RESEARCH NEWS

Fraunhofer at the Hannover Messe 2022

Production control with the Fraunhofer Edge Cloud

Today, public cloud systems can be used for outsourcing computationally intensive applications and storing large amounts of data. However, these systems are not designed for millisecond-accurate control of machines in production environments. They are not freely configurable and are difficult to connect to real-time-capable networks. The Fraunhofer Institute for Production Technology IPT has developed the Fraunhofer Edge Cloud in collaboration with other institutes and its partner German Edge Cloud to show companies how they can use local cloud systems to monitor their machines and plants and exchange sensor information. The hardware and software architecture of the Fraunhofer Edge Cloud will be showcased using various example applications from May 30 to June 2 at the Hannover Messe 2022 at the joint Fraunhofer booth in Hall 5, Booth A06.

Today, it's a matter of course for people to store data in the cloud – images or documents, for example. Cloud technology has also made its mark on the industrial sector. For example, to maintain wind turbines remotely, it is perfectly normal to store operating parameters and measured values from sensors in the cloud. In production environments, however, cloud technologies have not yet achieved widespread use. One reason for this is that many companies are reluctant to store their valuable machine and manufacturing data outside their own company. The other reason is that conventional technology is not capable of sending data back and forth in real time.

Data security guaranteed

In most cases, therefore, machines and industrial robots are still connected via cables to the control center, which monitors them or switches them on and off. They only ever do what they are programmed to do and are generally inflexible. If machines are required to take on new tasks or manufacture new products, technicians usually have to head out with a laptop to install new software or design templates onto the machines. This is not what flexibility looks like. As part of a research project, therefore, Fraunhofer IPT has developed a cloud solution tailored to the needs of the production sector — the Fraunhofer Edge Cloud, which can control the production process on site at the factory or at several locations at the same time. Unlike the conventional global cloud, the Fraunhofer Edge Cloud keeps the data in the hands of the production companies. This way, data security is guaranteed. At the Hannover Messe from May 30 to June 2,

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2022, the Fraunhofer Edge Cloud will be showcased across several exhibits at the joint Fraunhofer booth in Hall 5, Booth A06.

Simultaneous software updates across all machines

"An edge cloud like this is beneficial for companies in a number of ways," says Pierre Kehl, an expert in edge cloud solutions and Group Manager for Digital Infrastructures at Fraunhofer IPT in Aachen. "For example, it allows entire machine parks to be controlled securely and quickly using centralized software. If the machines require updates or new software versions, these can simply be installed centrally. That saves the technicians on site from having to do a lot of running around." Kehl also explains that the machines are able to send their current operating parameters and sensor values to the edge cloud. The Fraunhofer project team is currently developing, among other things, intelligent analysis software that detects conspicuous vibrations, which can give indications of impending damage. In this way, a fault on a milling or grinding machine can be detected before anything untoward happens.

Processing data in real time

Thanks to the fast mobile communications standard of 5G, all of the necessary data can be transmitted between the cloud and the machines in fractions of a second. Time-Sensitive Networking (TSN) is also used to send data in real time. This allows swift work processes to be controlled securely and centrally from the cloud. The benefit here, once again, is that changes to the production parameters can be transmitted to the machines via the cloud. Over the course of the Hannover Messe 2022, the Fraunhofer partners will demonstrate how the cloud works using an exhibit in which four actuators juggle a ping-pong ball together on a plate. The position of the ball is recorded by a camera and transmitted to the Fraunhofer Edge Cloud, which then sends commands to the arms within milliseconds. The highlight is that two of the arms are connected to the Fraunhofer Edge Cloud via network cables and TSN, and the other two communicate with it via 5G and TSN. Kehl explains: "By doing this, we're showing that it is possible to combine wired communication with wireless standards as part of a control system."

Testing production solutions with the Fraunhofer Edge Cloud

Fraunhofer IPT offers small and large companies that are interested in an edge cloud solution the opportunity to develop and simulate application scenarios with the aid of the Fraunhofer Edge Cloud. "This allows companies to test the potential that the solution has for their production environment in a secure setting without having to invest in edge cloud technology right away," says Pierre Kehl. One of the development partners is the company German Edge Cloud, which provides the technology – for example, adapters for retrofitting, which enable the machine controller to communicate with the cloud via 5G and TNS. The software solutions, on the other hand, come from the Fraunhofer institutes that are involved in the project. The fact that companies are

able to collect data centrally in their own edge cloud also offers them the advantage of being able to use the information for other purposes – for example, to optimize production or to make processed data available to others. Machine manufacturers, for example, may have an interest in learning more about how their machines are performing at their customers' sites so that they can refine their technology.

Fraunhofer IPT will be presenting the first functioning prototypes of the Fraunhofer Edge Cloud at the Hannover Messe in Hannover from May 30 to June 2 at the Fraunhofer-Gesellschaft communications booth in Hall 5, Booth A06.

Fig. 1 Possible areas of application for the Fraunhofer Edge Cloud.

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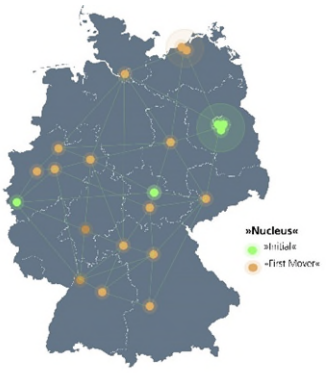

Fig. 2 Fraunhofer Edge Cloud locations.

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