INTEGRATION OF IOT - EMPOWERED CLOUD MANUFACTURING SYSTEMS IN INDUSTRIAL ENGINEERING

[1]S. YESHWANT RAJ, [2]SARABESH SRIRAM, [3]M. SIVAPRAKASH

Assistant Professor, Final year Student
E-mail: [1]Yeshwantraj.s@gmail.com, [2]sarabeshsriram@gmail.com, [3]sivaprakash4298@gmail.com

Abstract - There's no contradictory on the fact that technology is dominating us to a global scale where our conduct, style and living patterns are going to change exceptionally. A new Internet poised to change the world again i.e. IoT (Internet of things) based cloud manufacturing. The integration of the duo has many drawbacks as well as proved to be a upper hand in many applications, mainly in the construction of architecture and work flow, in order to avoid such circumstances an re-developed integrated architecture has been framed to make the system flexible, reliable and robust in all extreme conditions. The study has not been specifically aimed at a particular industry, but have connected the two pioneering technologies (i.e. cloud manufacturing and IoT), also have explored the common factors and discussed the detail about the challenges and how cloud computing technology progresses the operation of the IoT. Decisively we have correlated identical papers in the area. This paper is deep global in its reports and intensely covers dominant factors on IoT and cloud manufacturing.

Keywords - IoT; cloud; Integration; semantics;

I. INTRODUCTION

The universal language for communications is not English or any other foreign language but it is DATA (Semantics). Colossal amount of data in the future has to be arrayed in order to forbid from various adverse effects in the environment, which can only be materialised by the amalgamation of IoT and Cloud [1]. Cloud is for strategic behaviour control and the IoT is for tactical behaviour.

By 2020 every single byte and digit will be stored in the cloud or at least some part of it. IoT is a platform and cloud is a process. The IoT is developing a bizarre amount of data, which in turn puts a colossal strain on the Internet framework. As an outcome all the competitors out in the market are finding out solutions in lighten that pressure and decipher the data problem.

Cloud is for strategic behaviour control and the IoT is for tactical behaviour. Cloud manufacturing is a service or a model for conceding acceptable, on-demand access from anywhere to a shared pool of computing assets. The Internet of Things, meanwhile, refers to the connection of devices to the Internet. There may be always a statement referring whether IoT or Cloud plays a major role or a upper hand, the result will definitely be IoT. With the rise of IOT there has been a globe revolution where companies or manufacturers' are trying to systematize into resourceful systems. [2].

In this paper we are going to mainly focus on how the integration occurs when combination of IoT and Cloud takes place in an industrial engineering scenario. The integration would be explained with a systematic architecture. Before entering into the main study let discuss how the big guns IoT and Cloud are analysed and characterized.

II. CHARACTERIZATIONS OF CLOUD & IOT

Allows user interface to quickly and automatically get access to the resources that they want without requiring human interaction. [3] Pay-as-you-grow (Pay as you Go) methodology is followed, rather than one pay for the entire production framework. Then they have the ability to access the servers from any standard device that is connected to the network including work computers, laptops, mobile phones or tablets. The employees can easily access on the go if they require any information or need to change some data in their day-to-day work. Networking and storage are pooled and shared across multiple customers. Elasticity allows ones to quickly scale or shrink the capabilities of the cloud to match the level of user demand. Metering Tracks and controls the level of resource usage or the cost of that usage. Any customer would choose normally three kinds or options for their cloud deployment: Hybrid, Public or Private according to the usage and demands from their clients. It's not necessary to be expert to use a cloud. Below given data is the simple explanation of cloud and its characterization, mainly its starts with a software to servers for database to backup systems, safe guard using safe rooms for all the machines, a network for connection, clients connected to that network and finally an external IT consultant.

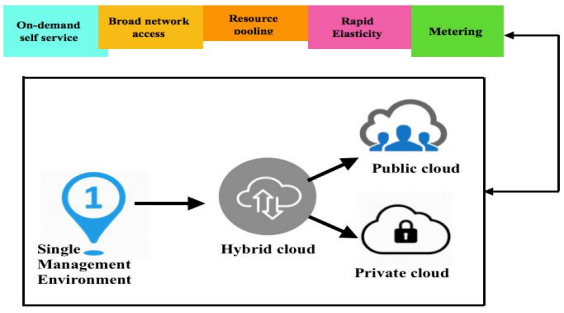


Figure 1. Characterization of cloud manufacturing Entry level.

IoT is always dependent on a software and is a giant network with connected devices, these devices gather and share data about how their use and then environment in which they are operated. They are solely developed using sensors and these sensors are embedded in every physical devices. The process of IoT functions as shown in the figure 2. Mainly its starts with diagnosing the data, adding up sensing and communication then computation methods with service and finally the language i.e. semantics play an important role. It has changed the era of communication from machine to machine (M2M) to many machines to many machines (MM2MM).

III. STUDY ON INTEGRATION

Cloud manufacturing is blending a practice of cloud computing into manufacturing. Any firm or company connected to a cloud basically increases the supply chain when pursued in a competent procedure. The below given figure 2 simply states the working of a manufacturing unit when connected to a cloud [4] CBM (Cloud Based Manufacturing), it may be a interdependent cloud format or when combined with two or more companies joining together to create or produce a whole unit or so, such as a car (when the manufacturer is need of certain part or piece of a car in excess from the required order, then it can be directly added up in the cloud using the above architecture which is given in figure 2. But by following these steps and procedures the manufacturer faces many problems especially SME's (Small Scale Enterprises) and MSME's (Micro Small and Medium Scale enterprises).

The big players are always safe with certain points under them such as Efficiency, Quality, well timed-service and supply chain constancy. From the early studies the fact has been stated that the layers are differenced in terms of software (Enterprise, Application, Hardware and Infrastructure) and in IoT it is a process of sensing the problem to understanding

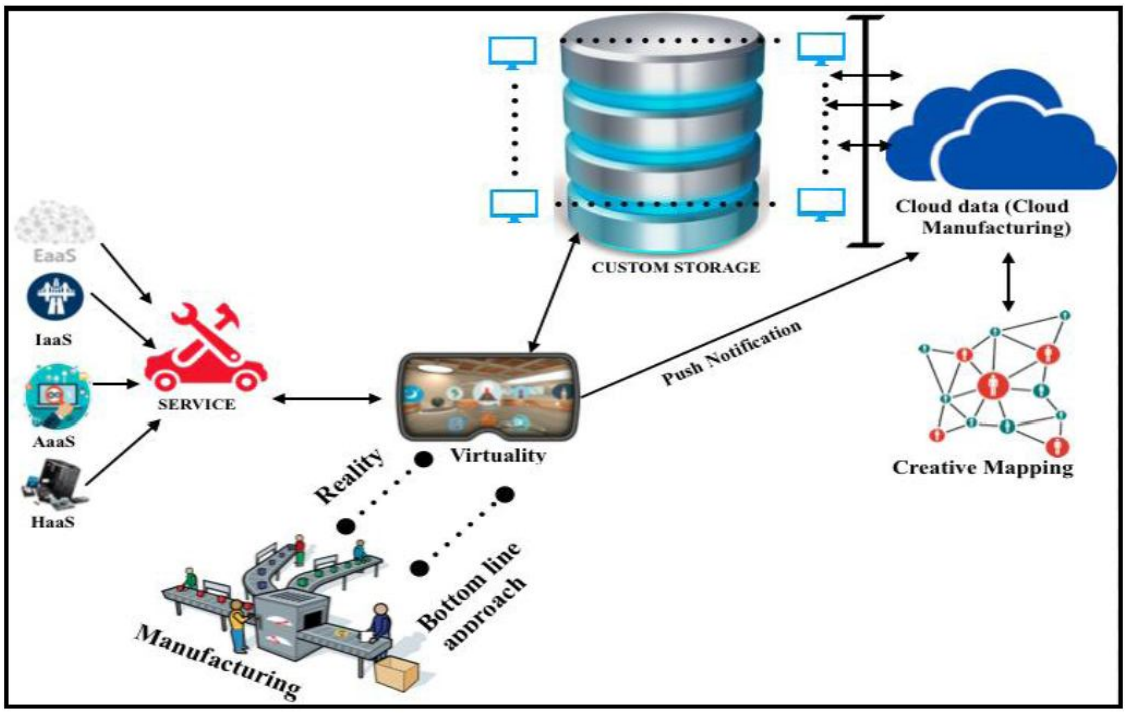


Figure 2. Cloud based Manufacturing (Cmfg)

the language as shown in the figure 3. In both the technologies the main goal is only reality changing to virtual means.

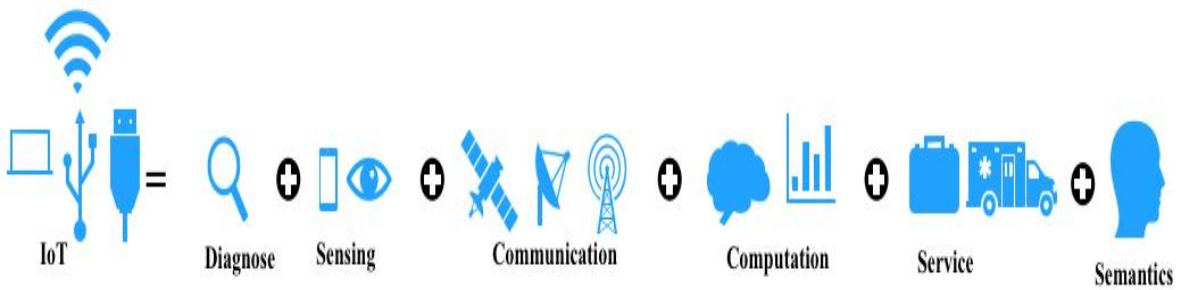


Figure 3. Characterization of IoT

Next era of connection between two companies or two enterprises would only be the IoT and cloud, in other terms creative mapping between real world and the implicit world. These technologies can give rise to three phrases namely creativity, innovation and humanity. Every technology rises in big success but always ends up with problems with future implications as day by day new concepts comes out in the market making the past obsolete.

Table 1. Common Barriers of IOT and Cloud with respect to SME's and MSME's.

S.no	Barriers of IoT and cloud
	Approach of open architecture [5]
	Replication of servers [6]
	Lack of reliability security solutions [7]
	Deficiency of R&D [8]
	No practical solutions [9]
	Cloud based design (CBD) to Cloud based manufacturing (CBM) [10]

The above barriers would have clearly stated the gaps and in order to fill the gaps a modified and re-developed architecture is constructed as shown in figure 4. With the construction the following points can be concluded stating that the integration is satisfying the barriers in well-fashioned way. The system (integration) consists of four phases where IoT and Cloud are primarily the major guns. When analysing from the table 1. The first two barriers are wholly dependent on the IT professional whose designing the whole package (user interface software), the third one i.e. lack reliability solutions (security, quality and repeatability) are all totally reliant on the API (Application Program Interface). The API's are the absolute source for communication and the complication rises during communication only. That is why in the figure 4. if one has a closer look, all the API's are synchronised with an encryption and those encryptions are perfectly connected to threat analysis scan, where it scan all kinds of possibilities in both software and hardware. The fourth barrier - deficiency of R&D, development should always be from both the parts of the company or the frim, without the coordination it is very difficult to the survive in the competitive market. Lastly the CBD- CBM transition takes place where CBM can only be possible via smart manufacturing and in order to use smart manufacturing the firm has to channel the artilleries (IoT and Cloud). Basically the communication between the internal and external customers would be in closed loop and two way link. By adopting this methodology both the firm as well as the user interface are favoured in using a remarkable process.

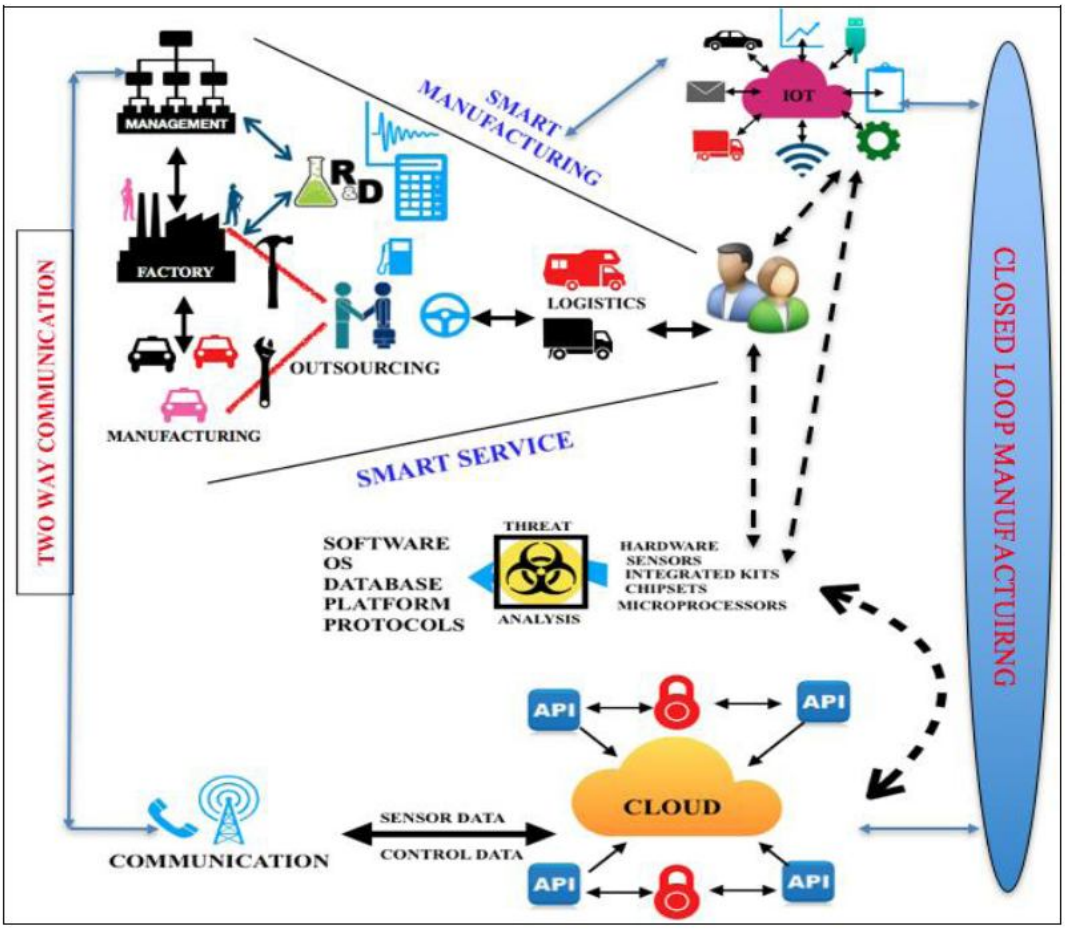


Figure 4. IoT - CLOUD Paradigm Architecture

CONCLUSION & FUTURE SCOPE

The architecture and the integration have fully explained and have given additive advantage on the scope of the Industrial IoT and cloud Mfg. By using this integration, the following points may rise up: 1. Adequate and more competent wired and wireless connections are possible, 2. Implementation of low connectivity cost and manufacturing cost for smart devices, 3. Government motivation for investment in the new technology by loans and other financial markets, 4. Signs of fewer maturity (considerable contraction in technologies) and many more. This technology can be implemented with extra effort with an IT consultant (software and hardware) and the manufacturer (products and services)

REFERENCES

[1] Henze, Martin, et al. "A comprehensive approach to privacy in the cloud-based Internet of Things." Future Generation Computer Systems 56 (2016): 701-718.

[2] Kurniadi, Kezia Amanda, and Kwangyeol Ryu. "Development of IOT-based Reconfigurable Manufacturing System to solve Reconfiguration Planning Problem." Procedia Manufacturing11 (2017): 965-972.

[3] Gubbi, Jayavardhana, et al. "Internet of Things (IoT): A vision, architectural elements, and future directions." Future generation computer systems 29.7 (2013): 1645-1660.

[4] Stergiou, Christos, et al. "Secure integration of IoT and cloud computing." Future Generation Computer Systems 78 (2018): 964-975.

[5] Wu, Dazhong, et al. "Cloud manufacturing: Strategic vision and state-of-the-art." Journal of Manufacturing Systems 32.4 (2013): 564-579.

[6] Red, Edward, et al. "Multi-User Computer-Aided Design and Engineering Software Applications." Cloud-Based Design and Manufacturing (CBDM). Springer International Publishing, 2014. 25-62.

[7] Tao, Fei, et al. "Cloud manufacturing." Advanced Materials Research. Vol. 201. Trans Tech Publications, 2011.

[8] Cloud manufacturing service platform for small- and medium-sized enterprises (Int J Adv Manuf Technol (2013) 65:1261–1272) Biqing Huang & Chenghai Li & Chao Yin & Xinpei Zhao

[9] Zhang, Lin, et al. "Flexible management of resource service composition in cloud manufacturing." Industrial Engineering and Engineering Management (IEEM), 2010 IEEE International Conference on. IEEE, 2010.

[10] Wu, Dazhong, David W. Rosen, and Dirk Schaefer. "Cloud-based design and manufacturing: status and promise." Cloud-Based Design and Manufacturing (CBDM). Springer International Publishing, 2014. 1-24.

★★★