Industrial IoT

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Abstract

This paper discusses industrial internet of things (IIoT), the technologies used, security issues, business use cases and applications in manufacturing operations that are driving the adoption of Industrial IoT in manufacturing.

Keywords : Industrial Internet of Things, sensors

I. INTRODUCTION

Industrial Internet of Things or Industrial IoT (IIoT) refers to an industrial framework in which a large number of devices or machines are connected and synchronized using software tools and third platform technologies in a machine-to-machine and Internet of Things context or an Industry 4.0 or Industrial Internet context [2].

Internet of Things is rich in data which get collected and shared through Internet of Things to get insights. The benefits of IIoT are [2] :

↳ Reduced human errors

↳ Reduced manual labor

↳ Increase in efficiency

↳ Reduced costs

↳ Effectiveness in in quality control and maintenance.

II. IIoT TECHNOLOGIES

Some of the technologies used in IIoT are :

↳ Cyber-physical systems (CPS) is the basic technology platform for IoT and IIoT. It connects physical machines that were previously disconnected through software and communication, providing abstractions and modeling, design, and analysis techniques [3].

↳ Cloud computing: With cloud computing, IT services and resources can be uploaded to and retrieved from the internet.

↳ Edge computing is a distributed computing system. It brings computer data storage closer to the location where it is needed. It is industrial internet requires more of an edge-plus-cloud architecture rather than one based on purely centralized cloud [3].

↳ Big data analytics examines large and varied data sets.

↳ Artificial intelligence and machine learning: Artificial intelligence (AI) is a field in which intelligent machines are created that work and react like humans. With machine learning, AI can predict outcomes without explicit programming.

III. USE CASES

A. Production Visibility

Visibility can be gained into production by process engineers and managers with the use of IoT as it connects machines, tools, sensors on the shop floor. Parts on
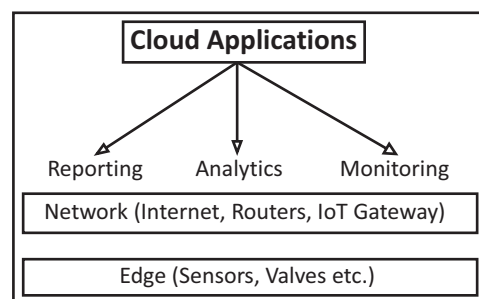
Fig. 1. Architecture of Industrial Internet of Things

assemblies can be tracked using RFID and break beams. IIoT gives real time view of yields and it can be used to identify bottlenecks [1].

B. Higher Operator Productivity

Settings of IoT enabled tools can be adjusted to increase speed according to the activity being performed [1].

C. Faster Improvement Cycles

As data collection becomes automated with IIoT, shop floor engineers get more time to spend on improving processes which would otherwise have been spent on manually collecting data [1].

D. Reduce Cost of Quality Management Systems

Cost of maintaining quality management systems (QMS) can be reduced by using IIoT for automating and streamlining the process control plan. Critical quality factors can be checked using sensors and reduce time and resources required for QMS [1].

E. Improve Quality Through Monitoring

Environmental sensors can be used to monitor conditions critical to quality, for example, temperature, humidity, and trigger alerts [1].

F. Increase Machine Utilization

Machine utilization can be increased by automated monitoring of operations.

IV. SECURITY ISSUES

IoT applications are built with existing industrial control system (ICS) devices that do not have adequate security. This is done to generate more data that is required for big data analytics. These devices use custom protocols or gateways which are developed without sufficient security considerations.

IIoT comprises various levels along with security and operational issues related to them. Local area networks that are used for collecting and processing data from connected ICS objects have issues of lack of security in process sensors. Compromised data can cause equipment damage, regulatory issues, and personal safety hazards.

The issue with transfer of data to the Cloud is lack of security in protocols and gateways. There is lack of secure communication protocols between platforms and end user applications which can adversely affect operations.

V. APPLICATIONS

Some examples of companies that are using IIoT are as follows [5] :

✎ Boeing is using IIoT to increase efficiency in supply chains and its factories

✎ Bosch is using IIoT to track and trace components which otherwise requires workers to spend lot of time on.

✎ Fanuc is using IIoT for predictive maintenance.

VI. CONCLUSION

The global IIoT market was valued at USD 313.27 billion in 2019., which is expected to grow at 12.3% over 2020–2025 [4]. Industrial IoT has the ability to change manufacturing radically. Global markets and changes in industry has forced manufacturers to reconsider operations. Therefore, smart manufacturing with IIoT-driven data analytics has become very important. In the future there will be more focus on lower costs for companies of all sizes.

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About the Author

Deepak Jain is an experienced engineer and product leader with a demonstrated history of working in the computer software industry solving technically challenging problems at scale. Eager to build products, solving real-time problems, Deepak founded Subtlelabs as a software engineering company that is today serving customers across the globe. He had earlier worked with global companies and architected solutions in Healthcare, Security, Fintech, Logistics, and CRM domains.