Industry 4.0:
Industrial internet of things (IIoT) and Predictive Analytics

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Introduction

The industrial world is on the verge of entering the next revolution: Industry 4.0. This is going to change control systems architecture, systems connectivity and sensors as we know it today.

A lot of the data from devices will be analysed on the internet and hence the Internet of Things (IoT) will be a big part of Industry 4.0. The field which relates to industrial data to the internet is further referred to as Industrial Internet of Things (IIoT).

The other major aspect of Industry 4.0 is how businesses utilise the data collected and analysed from their systems. This will provide information on important aspects of machine condition, for example premature machine failure. This field is referred to as the machine analytics and forms the basis of the technology that is predictive analytics.

This paper discusses Industry 4.0, the Industrial Internet of Things and predictive analytics in detail with recommendations on how businesses can improve their operations by adopting future forward smart solutions.

Industry 4.0:

Industry 4.0 refers to the fourth industrial revolution. The term was coined by the German government as ‘Industrie 4.0’ and originates from a project in high-tech strategy that promotes the computerization of manufacturing. The first industrial revolution was the mechanization of production using water and steam power. The second industrial revolution then introduced mass production with the help of electric power, followed by the third digital revolution and the use of electronics and IT to further automate production.
The convergence of cheap processing, unending storage, massive bandwidth, near-ubiquitous connectivity, and cloud-based applications is driving new capabilities for gathering information and changing the way we interact with machines and services. The data generated by sensors in this network of connected devices is being collected and analysed, spawning the growth of big data analytics and applications. And the resulting analytics are being used to improve business efficiency, better serve customers and disrupt oldbusiness models.

As it stands, industry 4.0 could be considered as an umbrella with multiple technologies that form the basis of this next revolution. The two major aspects that will be discussed through the medium of this paper include IIoT and Predictive analytics.

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Industrial Internet of Things (IIoT)

Simply put, the Internet of Things is the concept of connecting any device with an on and off switch to the Internet (and/or to each other). This includes everything from cell phones, coffee makers, washing machines, headphones, lamps, wearable devices and almost anything else you can think of. If a device has an on and off switch, then chances are it can be a part of the IoT. A.T. Kearney predicts IoT will lead to a $1.9 trillion productivity increase and $177 billion in reduced costs by 2020, with 26 billion connected devices[1].

Some of the benefits of IoT include:
- Tracking behaviour for real-time monitoring;
- Enhanced situational awareness;
- Sensor-driven decision analytics;
- Process optimization;
- Optimized resource consumption; and
- Instantaneous control and response in complexautonomous systems.

When the concept of IoT is applied to industry it is referred to the IIoT as the data from machines can flow tothe internet and provide real time information to the user about the availability of the machine or help look at the performance of the machine. The data generated from the machines can be used to do predictive analytics, for instance let the factory manager know that they have a machine that is about to fail in the next few days. This information can assist the stakeholders toberready for failures.

Predictive analytics

In order to do predictive analytics, it is important for the sensors and field devices to create meaningful data. This data generated has to address failure modes or process information pertaining to the machine for example, pressure, temperature and vibrations. It is also important to note that the data generated from the sensors has to be easily available and be based on generic protocols (Like https, MQTT) and cannot be vendor specific.

Once the data reaches the cloud, analytical systems act on the information and provide detailed information back to the key stakeholders in the organisation.

Visual analytics: Real time and historic views

It is important for the user of the system to be able to view real-time data and be able to make changes to the process and analyse historical data (both locally and/ or remotely). Armed with all this data in an easy-to-find central location will enable the user to analyse and improve system efficiencies more effectively.

Alarm Management

In today's modern world, virtually everything is controlled and communicated to a smart device such as a phone or tablet. Therefore, the ability for the software to provide users with real-time alarm event information via SMS or emails and/or view a history log of all previous alarms which have occurred directly to their smart device is a must and no longer an optional feature.

Data directly into ERP system

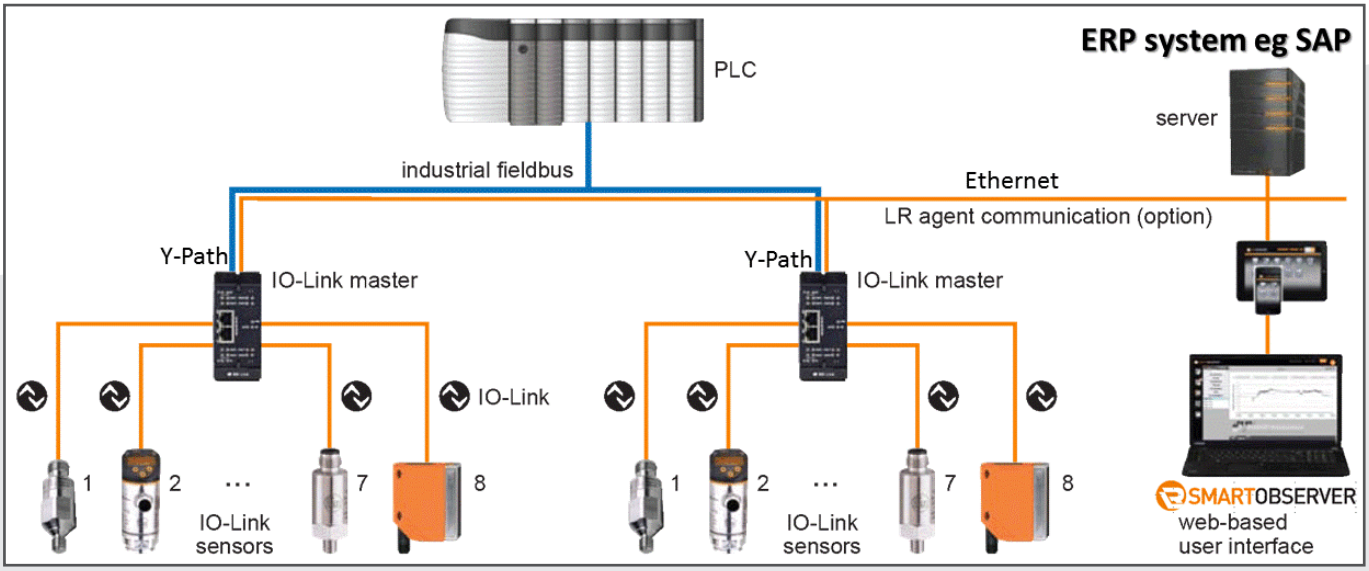
Getting the data into an Enterprise Resource Planning (ERP) system and to the cloud in a cost-effective manner has been a challenge in the past. But with the introduction of unique software offerings, parallel communication between factory floor sensors, Programmable Logic Controllers (PLCs) and ERP is now possible. This communication is classed as Y-Path by ifm efector which is illustrated by the picture below and allows for smart IO-Link sensors to communicate not only with the PLC, but directly with ERP systems such as SAP.

The perfect solution

An out-of-the-box product that addresses the challenges mentioned in this paper and aligns the user towards IIoT, is ifm efector's SMARTOBSERVER software which offers Energy Efficiency and Condition Monitoring via easily customised viewing cockpits.

Results that can be obtained from the software include:

- Live display of the current situation and time series
- Alarm for preventive maintenance tasks
- Trend display and energy consumption measurements
- Alarm escalation strategy
- Time series as a table and graphics with signal limits
- Live status with access to system messages
- Implemented in a web server or alternative installation on the machine
- Production-specific evaluation of process values
- Benefits that can be obtained from the software are:
- Optimisation and reduction of the energy consumption
- Cost reduction in the entire manufacturing process
- Continuous condition monitoring of machines and installations
- Organisation for preventive service and maintenance
- Process reliability of the installations
- Organisation of maintenance
- Quality assurance of the produced products



Summary

Businesses can begin to harness the benefits of IIoT and predictive analysis by adopting smart solutions. As we approach Industry 4.0, there is a pronounced need to implement future forward solutions. The ifm SMARTOBSERVER creates a communication between sensors and systems that enables condition monitoring and preventative maintenance. It is a smart bridging option for modern industrial operations.

REFERENCES

[1] Internet of Things 2020: A Glimpse into the Future, A.T. Kearney. https://www.atkearney.com/web/atkearney-silicon-valley/future-of-the-internet-of-things

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