Chapter 6

A Review of the IoT-Based Pervasive Computing Architecture for Microservices in Manufacturing Supply Chain Management

Kamalendu Pal

https://orcid.org/0000-0001-7158-6481

City, University of London, UK

ABSTRACT

Supply chain coordination needs resource and information sharing between business partners. Recent advances in information and communication technology (ICT) enables the evolution of the supply chain industry to meet the new requirements of information sharing architectures due to globalization of supply chain operations. The advent of the internet of things (IoT) technology has since seen a growing interest in architectural design and adaptive frameworks to promote the connection between heterogenous IoT devices and IoT-based information systems. The most widely preferred software architecture in IoT is the semantic web-based service-oriented architecture (SOA), which aims to provide a loosely coupled systems to leverage the use of IoT services at the middle-ware layer to minimise system integration problems. This chapter reviews existing architectural frameworks for integrating IoT devices and identifies the key areas that require further research for industrial information service improvements. Finally, several future research directions in microservice systems are discussed.

INTRODUCTION

Internet of Things (IoT) based computing is one of the promising technologies for the automation of distributed complex information systems. Many researchers and practitioners expressed their views that IoT technology represents the most influential new paradigm for the fourth industrial revolution, which is

commonly known as Industry 4.0 (Pal, 2020). It is ushering a new hope in global manufacturing industries by increasing production uptime and reducing operational risks. The IoT based technologies along with service-oriented computing (SOC), data analytics, and cyber-physical systems play an important role in a manufacturing industry supply chain operating environment. In this way, the manufacturing supply chain operation is heavily influenced by the Industry 4.0 information and communication technology (ICT) evolution since it faces the challenge of rapidly growing requirements for agile and efficient reactivity to the rapidly changing global customer demands. Customers are increasingly defining how retail manufacturing businesses design and deploy their supply chain operations. These demanding customers can now do their shopping anywhere and anytime and expect a more fulfilling experience from retailers. However, many retail businesses are dealing with how to find an innovative approach to sourcing, replenishment, and distribution strategies to address the changes. Retail businesses are starting to consider seriously how best to optimize their supply chain operations to face fast-changing customer demand while minimizing operational expenditure.

A retail manufacturing supply chain consists of interconnected activities, and their associated business processes together to provide value-added service to its customers. Customer-engaged retail companies, from automobile dealers to highly attractive summer dressmakers, always need different stakeholders' information for their supply chains. An entire network of manufacturers and distributors, transportation and logistics agencies, warehouses and freight-forwards work together to make sure that the right goods and services are available at the right price, where and when the customers want them. Having supplied value-added services (e.g., products and associated customer services), the supply chain does not terminate. The retail supply chain is comprised of several steps from the front end, through the customer request, supply chain order processing initiation, quality assurance for product and services, relevant training processes for staffs, customer support facilities, to maintenance and replacement facilities.

Figure 1. RFID tagging level at different stages in the apparel manufacturing network

In a typical manufacturing supply chain, raw materials are purchased from suppliers and products are manufactured at one or more manufacturing plants. Then they are transported to intermediated storage (e.g., warehouse, distribution centre) for packing and shipping to retailers or customers (Pal, 2017). The path from supplier to a customer can include several intermediaries such as wholesalers, warehouse, and retailers, depending on the product and markets. In this way, supply chain management relates to business activities such as inbound and outbound transportation, warehousing, and inventory management. Figure 1 presents a simple diagrammatic representation of an apparel manufacturing supply chain,

Related Content

Bengali (Bangla) Information Retrieval
Debasis Ganguly, Johannes Levelingand Gareth J.F. Jones (2013). *Technical Challenges and Design Issues in Bangla Language Processing (pp. 273-301).*
www.irma-international.org/chapter/bengali-bangla-information-retrieval/78479

The Role of Textual Graph Patterns in Discovering Event Causality
Bryan Rink, Cosmin Adrian Bejanand Sanda Harabagiu (2012). *Applied Natural Language Processing: Identification, Investigation and Resolution (pp. 334-350).*
www.irma-international.org/chapter/role-textual-graph-patterns-discovering/61057

Semantic Medical Image Analysis: An Alternative to Cross-Domain Transfer Learning
Joy Nkechinyere Olawuyi, Bernard Ijesunor Akhigbe, Babajide Samuel Afolabiand Attoh Okine (2021). *Advanced Concepts, Methods, and Applications in Semantic Computing (pp. 128-146).*
www.irma-international.org/chapter/semantic-medical-image-analysis/271125

Statistical Machine Translation
Lucia Specia (2014). *Computational Linguistics: Concepts, Methodologies, Tools, and Applications (pp. 897-931).*
www.irma-international.org/chapter/statistical-machine-translation/108756

Disambiguation and Filtering Methods in Using Web Knowledge for Coreference Resolution
Olga Uryupina, Massimo Poesio, Claudio Giulianoand Kateryna Tymoshenko (2012). *Cross-Disciplinary Advances in Applied Natural Language Processing: Issues and Approaches (pp. 185-201).*
www.irma-international.org/chapter/disambiguation-filtering-methods-using-web/64588