Design and analysis of enhancing secure data in a pharmaceutical industry manufacturing execution system platform using a cloud computing paradigm

Giriraj Mannayee[1], Muthu S[2]
[1]Department of Design and Automation, VIT University, Tamil Nadu, India,
[2]D.M.I College of Engineering, Tamil Nadu, India.
***Corresponding author: E-Mail: girirajmannayee@gmail.com**

ABSTRACT

Pharmaceutical manufacturing systems want require to process generous amounts of complex data due to a rising demand on visibility and vertical integration of factory floor devices with high level systems. In this system contained in high layers of the business model are rapidly moving towards a service Oriented Architecture, inducing a tendency to push cloud computing technologies down to the factory floor level. Evidence of this trend is the addition of cloud computing services at the device level with Device profiles for computing services and the transition of OPC based on COM / DCOM communication to OPCUA based on web services. DPWS and OPC-UA are becoming nowadays the preferred options to provide on a device level, service oriented solutions capable to extend with in event Driven Architecture into manufacturing systems.

KEY WORDS: Device, manufacturing, paradigm.

1. INTRODUCTION

This thesis provides a fulfillment of a Pharmaceutical plant-monitor being based on the complex event which goes for manufacturing method done by an event in a procession. Pharmaceutical plant floor shop monitors are especially used to inform the workshop staff about alarms, announcements, and, visually helps about the achievement and status of a pharmaceutical manufacturing process data. This work abstracts the informative value of the event cloud which surrounds the factory production plant this, his contents against rules and formulae working on to convert it to the valuable information which can be issued to commercial monitors and dashboards Consequently a system with a general framework to integrate heterogeneous sources was reached, transforming simple data warnings and complex events reshaping which contain a specific connection within the manufacturing process. These pharmaceutical manufacturing execution system data are posted in a cloud environment with reliable model. The Many advantages of the cloud computing technology draw more and more persons and organizations to separate their data from local to distant cloud servers. In addition to cloud infrastructure and platform providers, like the Amazon, Google, and Microsoft, more and more appear the cloud application providers who are dedicated to the offer of more accessible and user-friendly data storage services cloud customers. It is a clear trend that separating cloud data become a pervasive service. Together with the widespread enthusiasm on the cloud which estimates, nevertheless concerns of the data security with the cloud data storage originate in relation to the dependability and concerns which arise as the primary obstacles to the adoption of the cloud computing field. To direct these difficult problems, this doctoral thesis investigates the problem from sure and reliable data separating in the cloud computing. We concentrate upon unfolding the most basic data services, data utilization and data management, while we think about dependability and privacy assurance. This has run out to a renewed one concentrate upon security of information in the case where data are supplied in the virtual space of the cloud and are accessible to the customer not physically. By this thesis become the boundaries to protect data in a cloud connection, while they keep the advantages of the cloud, investigates. The thesis directs the increasing security concerns of the migrating to the cloud and using of it for the data storage. The securing of data in un-trusted cloud environment, data protecting, access control in the cloud, and data outside the cloud in the environment of the user protecting. Every area is directed by separate concepts. Together enclose these secure dynamic clouds based collaboration environments with the hierarchical access. To further next the concepts is to be made valid, been founded the proof by draft prototypes. The concepts have been constructed, investigating and the boundaries of available secure data storage patterns extending, and then this with well-known security reason principles and innovative research within the field of the cryptography. The results of this thesis are workable concepts of cloud-founded dynamic collaboration environment. The conceptual design the challenges of the sure cloud- based storage and permit that the advantages of the cloud supported storage to be utilized. The term-clouds computing technology has been used to define Commoditized clusters of server nodes where elasticity and by request with supplies makes easier supplying resource the efficient processing of user applications and services. A promise of the cloud which is a computing paradigm that work routines can be hard to hosted and be led more efficiently being based on the new level of the dynamism and the control. However, new conditions and challenges, cloud technologies originate in this manner restorative. This doctoral thesis investigates the supervision, configuration and dynamic resource management of official workflows in a cloud environment. A main contribution should use the dynamism of virtualized clouds means in different workflow management operations.

Problem formulation: Present intelligent pharmaceutical manufacturing execution system field requirements, pushing automation systems to suppose a position where the pharmaceutical plant floor visibility of every component of a company of the process control is necessary up to the commercial managerial activities. Product customization, variances, servicing, high-class control and, is the commercial supervision some examples of conditions which bump for a holistic production supervision which can make available a right visibility. Because of this rising inquiry on the visibility and vertical integration of factory floor-devices with higher level systems future manufacturing systems will ask to work on big amounts of heterogeneous data which describe different states and situations at different levels of a business.

The System Model: In view of cloud data storage service which makes available to secure data outsourcing services as well as efficient data retrieval and repair service including four different entities: the data owner, the data user, the cloud server, and the third party server. The data owner outsources the encoded fragments of the file M to N as a storage server to indicate cloud servers. In this model have many threats; the cloud server is looked as "curious-and-vulnerable". Specifically the cloud server is vulnerable to Byzantine failures and outside attacks. While Byzantine failures can be done by hardware mistake. After the opponent wins the control of the cloud server, it can seize the pollution attack or the replay-attack which has to the purpose to break the linear independence under encoded data the data stored on the corrupted cloud server with old encoded data substituting. If the cloud server is not corrupted, it follows properly the designated protocol specification, but it will try, to derive and to analyze data in its storage and interaction during the protocol execution to learn additional information. This represents a threat against the privacy of cloud user data stored on the server. Every system can be described by his qualities. To allow the comparison of designs for dynamic collaboration surroundings, certain qualities have been selected and will be the focus everywhere in this thesis. The qualities are divided into three categories: Security, access control, and achievement. The dynamic collaboration surroundings cover the cloud as well as the local surroundings with his users. However, the properties of important qualities are not identical for both of these surroundings.

2. EXPERIMENTAL SETUP

Figure 1 shows the experimental pharmaceutical manufacturing system. It's a product sorting represents, and assembly processes which can be controlled by the programmable logic controller. The upper conveyor and the lower conveyor are driven by the rotary actuator 1 and the lower conveyor -rotary actuator 2 respectively.

Figure.1. Pharmaceutical Manufacturing Execution system setup

A random choice in metallic pegs and plastic rings is placed on the upper conveyor. The rings and pegs must be identified and be distinguished. This is done by two sensors, a proximity sensor1 and infra-red reflective sensor 2. Using these two sensors, a differentiation can be done between the peg and the ring. By means of the kind of sort linear actuator 3 plastic rings can be expelled the assembly chute which can have up to plastic rings. Metallic fasteners continue, in the meantime, the upper conveyor and are defected down the feeder chute. The feeder chute automatically feeds fasteners on the lower conveyor. An infrared sensor is used to determine, in spite of which whether the assembly area is empty. If it is, basic trick trigger of the solenoid of the assembly is used to release a ring from the assembly channel in the assembly area. The assembly area is put just about the lower conveyor and if metallic fastener passes, have occupied themselves the fastener with the hole in the ring and two components are assembled. The lower conveyor is used to carry completed components in the collection tray. With the programmable logic controller interfaced module printing, gets data on the system and print about the component with relevant parameters, like manufacturer, license no, a group now, Mfg. Date, expiry date etc. In this work Siemens S7-300 programmable logic controller is used to control the process, and software called 'Simatic of manager' is used to program the programmable logic controller.

Simulation testing and validation: The mission for the simulation, testing and validity of the assembly process is paramount to any supervision of pharmaceutical manufacturing execution system. The more translucent process simulation, examining and valid explanation signifies more efficient floor management. Now end users demand in detail their plant floor and progress are represented as near to the reality as possible. The immediate look, feeling and touch experience allow running free extra array of the sensory sensitivity.

Pharmaceutical manufacturing execution system data: Manufacturing execution system, plant floor-automation programs in this level are being developed based on the middleware principle. The pharmaceutical plant floor-system can extract out programmable logic controller-data, pharmaceutical plant- floor production can be tracked help of

sensory systems and middleware. Manufacturing data of an assembly process can be viewed in another process. All data can be saved in a database in the plant floor-system like Microsoft access or oracle. This data posted to the cloud computing environment with the help of Luby transform coding.

Secure and Reliable Data Outsourcing in Cloud Computing environment: In this second part of the hypothesis we present the LT codes based secure and reliable cloud storage service where n storage server {Sl} $1 \leq l \leq n$ are used to make available the data storage service for the data owner and data users. Our data integrity technology is partially adopted by the encryption algorithm. Based distributed storage system of the codes of the optimum erasure, and more reliable by many scales than the replication-based system.

Secure Dynamic Cloud-based Data-sharing: Secure Dynamic Cloud-based Data-sharing (SDCD) uses ESE to allow, searching on encrypted data as ESE suits to be connected with PRE. The combining this cryptographic primitive one enables to the concept to have shared all data encrypted, at the same time individual keys for users supporting. To have individual keys for users, it does possibly to revoke user efficiently. The image one is central to SDCD. The Data Owner (DO) responsible for generating keys and PRE tokens for all users. This puts in the DO complete control of users who have access to shared data. Although the DO is central to the system, the access data of the user depend directly on the cloud and users only from to be granted the initial access. Figure 2 gives a conceptual overview of SDCD.

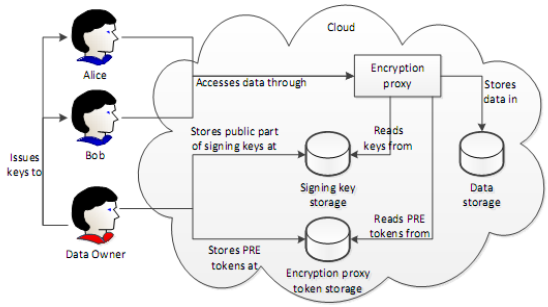

Figure.2. Conceptual overview of SDCD

Resource management of cloud environments: We developed a gossip - based protocol for the resource allocation in large -scale cloud environment. The protocol carries out a key function within the distributed middleware architecture for big clouds. The protocol carries out a distributed pattern, the cloud means of a set of applications assign which have central processing unit requirements dependent on time and memory requirements independent of time, and it dynamically maximizes a global cloud utility program-function. We prove analytically that the protocol generates a distributed allocation which gathers exponentially fast for an optimum allocation if memory restrictions can be neglected.

2. CONCLUSION

The presented use case has required for the pharmaceutical monitoring system, to receive and process semantic data incoming from heterogeneous systems in factory business environment. The test results support the acceptances taken during the architectural design of this implementation which reaches all imposed intentions. The result shows the monitor, reacting instantly, a time interval of information preventing to announce the responsible one and to treat the situation accordingly. These semantic databases successfully upload to a cloud environment by utilizing Luby transform code. These semantic databases successfully upload to a cloud environment by utilizing Luby transform code. Conceptual design was used for the Secure Dynamic Cloud-based Data-sharing (SDCD) to supply data securely in the cloud, presented. The design uses a combination of the symmetrical and asymmetrical code to protect confidentiality. If data are presented and are supplied in the cloud, it is encrypted by the same master key no matter who presents it. The problems of the supervision, the configuration and the dynamic resources management are examined by official workflows in a cloud environment. Different algorithms and strategies are suggested to seize each of them and finally adopted gossip protocol for an adaptive service which controls algorithm, which improves monitoring process for used services is suggested and investigated. The algorithm is inspired by the traffic jam controlling mechanism in the protocol. Gossip protocol adjusts examination periods for different services, being based on their historical health status pliable.

REFERENCES

Bart Saint Germain, Paul Valckenaers, Networked manufacturing control: An industrial case, CIRP Journal of Manufacturing Science and Technology, 4, 2011, 324–326.

Bose I, Pal R &Ye A, ERP and SCM Systems Integra Tion: The Case of a Valve Manufacturer in China, Information & Management, 45 (4), 2008, 233-241.

Bouzakis KD, Andreadis G, Vakali A, Sarigiannidou M, Automating the Manufacturing Process under a Web Based Framework, Advances in Engineering Software, 40 (9), 2009, 956-964.

Brintrup A, Behaviour Adaptation in the Multi agent, multi objective and Multirole Supply Chain, Computers in Industry, 61 (7), 2010, 636-645.

Butala P & Sluga A, Autonomous Work Systems in Manufacturing Networks, Annals of the CIRP, 55 (1), 2006, 521-524.

Calyam P, Patali R, Berryman A, Lai AM & Ramnath R, Utility-Directed Resource Allocation in Virtual Desktop Clouds, Computer Networks, 55 (18), 2011, 4112-4130.

Camarinha-Matos LM & Afsarmanesh H, Elements of a Base VE Infrastructure, Computers in Industry, 51 (2), 2003, 139-163.

Camarinha-Matos LM, Afsarmanesh H, Galeano N & Molina A, Collaborative Networked Organizations Concepts and Practice in Manufacturing Enterprises, Computers & Industrial Engineering, 57 (1), 2009, 46-60.

Candido G, SOA at Device Level in the Industrial Domain: Assessment of OPC UA and DPWS Specifications, Indian 8th IEEE International Conference on Industrial Informatics, 2010, 939-949.

Candido GA, Colombo JBAW & Jammes E, SOA in Reconfigurable Supply Chains: A Research Roadmap, Engineering Applications of Artificial Intelligence, 22 (6), 2009, 939-949.

Cao N, Secure and Reliable Data Outsourcing in Cloud Computing, Ph.D. Dissertation, Department of Electrical and Computer Engineering, Worcester Polytechnic Institute, United States, 2012.

Carbonneau R, Laframboise K & Vahidov R, Application of Machine Learning Techniques for Supply Chain Demand Forecasting, European Journal of Operational Research, 184 (3), 2008, 1140-1154.

Cenk Erdil D, Autonomic cloud resource sharing for inter cloud federations, Future Generation Computer Systems, 29, 2013, 1700-1708.

Chirag Modi, Dhiren Patel, A survey of intrusion detection techniques in Cloud, Journal of Network and Computer Applications, 36, 2013, 42 –57.

Dimitrios Zissis and Dimitrios Lekkas, Addressing cloud computing security issues, Future Generation Computer Systems, 28, 2012, 583–592.

Mackay M, Baker T, Security- oriented cloud computing platform for critical infrastructures, Computer law & security review, 28, 2012, 679 – 686.

Milagros Rolon and Ernesto Martinez, Agent based modeling and simulation of an autonomic manufacturing execution system, Computers in Industry, 63, 2012, 53–78.

Milagros Rolon and Ernesto Martinez, Agent learning in autonomic manufacturing execution systems for enterprise networking, Computers & Industrial Engineering, 63, 2012, 901–925.

Ray Y Zhong, Dai Qy, RFID-enabled real-time manufacturing execution system for mass-customization production, Robotics and Computer Integrated Manufacturing, 29, 2013, 283 –292.

Sandeep K, Sood, A combined approach to ensure data security in cloud computing, Journal of Network and Computer Applications, 35, 2012, 1831 –1838.

Xun Xu, From cloud computing to cloud manufacturing, Robotics and Computer-Integrated Manufacturing, 28, 2012, 75 –86.