-effective supply chain management (SCM). Cloud service offerings are of three types: Infrastructure as a Service (IAAS), Software as a Service (SAAS) and Platform as a Service (PAAS). Adoption of cloud based services reduces the operational costs of a company by almost 50% [1], when compared to the costs incurred in traditional IT model. The subsequent sections deal with the basic concepts of a supply chain management, RFID System, RFID in SCM, Electronic product code (EPC), Cloud Computing, Cloud based RFID technique. The core idea is to use cloud based RFID in supply chain management as a technique to achieve a cost-effective system.

RFID helps the manufacturers to acquire the information about the object without a direct link with transponders and readers [2]. When RFID is applied successfully in logistics, it pools the data to be centralized in CLOUD repository [1]. Both RFID and Cloud are used as a technique to save cost while bringing efficiency and transparency in supply chain system [3].

2. SUPPLY CHAIN MANAGEMENT

Supply chain management (SCM) is interpreted as the management and control of all materials and information in the logistics process. It begins with the acquisition of raw materials ends with the delivery to the end user. The focus is to improve product quality, product time compression and costs and lead-times

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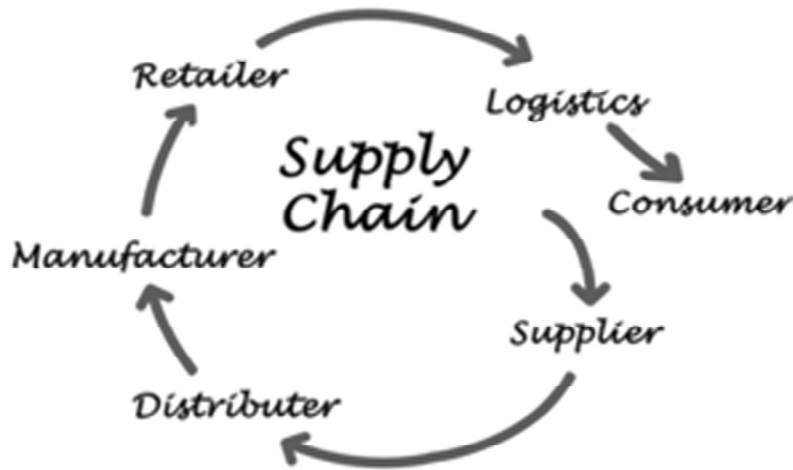
Figure 1: Supply Chain Management [12]

reduction. These goals can only be realized through well-planned supply policy which is termed as supply chain policy (SCP) or SCM. Supply chain manifests a system of organization that involves people, information and resources. It includes a process that moves a product from supplier to customer (figure 1). SCM is perceived as a technique to streamline the material flow. It is also seen it as an industrial process [1]. With the onset of globalization, there is a stiff competition among the suppliers to establish close relationship with the customers. [5]. Supply Chain management is considered indispensable for a competitive market as it helps in delivering particular goods in perfect time and manner at the appointed place where it is to be reached.

3. RFID

As a wireless expertise RFID uses broadcasting signals to identify tagged items mechanically [2]. Information gained through RFID can be used to improve inventory control policies. It provides instantaneous tracking information of goods as well as refill orders in the supply chain system. Product process information can be used to improve inventory replenishment decisions. RFID contains two or three components. The two
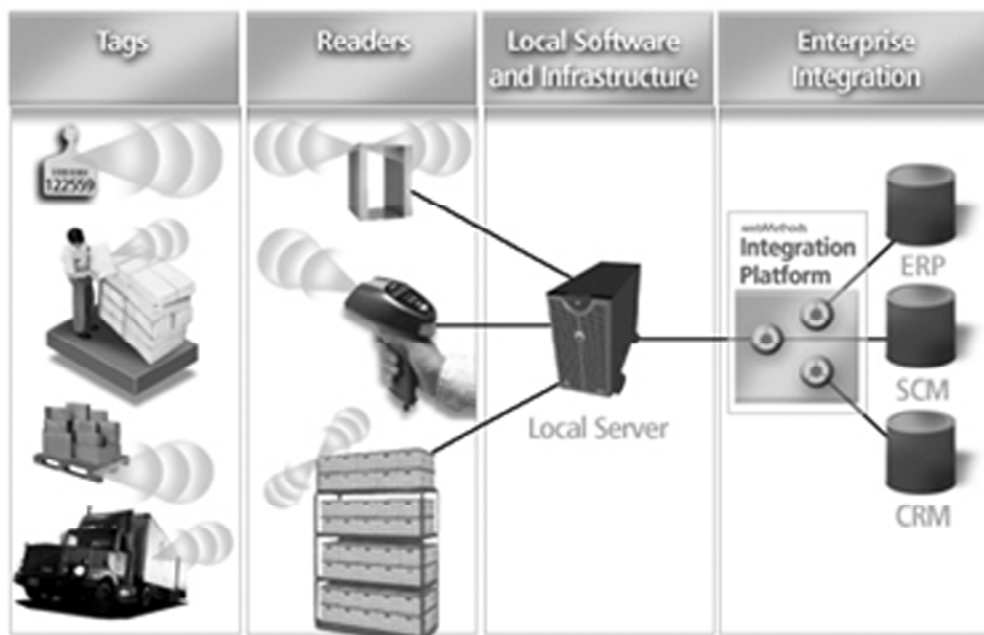

Figure 2: RFID with SCM in Cloud [11]

components system includes reader and transponder while the three components system covers reader, transponder and software (figure-2). A tag is connected with the Transponder that includes microchip, antenna and casing. When the tag is placed in the sphere of broadcasting wave, the Reader emits radio waves. It is converted into the comprehensible format and then record in the cloud is updated. Different RFID systems are operated at different frequencies [4].

4.   RFID IN SUPPLY CHAIN MANAGEMENT (SCM)

One can find RFID technology in the entire area of the supply chain. The multifaceted applications of RFID hold areas of trade, stock and logistics and industrialized sectors. It also covers authentication, counterfeit protection and security and configuration management. The tags of RFID are useful at different levels such as Pallet-level tagging, case level tagging and item-level tagging. In Pallet-level tagging, RFID tags are placed on individual pallets .It is used in logistics, full-pallet storage space and carrying applications. In the container level tagging, RFID tags are attached to cases to help mixed-pallet loads. The article-level tagging talks about the unit manufactured article that has its individual RFID tag and provides the tracking facility in detail. It is primarily designed to help retail operations. To view the recent RFID applications in supply chains,[7]. Figure 3 that reflects how a supply chain system helps in channelizing material as well as the information in sectors like manufacturing, retail and logistic as per EPC. The highlights of supply chain management are as follows:

- To control inventory flows through the pipeline.

- To combine both internal and external systems as a choral mass.

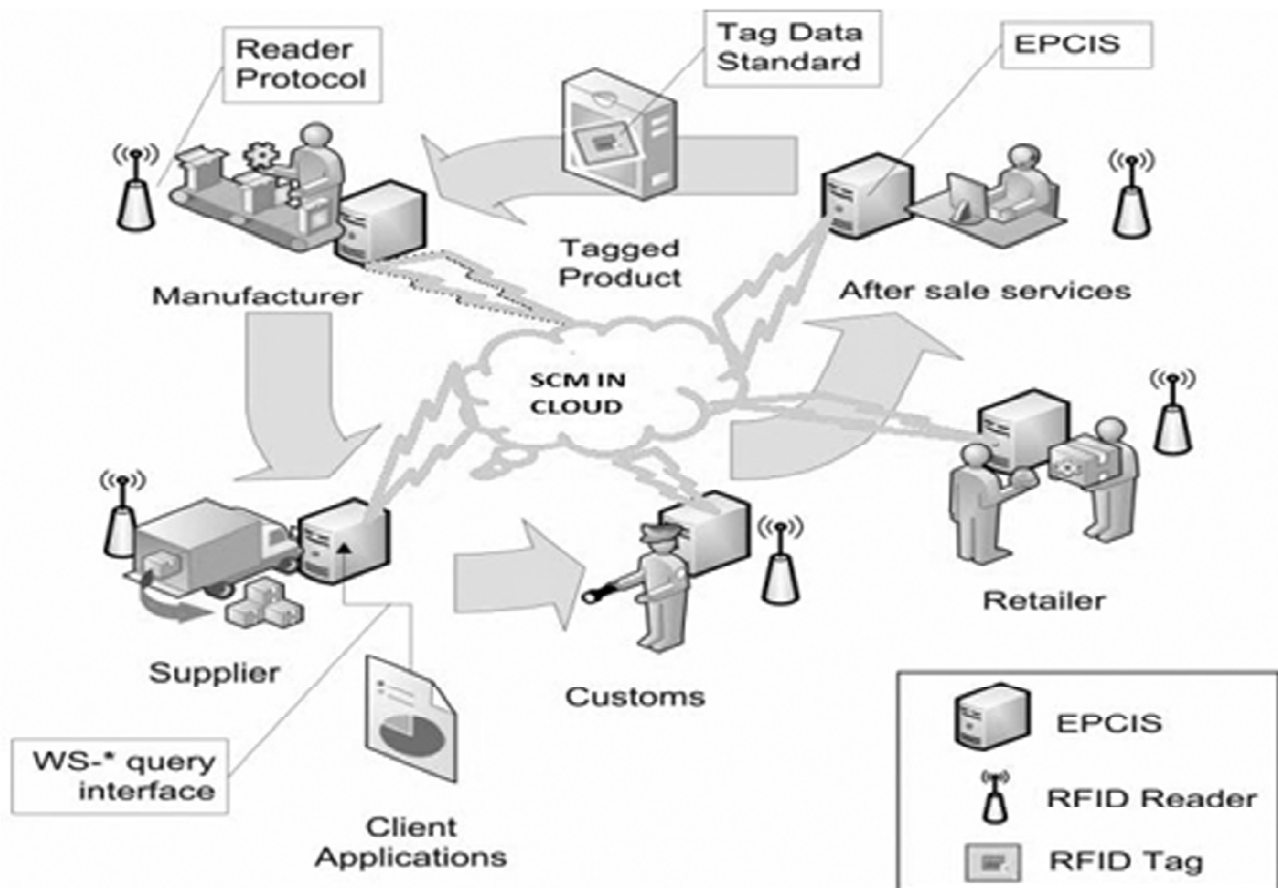- To increase the value of the customer.

Figure 3: Architecture of supply chain management [1]

5. ELECTRONIC PRODUCT CODE

The Electronic Product Code (EPC) works as an identifier. It is reflected in the tag. Its function is to bring out more information relating to the tagged item from a database. It acts as an alternative to Universal Product Code number that refers to a class of products. EPC is related to a specific instance of product. The EPC serial code referred in the tag is communicated back to the reader when an EPC tag is tracked by RFID reader. The Object Naming Service helps in identifying the goods through internet. The function of EPC Information Services (EPCIS) is to give available information via EPC global Network. The real time data exchanged in EPC global Network facilitates in monitoring the products. EPC tracks a tagged product with the help of a serial number embedded in it. The EPCs placed in the personal domain of a person are known as one's own "EPC cloud". This EPC cloud is empowered with tracking activities related to thefts within the supply chain system [8].

6. CLOUD COMPUTING

Cloud computing refers to a standardized Information technology that provides service like software application through Internet. Cloud consists of three parts namely, Infrastructure as a Service, Software as
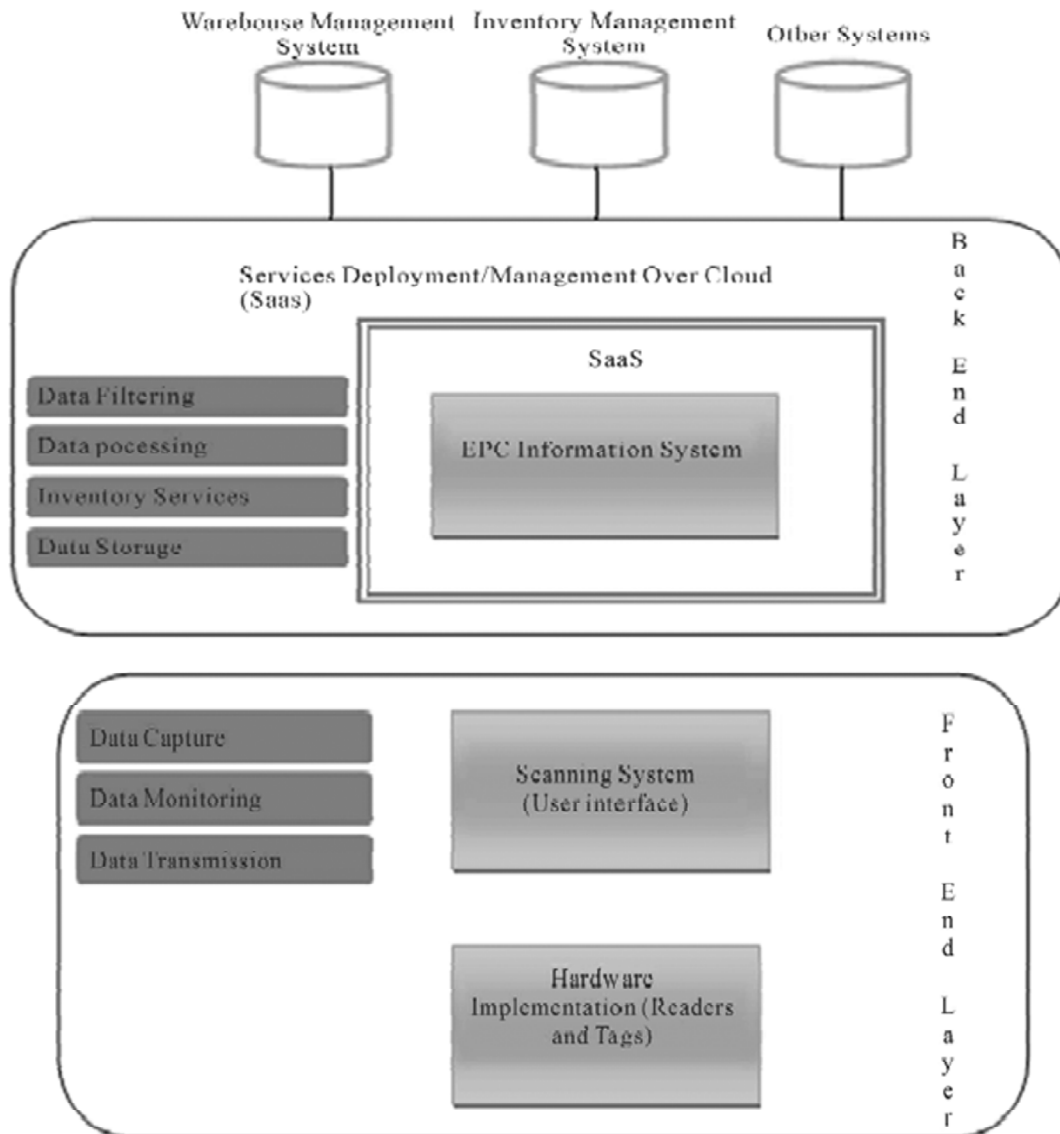

Figure 4: Cloud-based architecture.[10]

a service and Platform as a service. Companies spend a lot to develop their own software system. The adoption of a IT model based on CLOUD minimizes the cost of IT up to 50%. [1].

In conventional IT solutions for example, the customer opts for buying both operating systems and servers as well.. It makes the concerned customer to spend a lot to install one's own hardware and also for its maintenance. In contrast, the modern cloud solution gives the option to subscribe the required software services only. There is no need of buying own hardware and software and managing the human capital. The customer has the option to select and use according to one's own requirement.

7. RFID BASED CLOUD SCM

RFID based system helps to protect the identifier and other particulars about the goods in cloud. It simplifies the process of tracking the items worldwide by developing a centralized data-base [9]. This article makes a detailed study about the components of Supply Chain CLOUD based RFID system.

8. THE WAY OUT:

The problem area offers a pertinent solution to the current supply chain management across the globe. While the stakeholders use various expensive infrastructures to address the issue the new mechanism offers the better option with minimum cost for the supply chain management. The RFID system can serve as basic element to preserve data related to a particular product by tracking the concerned product in supply chain system The Process makes the Product manufacturers to enter an appropriate Electronic Product Code tag and upload in federal worldwide database which is stored at cloud. Here, EPC code acts as a input
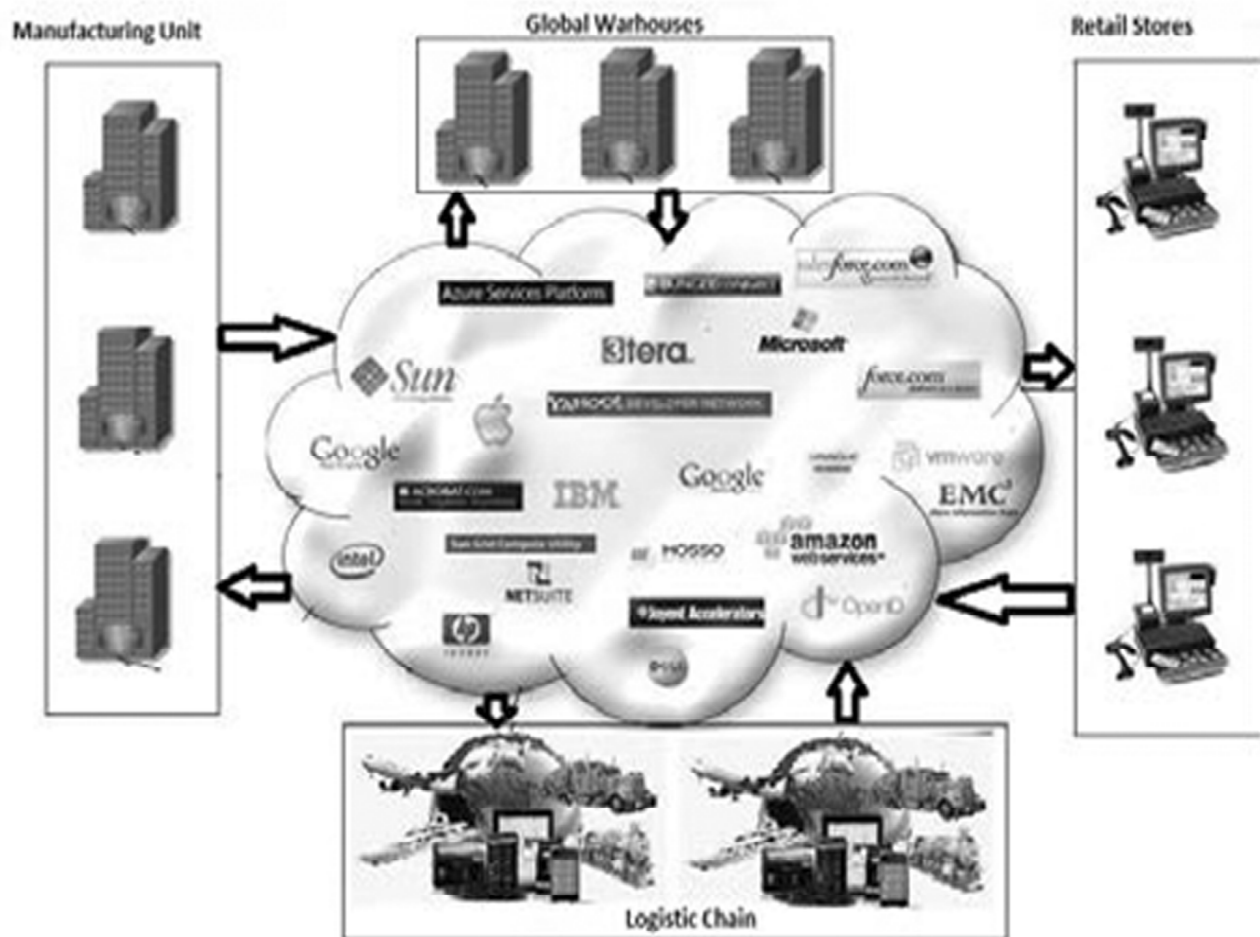

Figure 5: supply chain over cloud [1]

for the product. This information can be accessed by the customers. The logistic one can keep the track of the products with EPC tag when the product is in transit. CLOUD based infrastructure helps in reducing the IT expenditure as it rules out the purchase of unnecessary software and hardware. It converts it into a centralized Hardware and Software .While the EPC is connected with managing the goods on shelf and billing in retail specter, in warehouse, the goods are classified to be handed over to the traders.

9. CONCLUSION

The proposed Cloud computing architecture allows customers to access the information from anywhere across the world with minimum cost. The RFID/EPC Network applications will be a cost-effective mechanism for cloud based SCM solution.

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[12]   http://www.businessnewsdaily.com/4804-supply-chain-management.html