Development Internet Of Things For Smart Factory In PT Wik East Batam

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Abstract. Industrial Internet of Things (IIoT) combines a network of machines and devices with increased intelligence and is defined through software. The purpose of this research is to find out how to read sensors in all production machines in a molding department, how to convert and store data from production machines to databases, how to display in web applications and read by all devices for decision making materials and to find out the added value obtained by the molding department with the Internet of Things. The method used uses the SDLC method: planning, design analysis and implementation. The results of his research that with IoT we can read sensors in all production machines in a molding department, can convert and store data from production machines to a database that will become big data, can display in web applications and read by all devices for decision making materials and can get added value such as interconnection, information transparency and decentralized decisions.

1. Introduction

Internet of Things (IoT) describes a system where objects, sensors, and software are connected to the Internet through wireless and wired networks. This enables added value and services by exchanging data with producers, operators or other connected devices. ITU (International Telecommunications Union) defines IoT as a global infrastructure for the information society, which enables continued services through interconnection (physical and virtual) based on the existing and growing interoperability of information and communication technology. In 2010, the number of devices connected to the internet exceeded the number of people on this planet. In 2020, devices connected to the Internet are estimated at 50 billion [1].
Considering these large changes in the IoT environment, it is very important to combine sensor technology with network infrastructure. Besides, it is also more important to demonstrate the feasibility of IoT technology in the manufacturing system factory environment. WIK was founded in the early 50s and is a designer and manufacturer of electrical appliances. They have created and developed hundreds of system solutions and produced millions of products. With more than 6,000 employees including 350 engineers, WIK has turned into a comprehensive global service and manufacturing development partner to many leading international brands. Wik Group has 4 branch companies with different functions.

Table 1. WIK Group Branch

| No | Branch                                           | Address          | Activity                                                                 |
|----|--------------------------------------------------|------------------|--------------------------------------------------------------------------|
| 1  | WIK - Entwicklungs- und Service-Gmbh & Co. KG    | Essen, Germany   | Innovation Center, key account management, after sales service          |
| 2  | WIK Far East Ltd.                                | Hong Kong, China | Finance and Customer Service                                             |
| 3  | Shenzhen WIK Domestic Appliances Co. Ltd.        | Shenzhen, China  | Development support, industrialization, manufacturing, logistics        |
| 4  | PT. WIK Far East Batam                           | Batam, Indonesia | Industrialization, manufacturing, logistics                              |

This research will utilize the Internet of Things technology to get to the smart factory at PT WIK Far East Batam. With one way to utilize sensors on all production machines in a molding department. The output of these sensors (analog and digital) will be recorded into the database. The web application will read the database of the results of the production machine in real-time.

The objectives of this study are:
1. To find out how to read sensors in all production machines in a molding department.
2. To find out how to convert and store data from a production machine to a database that will become big data.
3. To find out how to display in a web application and read by all devices for decision-making material.
4. To find out the added value obtained by the molding department with the Internet of Things.

2. Internet of Things
The following article is about performance measurement based on IoT architecture. In general, materials going to the production room will be detected by IoT. Which finally information is stored in the database. This database will be summarized so that you will get a better understanding of what actually happens on the production floor [3].
3. **Industry 4.0**

It turned out that logistics management was also affected by Industry 4.0. As such, we follow a conceptual research approach that is based on a logistical oriented Industrial 4.0 application model as described in the following figure.

![Figure 3. Model of logistics applications based on Industry 4.0](image)

This model includes two dimensions:

1. **Physical supply chain dimensions**: Automatic logistics and control sub-logistics systems such as transportation, moving equipment (for example through unloading trailers or robots) or order processing that interact with each other.

2. **Dimensions of digital data value chains**: Machine and sensor data are collected at a "physical" level throughout the entire physical supply chain. Through the connectivity layer, the data collected is provided for any type of analysis (cloud), which is likely to produce value-added business services.

Currently, Industry 4.0 is based on the Internet and Cyber-Physical Systems (CPS). Cyber-Physical Systems are a new generation of systems that integrate computer and physical capabilities. With a combination of cyber systems and physical systems, users can be tracked and thus be able to communicate with people. The cybernetic system is the sum of logic and sensor units, as long as the physical system is added to the actuator unit [4].

4. **Industry Internet of Things**

IoT devices are now everywhere because they can be found in factories, warehouses, offices, offices, intelligent and automatic machines. Examples of IoT devices used in manufacturing. Increasing the
number and diversity of devices, IoT data and communication exchanges and the need to manage different IoT devices present many challenges for the manufacturing industry. IIoT can manage, monitor and control IoT devices. Which can change from traditional manufacturing, industrial and business processes to high value-added products or services. The proposed IIoT can also be adopted at existing smart factories to optimize the management of smart equipment and IoT devices. It can also improve production efficiency so that it can provide customers with innovative and high value-added products and services [1].

5. Result and Discussion

There are 40 units of molding machines that have different tasks. All machines will be integrated using the principle of the Internet of Things. We want to unite the physical part of the digital world. The management wants the report automatically and in real-time. To take strategic decisions so that maximum production performance and efficiency is also achieved.

Use Case use to communicate at a high level what the system needs to do, and each of the UML diagram techniques for building a program presents functions in different ways, each view having a different purpose. The following is a Use Case of the system to be made.
Class diagram is a type of static structure diagram that describes the structure of a system by showing the system class, its attributes, operations (or methods), and relationships between objects. The following is an overview of the database system.

Testing Web-Based Monitoring Application. Testing is done by running a web application that is in Raspberry Pi. We made the raspberry IP fixed for easy remote. The following is the first appearance after login.

Temperature Sensor Testing. The sensor used is the DS18b20 Digital Temperature module. This sensor has the ability to read temperatures with the accuracy of 9 to 12-bit, the range of -55 degrees Celsius to 125 degrees Celsius with accuracy (+/- 0.5 degC). Each sensor has a unique code with a value of 64-Bit in which each chip, allowing the use of sensors in large numbers only through 1 cable only.

After being installed in the series the researchers tried with the Node.JS programming language. Researchers run and activate the device. So that it displays through the terminal as follows.
Figure 9. Running the Node.js to Test the Temperature Sensor

The temperature sensor will send temperature data once every hour. So that the state of the machine will remain monitored while running. Because of the limitations of this research tool only uses 3 sensors only.

Testing of Production Amount and Status. Researchers make the box so neat and easy to simulate. Actually the PLC output from the molding machine in the company is in the form of a switch. Instead of a machine, we made just a button. There are 3 buttons to calculate the amount of production, these buttons represent each machine.

The added value obtained by the molding department is the existence of the Internet of Things. The following are added values with the existence of the Internet of Things. Machines, devices, sensors and employees are connected via IoT. Wireless communication technology plays an important role in increased interaction because it allows internet access everywhere. Information transparency can be easily implemented. Activated by an increasing number of interrelated objects and people, the merging of the physical and virtual worlds enables new forms of information transparency. Decisions can be made decentralized. Decentralized decisions are based on the interconnection of objects and people and the transparency of information from inside and outside production facilities.

6. Conclusion

The conclusion the researcher took is based on the formulation of the problem that was developed into the results of the study and was discussed. The following conclusions can be conveyed by researchers. IoT can read sensors in all production machines in a molding department. IoT can convert and save data from production machines to a database that will become big data. IoT can display in web applications and read by all devices for decision-making material. IoT can get added value such as interconnection, information transparency, and decentralized decisions.

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