Edge computing and the Industrial IoT

The industrial sectors are currently undergoing transformation, often labelled as Industry 4.0. Edge computing will be crucial to enabling this change. This article looks at how edge computing supports advanced new use cases for the Industrial Internet of Things (IIoT).

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Overview of edge in industrial IoT (IIoT)

The industrials sectors – manufacturing, oil and gas and mining – are currently undergoing transformation. Often referred to as Industry 4.0, smart technologies and cyber-physical systems (CPS) are fundamentally changing the way people interact with engineered systems in industrials. New advanced capabilities such as predictive maintenance, condition-based monitoring, remote-guided vehicles, and AR/VR are now starting to be deployed on industrial sites.

Edge computing capabilities in IIoT

There are, however, technical challenges in deployed these advanced new solutions. Edge computing will be a key technology for the success of Industry 4.0 by enabling real-time responses, cost reductions, and ensuring the security to data and systems.

The bigger picture: edge in smart factories

Perhaps the most important feature of a smart factory is that it is connected and leverages IoT. This means integrating data across all operations. A truly smart factory will therefore involve unified and real-time communications – this will likely be on an edge platform.

The market today is experiencing disruption; it's not only the big SIs and OEMs (e.g. Siemens, Schneider Electric, Bosch, etc.) who will play a key role. The hyperscale cloud providers (e.g. AWS, Azure, and Google Cloud) are all now targeting the industrials sectors with edge computing solutions. AWS Wavelength, announced at the end of 2019, has partnered with several major operators to combine their edge platform offering with operators' 5G connectivity – the combination of 5G and edge is seen as crucial to enabling smart factory.

3 industrial IoT edge use cases

AR/VR for field workers

Field workers often have to perform complex tasks on the factory floor. The equipment they interact with can be dangerous due to high temperatures or voltages. Sometimes, field workers lack the skills to complete specific tasks.

Augmented and virtual reality (AR/VR) can be used to help both these problems. For instance, AR/VR can provide field workers remote expert assistance, or environmental information about equipment to increase safety. The former involves a field worker in the factory receiving AR assistance to perform complex assembly tasks. A field worker wears AR glasses which provide an overlay of detailed instructions from a remote expert who is able to see the visual environment of the field worker.

Edge computing will be crucial to support this technology. Streaming AR/VR from an edge server eliminates the need for heavy compute on the AR/VR device, something that would make it impractical for reasons to do with battery and weight. Edge-enabled AR/VR is also the only way to meet latency requirements – roughly a maximum of 20ms for VR and 30ms for AR. Streaming the overlay from the cloud would mean much higher latencies and cost of connectivity.

Advanced predictive maintenance

One of manufacturers chief concerns at the moment is decreasing unplanned downtime. According to research 83% of manufacturers continue to be affected by this.

Advanced predictive maintenance can reduce downtime. It involves monitoring data from sensors on equipment to pre-emptively predict when a machine will fail and if there is a need for repair. To perform the necessary data analytics, data from thousands of sensors needs to be collected and analysed. This amount of data is expensive to send to a central server and would therefore benefit from edge. Beyond the economics of

connectivity, localising data on an edge server improves security. In future, when closed-loop automated maintenance will become common, security will be paramount, as vulnerabilities in these systems could be fatal.

Condition-based monitoring

A second want of manufacturers is greater visibility across the supply chain and production line in order to improve overall production time and establish stable, predictable processes that limit product variation. Shop floor operatives want detailed information into both the uptime and quality of the production line, so they can make adjustments if needed.

Condition-based monitoring increases visibility by providing detailed information about the condition of equipment. It involves real-time monitoring of manufacturing equipment using video cameras and analytics. Data about the condition of equipment can then be displayed on a dashboard.

The importance of Industrial IoT platforms

Smart factories require increasingly complex management and gateway systems. This is leading to the growth of Industrial IoT software platforms that move beyond simple device connectivity and can support advanced functionality.

IIoT are increasingly producing large amounts of sensor data. This requires intelligent orchestration of resources, something that IIoT platforms are being used for. Cloud IT services can therefore be appropriately done either at the edge, or else non-latency sensitive data can be sent to the cloud. Other uses for IIoT platforms are analytics and security at the edge, for example. As convergence of IT and OT (operational technology) increases, so will the importance of IIoT software platforms.

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