

Integration in RFID

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INTRODUCTION

The vision is to offer the end user, more information in less time

Mandated use of Radio Frequency for automatic Identification (RFID) of goods at the pallet, case and item level continues to churn the Consumer Product Goods (CPG), Logistics and Retail industry. The statement “Internet of things” is slowly becoming true; with concerted efforts from standard setting bodies such as EPC Global, ISO, FMCG consumer goods companies like Gillette, P&G and major retailers like Wal-Mart, TESCO, and the US DoD, to replace barcodes with RFID tags.

Barcodes are factual with the existing automatic identification systems. At the same time, RFID promises a smooth and accurate capture of data and organizations are looking forward to relieve the existing bottlenecks with systems which enable end-to-end tracking and monitoring of goods.

The early acceptance of RFID realizes the need for a good “integration fabric” that can seamlessly allow data to flow from the devices (tags) through the readers to the RFID middleware systems, and be utilized by the existing or new applications to trigger meaningful transactions. The vision is to combine the best of each into a smooth, tightly knit system, offering the end-user more information in less time.

Integration of systems and technologies will lead to realizing the dream of “Internet of all things”

The Integration landscape that will evolve needs to address issues such as device integration, data integration, presentation and management, ERP, Warehouse Management Systems integration, work flow integration (with partner systems) and concerns for security and privacy. The IT industry comes into the picture while making data available through the artifacts on integration – in turn providing data for better decisions and driving towards quantifiable benefits of the investments.

This white paper focuses on the Integration landscape that is emerging because of the RFID and EPC network adoption and gives an insight into the importance of integration technologies in realizing the dream of “Internet of all things”.

KEY DRIVERS OF INTEGRATION

CRITICALITY OF INTEGRATION VIS-À-VIS COMPLEXITY OF THE BUSINESS

As of date, the EPC based implementations are in the “proof of concept” phase or are being “field tested”, in almost every vertical that is striving to make use of RFID. However, as adopting organizations move forward on the road to automatic identification using RFID, the focus will shift to maximizing the benefits from the investments and re-using wherever possible the existing applications whilst migrating to the modern enterprise infrastructure.

Processes get complicated as the business grows. This soars the criticality of Integration

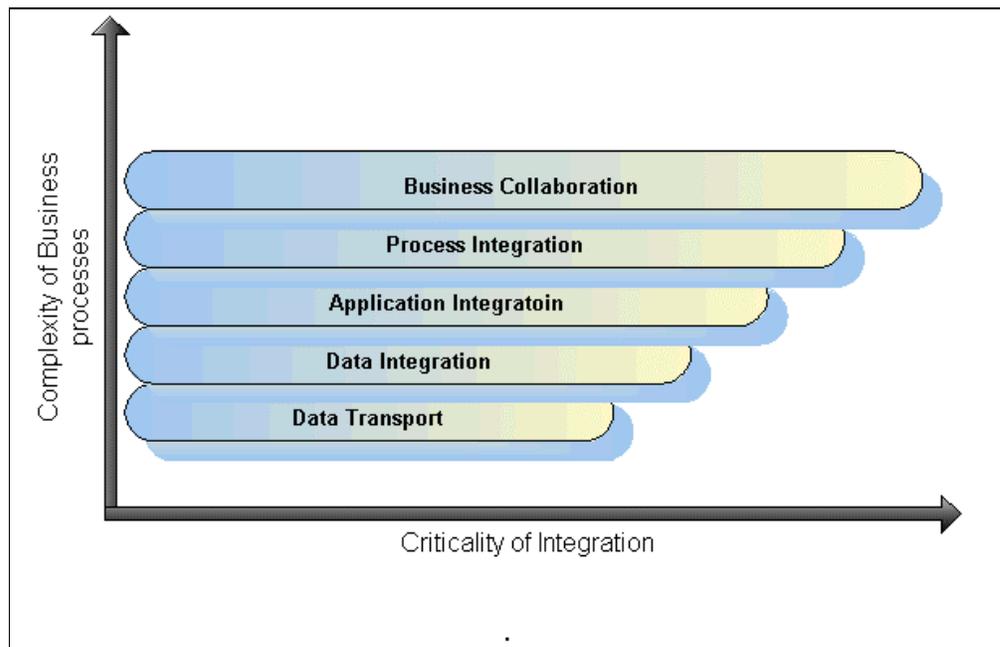


Figure 1: Integration Importance

To realize the dream of having every item identified on the lines of an “Internet id”, it would mean having similar infrastructure in place as in the case of the Internet and Web. This brings in the need to have mechanisms that can seamlessly integrate the data captured at various levels in the chain, with the backend applications, decision support systems and management dashboards. As the EPC/RFID technology becomes ubiquitous and the implementations mature, more and more demands will be made on the integration landscape leading to an increased complexity of business processes. The Figure 1 above depicts the importance of Integration in an organization against the complexity of the business.

EPC NETWORK INFRASTRUCTURE AND ITS IMPACT ON THE INTRA-ENTERPRISE APPLICATIONS

The “Internet of things” not only includes retail and commercial products, but also physical assemblies, components and systems. The code contains reference to networked information.

EPC connects the physical and virtual world with the help of Object Name Service (ONS) and the Physical Markup Language (PML). This connectivity is possible only when the Integration at various levels in the EPC network takes place. Figure 2 depicts an EPC implementation within an enterprise. Any EPC deployment will need to address device integration, data integration, application integration and process level integration with the EPC network infrastructure.

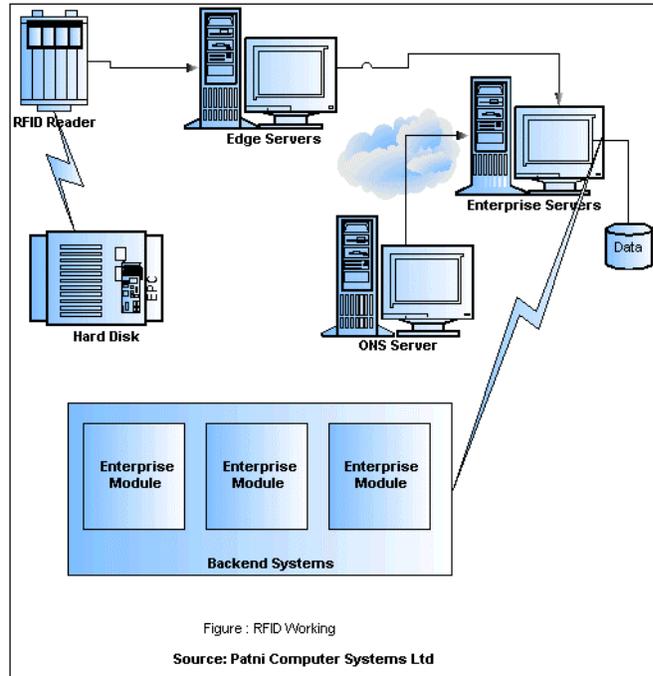


Figure 2: EPC Implementation within an Enterprise

CO-EXISTENCE WITH OLDER AND/OR DIFFERENT AUTO-IDENTIFICATION TECHNOLOGIES

With existing barcode systems, organizations would identify the need to use barcodes as well as RFID - for automatic identification as many of its downstream users might not have RF-enabled solutions in place. Follows the fact that RF-enabled solutions need to be completely tested before the existing solutions are replaced. This requires integration between multiple devices and data capture technologies

Apart from this, multiple data capture technologies, diverse host processing systems and corresponding backend applications would need to feed into various business processes to create meaningful decision support systems that the RFID technology promises to deliver. The Middleware framework for RFID addresses the device aggregation and data filtering aspects. However, the accuracy and interoperability is possible only with the help of the right infrastructure.

COLLABORATIVE AUTOMATION – INTER-ENTERPRISE INTEGRATION

An ideal scenario, as depicted in Figure 3, comprises Integration between organizations' EPC systems. Information sharing, data security, inter-organization messaging and communications are the key requirements besides having evolved collaborative business processes in place. Service oriented architectures may be the answer to this need. The integration landscape would be complete if it addresses concerns about privacy, as this will play an important role in the adoption process.

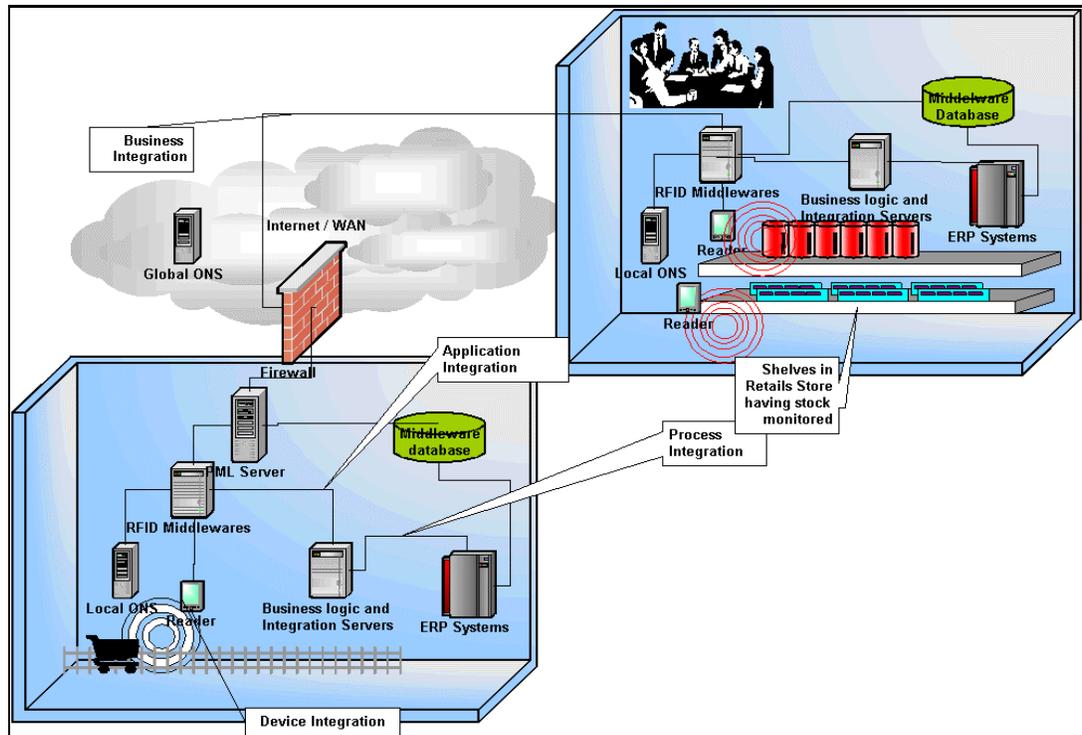


Figure 3: Inter Enterprise EPC Network

INTEGRATION LAYERS

The success of RFID will depend a lot on the rollout plan of the organization. The ideal way to do the same would be to divide the processes and technologies into various layers to make the impact of adoption minimal. We further take a look at these layers that make the integration complete.

DEVICE INTEGRATION

As organizations proceed to adapt themselves to the RFID technology, the RF-enabled readers have to integrate with the existing auto-id technologies for capturing the data. This drives the need for integration at the device level that comprises devices-device integration, device-computer integration and data capturing technologies.

APPLICATION INTEGRATION

Application Integration is a part of the evolution of application delivery that includes improved software componentization and the increasing acquisitions of packaged software. In its simplest form, application integration is the encapsulation of an existing application by a software component that acts as a functional interface to that application. The creation of an interface allows the other applications in the portfolio to interoperate with the wrapped application, increasing its value and long term usability.

The existing applications, now, in RF-enabled environment need to communicate in the EPC compatible language. The data that is gathered at the middleware, is converted to the application compatible format and sent across to the legacy / enterprise applications for further processing.

PROCESS INTEGRATION

Process integration tools provide a level of abstraction by letting users define integration requirements through workflow and business process models. This capability shields business analysts from the complexity of underlying middleware. Using process modeling, business analysts focus on optimizing processes and easily change or implement new processes with minimal amount of coding. The models map the flow of business processes and business rules across applications and people. When business processes change, the changes are made at the model level and even the on-going processes are updated.

After the application level integration, the organizations move onto process integration to combine and automate the processes, thus optimizing the data flow. The drivers for process integration in RF-enabled systems are:

- Existence of third-party process modeling tools
- Workflow modeling
- Process simulation
- Process-based task monitoring and management
- The need for runtime changes in processes.

The ultimate goal is to automate the processes and make the inter-business communication easier

BUSINESS INTEGRATION

The completely automated systems fall in place when the organizations inter-operate on business transactions. This is possible by reducing the cost of data ownership and reusing the information between vendors. Physical Mark up Language (PML) plays a key role by enabling the business partners to access the information about the object that is being read in RFID.

Business Integration depicts end-to-end business process flow across business units. It ensures the management and reliability of processes on the path. Organizations, with the help of business integration, are able to bridge the application environments across composite applications, creating a networked world.

PRESENTATION AND MANAGEMENT

While RFID automates the data capture and many of the business processes, the simultaneous requirement is to monitor and manage the data that flows from one process to another. This layer will help monitoring and managing the data and view the state of the system at each level. It also can help in generating various reports and analyze the information at various stages in the entire value chain. The Graphical User Interface, if provided, can also help in managing the information and providing a manual means of manipulating the information, when required.

INTEGRATION CHALLENGES

RFID also invites a lot of challenges for early adapters

The adoption of RFID, along with an ease of management invites a series of challenges for early adopters. The challenges start right from integrating the readers for identifying the data, to monitoring the data in the ERP and SCM systems, to later manage this data. The most likely areas where challenges can be foreseen are:

INCOMPLETE PACKAGES AND INFLEXIBLE SOLUTIONS

Organizations having partial packages - supporting functionality in chunks are likely to face a challenging stint with RFID. This is because of the fact that lot of amendments may be required in order to leverage the provisioning of RFID to the utmost.

NEED TO INTEGRATE LEGACY

While RFID is being integrated, organizations would want to re-use their existing systems. This will not only save cost and time, but also require less amount of familiarization time for in-house users.

NEED TO INCORPORATE NEW FUNCTIONS

Even while organizations are looking only at the identification aspect of RFID, there are many areas where new functionalities would be required to automate the existing systems. Vendors providing integration packages would be expected to develop their products/solutions in a way that integration in such scenarios can be achieved with minimal customizations.

DIVERSITY IN TECHNOLOGICAL STANDARDS

The ERPs and SCMs within organizations can be proprietary as well as vendor provided. However, in any case, with each ERP having different standards in the technology aspects, Integration challenges are likely to soar up in this arena.

INCOMPATIBILITY IN BUSINESS PROCESSES

The better you want, the tougher it is. Automation is to bring in series of changes in the existing processes that may or may not be compatible with each other. This puts up a challenge at the process integration level to provide an oblivious means for optimized automation.

COMPLEX TECHNOLOGY WITH HETEROGENEOUS PLATFORMS, N-TIER DISTRIBUTED COMPUTING AND THE WEB

Distributed computing environments and the advent of Internet brought in a concept of Inter-organization business communication through loosely coupled systems. eXtensible Markup language (XML) is accepted as a standard for such communications. The combination of Internet and XML gave birth to Web Services, which support multi-language and multi-platform systems. Integration aspects of RFID will cover a lot in this area with processes being automated and organizations reducing their cost of ownerships.

ROADMAP TO INTEGRATION

While RFID is being promoted as an applied science to provide real-time visibility of data pertaining to items, cases and pallets at all stages of the automatic identification, organizations are researching continuously to improvise their strategies for optimizing their efficiencies in terms

of costs, timely deliveries, consumer satisfactions and above all managing the complicated business rules using this tool.

Figure 4 illustrates the roadmap for integrating RFID with existing processes. The permeation through these stages can give: integrity, accuracy, unified view of business information, infrastructure optimization, technological flexibility, and above all, integrated real time data visibility.

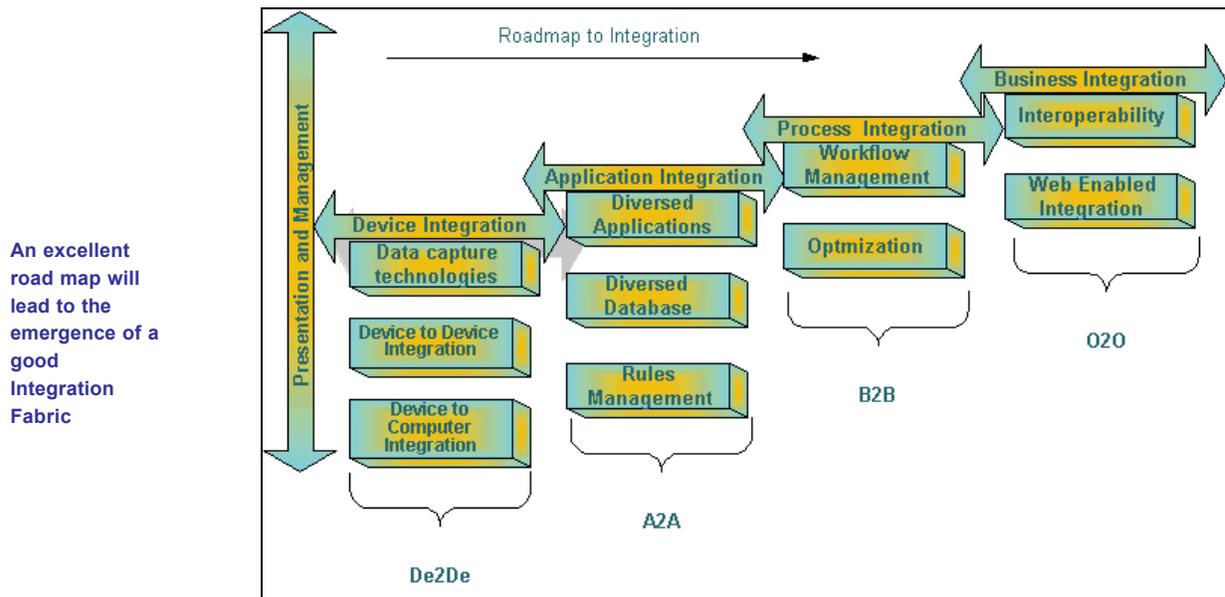


Figure 4: Integration Roadmap

With individual technologies rapidly becoming generic or obsolete, integration plays a vital role for a smooth running system. The requisite of an integrated platform envisages an approach to product development and opens the door to intelligent systems.

Radio Frequency Identification promises an era of ubiquitous computing. The “Internet of Things” is being realized as the means of low cost of ownership and a substance for real time monitoring. RFID is moving forward with a thrust and, the need for Integration at various stages with RFID becomes a crucial aspect for a smooth operation of the system. What makes the integration aspect vital is the existence of diverse applications in functional and technical aspects. Vendors across the Information Technology spectrum are taking a plunge for providing solutions that are extensible and robust to meet the challenging demands of every vertical concentrating on RFID. And what is promised is a better management of data and information for organizations, in turn, boosting efficiency and optimization of the resources.

ABOUT THE AUTHORS

Sandhya Sule

Sandhya has over 18 years of R&D and IT experience, working with a premiere academic institute for 8 years and some of the leading Indian product, IT consulting and services companies. Her technology incubation group on RFID at Patni consists of technology leads with experience on tag/reader technologies, application architects with experience on integration platforms and functional and domain experts in Manufacturing and Enterprise Applications. Sandhya holds a Masters in Telecom from IIT Kanpur, India.

Sapan Shah

Sapan is actively involved with the developments of RFID within and outside Patni. He also is involved in business acquisitions on up-coming technologies at Patni. His area of expertise lies in Integration, Tags/Readers and architecting RF-enabled applications. His experience comprises e-Commerce technologies, Integration frameworks and Enterprise Applications. Sapan holds a Masters degree in Computer Applications.

ABOUT PATNI

Patni Computer Systems Limited (BSE: PATNI COMPUT, NSE: PATNI) is a global IT Services provider servicing Global 2000 clients in the Manufacturing, Insurance, Banking & Financial Services, Retail, Hospitality, and Energy & Utilities industries. With a skilled employee strength of over 7,000; multiple offshore development facilities across six cities; and 22 international offices across the Americas, Europe and Asia-Pacific; Patni has registered revenues in excess of US \$251 million for the year 2003. Patni's technology focus spans e-business solutions, enterprise applications, embedded technology solutions and enterprise systems management. Its service offerings include application development and reengineering, application management and business process outsourcing. Committed to quality, Patni adds value to its client's businesses through well-established and structured methodologies, tools and techniques. Patni is an ISO 9001:2000 certified and SEI-CMMi Level 5 organization, assessed enterprise wide at P-CMM Level 3. In keeping with its focus on continuous process improvements, Patni adopts Six Sigma practices as an integral part of its quality and process frameworks.

Patni's RFID Expertise

Patni's dedicated RFID practice offers a complete range of RFID services as part of its Enterprise Application solutions. Patni, with its unique combination of internal strengths and external partnerships, is well placed to address this emerging market for RFID adoption. Patni strengths are derived from domain expertise and service competencies in the areas of ERP, SCM, CRM, Retail, e-Business, Embedded Technologies and Application and Systems Integration. Added to these are the strategic alliances with Enterprise Application vendors.

Patni has forged an alliance with OATSystems Inc, a key technology company, to enhance its service offering and provide greater value to its clients. OATSystems' Senseware provides a complete and powerful standards-based RFID solution for companies in the retail, CPG, manufacturing, pharmaceutical, and logistics markets. In addition, Patni also has partnerships with key RFID hardware vendors.

Patni is also the first Indian company to gain membership of EAN India and join the global RFID consortium. With this membership, Patni gains access to services of EPCglobal, Inc., which is a joint venture between EAN International and Uniform Code Council Inc., and develops and promotes commercial and technical standards for the Electronic Product Code (EPC™) Network. As a subscriber to EAN India, Patni will support the adoption of the EPC Network in India and help in the creation of industry standards for RFID technology worldwide.

Patni's RFID Lab is manned by dedicated expert teams. This lab allows clients to understand the impact/ benefits of RFID on their business processes, develop a prototype or simply enhance their understanding during the various phases of RFID adoption.

Patni offers a range of solutions spanning impact assessments, readiness assessments, 'proof of concepts', and full-fledged implementation, enabling RFID adoption with minimal disruptions.

For more information, visit <http://www.patni.com> or contact rfid@patni.com.

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