Interview

Dr. Olaf Sauer
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Industry of Things World 2015 and **Olaf Sauer** discuss the future of the Internet of Things prior to his talk at the event September in Berlin.

Industry of Things World:
Where do you see the IoT and its technologies creating the most impact?

Olaf Sauer: The main impact will be in new services built around manufacturing equipment. German manufacturers will not be able to do without those value-added services. They ensure customer loyalty and provide additional benefits that exceed the mere machine level. One example is the Internet-based access to equipment for maintenance or software update purposes. These services, however, are only the first step. It seems very likely that manufacturers of machinery and equipment will provide APPs relating to their equipment, allowing users to access or even operate the machines using mobile devices, for instance. It is, for example, conceivable that the machine itself could calculate performance indicators concerning its availability. One thing is for sure: These additional services will enhance the global competitiveness of the German mechanical and plant engineering sector. A survey performed by the Fraunhofer IFO Institute on behalf of the European Commission has found that machinery-related services add new value and thus provide jobs for highly-qualified staff. In addition, services relating to machinery pave the way for new business models that are less susceptible to fluctuating sales volumes and investment cycles.

Industry of Things World:
How are CPS (cyber physical systems) impacting Industry 4.0 concepts?

Olaf Sauer: CPS are a prerequisite and an enabling technology for Industry 4.0. Besides existing sensors, actuators and embedded systems also pure mechanical components, which have no "intelligence" yet, will become part of the internet of things by CPS. These CPS are going to be developed within companies that used to be pure machine builders or component manufacturers.

Industry of Things World:
Where do you see the biggest challenges in your field at the moment in terms of adoption of IoT?

Olaf Sauer: From my point of view, the biggest challenge is not a technological one, but an organizational one. There is still a gap between 'traditional' machine builders and IT companies. Both parties have to learn from each other: the IT companies need to understand that nobody in manufacturing will buy a new machine because it provides a nice IT interface. Manufacturing follows lead time, product quality and costs. IT providers have to address these goals with their technologies. For people in manufacturing, the IT is just a tool like any other piece of equipment. On the other hand, machine builders should open their equipment for IT components, because delivering even world class machining will not be enough.

Industry of Things World:
How do you see the next 5 years evolving?

Olaf Sauer: Within the next five years, we have to find solutions for the following two challenges, among other things.
First, the challenge of interoperability: Products, production plants and processes, their controls and directing applications will increasingly use internet technologies in the future. However, they evolve independently from each other. This is why, tomorrow, and beyond, the manufacturing sector will need methods, tools and software components to synchronize these three essential areas of manufacturing enterprises and the supporting IT systems, namely PLM, digital factory and MES. To ensure a consistent data exchange between machines and IT systems, standards for the secure communication within the factory are required, such as OPC UA, a widely recognized and increasingly used communication standard for manufacturing organizations. Moreover, there is a need for interoperability within

individual machines or production installations. These are composed of mechatronic elements, providing the basic information about the geometry, kinematics and logic of the installation. Since every mechatronic component contains some software-relevant parts which take the form of embedded systems or control code, the question of interoperability and consistent data management arises in this context too.

Second, the challenge of smart data: The existing volumes of data resulting from shop floor-related IT systems and the operation of plants, both of which are supplied by sensor data, contain hidden treasures waiting to be discovered – opening up potentials for cost efficiency and improvement. The increasing complexity of modern production plants results in a greater need for the automatic recognition of anomalies, of wear and tear and of defects in equipment. Today's data mining methodologies provide a first strategy to master the unprecedented volumes of data. In order not to overwhelm users with all the information delivered by the individual systems of a factory, the information must be made available in a role-based and distributed way. This means that all the users receive just the information they need to complete their tasks. To this end, every specialist unit has to be enabled to generate its own view on the basis of the role it has been assigned, allowing for a consistent visualization and modification in line with those of the other disciplines. So there is some work to do within the next five years.

Industry of Things World:
What are the most critical pieces missing today that will be needed to support this sort of computational ubiquity?

Olaf Sauer: People who understand both manufacturing and ICT's possibilities. This species is very rare.

Industry of Things World:

Will the IoT enable new business models or new business applications?

Olaf Sauer: Sure it will, but each company must develop a clear roadmap for its own IoT business. The survey we performed among a large number of enterprises in the mechanical engineering sector has found that some of them are already testing the additional IT-based services. However, this testing procedure is not as systematic as an engineering-based approach would suggest. A study by our colleagues from Fraunhofer IAO has shown that merely 25% of mechanical engineering enterprises have an explicit strategy regarding the Internet-based services they want to establish and enhance. Just 20% of these enterprises have an appropriate business model in place. Consequently, there is still need for action, particularly because software will evolve into a full-fledged part of the product portfolio in the future, including the associated challenges ranging from a professional software engineering process, quality assurance for software, models for software maintenance and service to the adaption of a sales organization which is able to sell ICT products and their benefits. The process of acquiring machine-related additional services can be compared with the development and production process of machinery or equipment. Against this background, we are very astonished that the 'try and error' principle seems to be applied when it comes to software.

Industry of Things World:

How are you at Fraunhofer implementing/ taking advantage of IoT?

Olaf Sauer: Fraunhofer and especially my institute, IOSB, has many years of experience in the design, development, roll-out and implementation of complex software systems in the manufacturing industry. In a large number of projects we performed for the manufacturing industry, we have repeatedly proved and stated that the underlying architecture of software is a decisive factor for the performance and service life of an IT solution. Today's software components such as portals for the remote access to machinery and equipment are complex solutions which, therefore, have to be designed in a professional way with the coding of the mere software program playing a minor role only.

One example is that we support the mechanical engineering sector in ensuring and/or enhancing machine-to-machine (M2M) communication. The associated software solution enables the machine to respond to commands and to fulfill tasks largely independently. What is more, it can interact with other machines or components. This includes the remote control of a heating system by means of a mobile device while on the move, the access to energy consumption data of a production plant or an infrared transmitter acting as a motion detector automatically activating specific monitoring systems and alerting the security staff by providing the collected information. Against this background, IoT opens up new opportunities for applications in mechanical engineering such as condition monitoring, remote maintenance and decentralized energy management. In addition, it will call for new approaches to architecture, communication and information management.

Industry of Things World:

What expectations do you have regarding the Industry of Things World 2015? Which outcomes and benefits do you expect to gain from the exchange with participating companies?

Olaf Sauer: I would like to learn what happens in other parts of the world, especially in China and the U.S. I am personally involved in the South Korean development and they watch very carefully the activities of the German Industrie 4.0 program. I would like to find a key to how a nation can maintain and strengthen its mechanical and plant engineering industry. We need a strong industrial basis for future turbulent periods because whoever manufactures and provides the production equipment also ensures that the added value resulting from this equipment remains in the country.

Industry of Things World:

Which burning questions or challenges would you like to discuss within the Industry of Things World community?

Olaf Sauer: How can we come to an increased level of resource efficiency? If we carry on in the way we are doing our business now, we will need 5 earths to survive. Even if all of us would go by bicycle and consequently recycle everything, we would need 4.5 earths according to Carl Friedrich von Weizäcker.

Industry of Things World:

Shout-outs: Any sites/people/articles or books that have inspired you lately?

Olaf Sauer:
Sites
> Dweet.io
> Phonebloks

Article:
Dr. Stefan Kowalewski, RWTH Aachen: Cyber-physical Systems- A UMIC Perspective

Books

The Industry of Things World team thanks Olaf Sauer for his insights and is looking forward to welcoming him as a speaker at:
   www.industryofthingsworld.com

About Olaf Sauer:
Dr. Olaf Sauer studied Industrial Engineering at the Karlsruhe Technical University. After two years in a small company in Karlsruhe he moved to Berlin where in 1996 he took his PhD in Production Engineering from Prof. Spur. After his time at the Fraunhofer Institute for Production Systems and Design Technology (IPK) he became part of Bombardier Transportation, where he was in charge of the introduction of the Digital Mock-up and first applications of digital manufacturing. After his time at Bombardier Dr. Sauer started his own business within the METROPLAN group dealing with production and material flow planning, manufacturing control and logistics, e.g. for DaimlerChrysler, smart, the GEA group and STILL. 2004 he joined the Karlsruhe-based Fraunhofer IOSB, where he was in charge of the business unit production monitoring & control until 2011, developing, supplying and maintaining the ProVis-familiy, a suite of MES-tools that e.g. monitor and control manufacturing facilities at the Daimler plants in Bremen, Woerth and partly Sindelfingen. Today he is deputy head of the institute and in charge of business development, marketing & sales for Fraunhofer IOSB's automation business at three sites. He is member of Industrie 4.0 related committees and holds a teaching position at the Karlsruhe Institute of Technology (KIT).