

Chapter 21


The Industrial Internet of Things: Advanced Analytic Framework

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ABSTRACT

Volumes of data produced by the dumb machines in industrial environment are used by smart machine for real time analysis. The ultimate result is far better than human handling and analysis of data, and hence enhancement and accuracy in business decisions. IIoT (industrial internet of things) also referred to as industry 4.0 is developed to enhance the accuracy and performance of industrial processes by using smart sensors and actuators. This chapter shed light on key technologies of IoT ecosystem and also discusses the architecture and development details of an IIoT solution its components, applications, and case studies.

1. INTRODUCTION

IIoT is not just a technological solution; it is a strategic tool enabling the complete digitization of industry. It increases the productivity, sustainability, and reliability of the industry. With the help of IIOT, management is able to recognize inefficiencies and deadlocks well before they actually occur. This becomes possible with the help of connected sensors and actuators, resulting in savings in time, money,

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effort, and sometimes company reputation. IIoT can be very useful in the manufacturing domain. This can be used for ensuring product quality, supply chain efficiency as well as in producing sustainable and eco-friendly products. IIoT solutions can be very effectively used for tracking the components in manufacturing work, predictive maintenance (PDM), enhancing field services and energy management. With changing technological trends, the production process in industries is now digitalized, which became the basic step towards Industry 4.0. The German government introduced a technical scheme to promote automation in manufacturing. “Industry 4.0” emerged from this process of automation in the manufacturing industry. With Industry 4.0, traditional manufacturing technologies are now changed to a more efficient, faster, automated, and adaptable production process. Technological evolution helped the industry to improve the quality of goods and production at reduced cost. Manufacturing industry has evolved with the evolution in communication technologies. The first major milestone was the shift from mechanical manufacturing process to industry automation. Now it is moving towards complete digitalization of manufacturing process with the help of fifth generation wireless communication technologies, combined with power of artificial intelligence, cloud computing, quantum computing and many more.

2. BASICS OF IIoT

IIoT is a network of intelligent devices such as interconnected sensors, actuators and many other smart devices that interact with people, products, and things to make the industry fully automated. An industrial ecosystem consists of:

1. Connected devices with sensors which can communicate and store data;
2. Data communication network (public or private);
3. Storage space for data generated by IIOT devices;
4. Analytics and applications that generate useful business information from raw data;
5. People.

A network of these highly intelligent assets and edge devices transmits information directly to the data communication infrastructure, then transforms it into actionable information. This high-end analysis leads to business optimization practices and benefits predictive maintenance. Physical objects like sensors, machinery, devices, buildings, and others can be connected together to form an information network. These interconnected objects work together to achieve a task. Such an arrangement is called the Internet of Things (IoT). Transportation, healthcare, smart homes, smart cities are its various use cases. Semantically IIoT is a technology, while Industry 4.0 combines the power of state-of-the-art technologies with traditional industries, is more associated with some form of economic effect. The concept of Industry 4.0 emerged from IIoT.

3. HISTORY OF IoT AND IIoT

The IoT was officially named in 1999. The Carnegie Mellon University (CMU) introduced a Coca-Cola machine in the 1980s. This machine was using the concept of IoT. The refrigerated appliance would connect via the internet to check the drink availability and temperature before going there.

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