

LIFTING THE FOG: FOG COMPUTING

July 17, 2018

It is not only the production control systems in companies that are becoming more powerful and intelligent. Even in and at the individual machines and devices, ever more powerful control technology is in operation. The fact that industry 4.0 is not (yet) commonplace in the production halls is partly due to the information technology gap that exists between them. Fog computing builds bridges between both worlds of intelligence - via intermediate gateways, so-called Fog and Edge nodes. Here, the research teams put the latest communication solutions for industry 4.0 into practice.

Hello Dr. Schreiner. You visit medium-sized manufacturing companies with your suitcase in your hand and bring them Industry 4.0. Is that correctly explained?

That's exactly the way it is - at least partly so. Together with our colleagues from the Fraunhofer Institute for Production Systems and Design Engineering IPK, we at the Fraunhofer Institute for Open Communication Systems FOKUS have developed the Industry 4.0 Suitcase in the "Berlin Center for Digital Transformation". We are using it to implement the first IoT applications in existing production environments. Such a "retrofitting" enables real-time condition monitoring, i.e. the monitoring of production facilities and processes. Based on this, for example, predictive maintenance can then be implemented using machine learning methods.



Open Sesame: What's in your suitcase?

First of all, the case contains a piece of hardware, an industrial gateway that can connect via Wi-Fi, Zigbee or Bluetooth interfaces with sensor nodes and via industrial Ethernet networks and Fieldbus systems with the controls of machines and industrial plants. Also included is a set of sensor nodes: Similar to a fitness wristband, which is able

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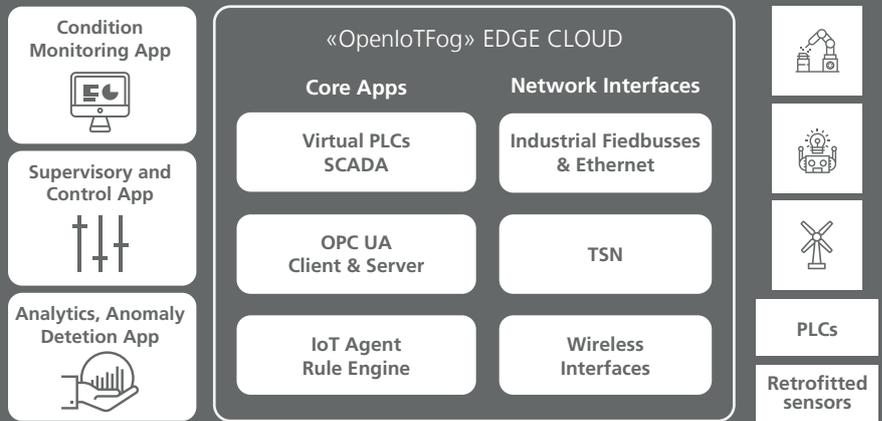
ALREADY PUTTING

THE FUTURE OF

MACHINE-TO-MACHINE

COMMUNICATION

INTO PRACTICE.»



A schematic representation of how "OpenIoTog" works

Picture: Fraunhofer FOKUS

to measure a number of significant parameters, we install a number of commercially available sensor components in the production environment and can use them to measure system states. These include parameters such as acceleration, rotation rate, temperature, magnetic fields, humidity, pressure and more.

So far your industry 4.0 case is nothing more than a kind of sample case of marketable industry 4.0 components...

...if it weren't for the most important thing: The software "OpenIoTog" developed by Fraunhofer FOKUS. This software toolkit is pre-installed in the Industry 4.0 case and ready for use on the gateway. With this "Fog Node" (or several) we establish a central component of future Industry 4.0 network architectures in the factory halls. The Fog nodes can be easily integrated into existing industrial networks and are able to read and actively control plant controls via standards-based interfaces. Similarly, a connection to a higher-level production control system such as a Manufacturing Execution System (MES) can be easily implemented.

The collection and analysis of plant data is completely handled by the software of the Fog node. With condition monitoring, for example, the OpenIoTog gateway can stop production before damage occurs if critical values are exceeded. And a tablet can be used to control the IoT functions of the node or to call up evaluations of the measured sensor data at any time.

However, the next generation of machine controls will already have industry 4.0 intelligence integrated into them. Won't the Fog nodes become superfluous?

I am convinced that Fog computing will be a decisive building block for industrial 4.0 production environments. And for three reasons: Firstly, the Fog nodes create gateways that can be easily integrated between the plant hardware and the production control cloud. This gives us the flexibility we need to seamlessly link old and new installations and flexibly configure constantly changing production environments.

Secondly, our software "OpenIoTog" is not limited to the use in commercial gateways and industrial PCs. It can also be installed on industrial controllers, for example, to use them as "TSN endpoints" according to the specifications of the Time Sensitive Networking (TSN) standard. Fog computing can also be used to operate virtual, programmable logic controllers, which can control machines just as reliably as the hardware-based PLC systems commonly used up to now. Above all, this virtualization has one big advantage: it is much more flexible in maintenance. And thirdly, we implement our solution according to the current, real-time specifications of the OPC UA standardization. We are thus already putting the future of machine-to-machine communication into practice. The versatile and flexible Fog nodes support companies in implementing Industry 4.0 step by step. This is a decisive point for us and the companies: Because they don't have to invest in systems that may be outdated tomorrow. Rather, they are building the basis to benefit sustainably from the advantages of evolution towards industry 4.0.

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