MindSphere

From the Internet of Things (IoT) to the Internet of Energy (IoE)

Successfully implemented under the term Industry 4.0, for example when machines and processes are intelligently linked with each other so they can work more efficiently and reliably throughout their entire service life, this approach is now entering the fields of energy industry and power engineering.

The "Internet of Things (IoT)" describes a communicatively networked system of so-called things with the aim to make the information from the individual components in the network available to all other participants simply and quickly. But simply networking things and generating data alone does not add any value. Data can only provide meaningful insights when combined with smart processing, display and analysis. This enables more efficient processes and realizing services which before could only be implemented with a lot of effort or were even impossible at all. Now, new applications are developed on a daily basis, which are based on an abundance of data and which, thanks to smart processing and data analysis, deliver added value that has not been obvious until now or even did not exist at all.

The Internet of Energy (IoE) is becoming a reality

The IoE is a networked system of partly smart energy infrastructure components, e.g. generation plants, loads, storage, energy meters, equipment like circuit-breakers, transformers, etc. Thanks to the communicative networking of the components and together with modern IT technology (e.g. cloud computing), the ever increasing requirements of modern energy supply systems can be fulfilled. In addition, new applications and services are implemented, which in turn contribute to making energy supply more economic and sustainable (**Figure 1**).

So-called "smart grids" deliver a quantity of data that enable important insights by using smart analyses, e.g. condition of the network. The energy revolution, in particular, with the use of increasingly distributed renewable energies and the increasing volatility of the resources, poses new challenges to the entire energy sector. The use of IoT technologies offers grid operators the opportunity to adapt to the relevant conditions and take suitable action – always with the aim to optimize operational efficiency.

Efficient maintenance and service

This technology offers, among others, new opportunities to improve maintenance and servicing of investment goods and make them more cost efficient. Undoubtedly, the care and maintenance of the different parts of equipment of an energy system, e.g. primary elements like circuit-breakers and transformers, but also secondary elements like protection and automation devices, can cause substantial costs. Actions taken to extend the service life of equipment are particularly important for these investment goods, because they do not only delay expensive refurbishment, but can even prevent them completely for a certain time.

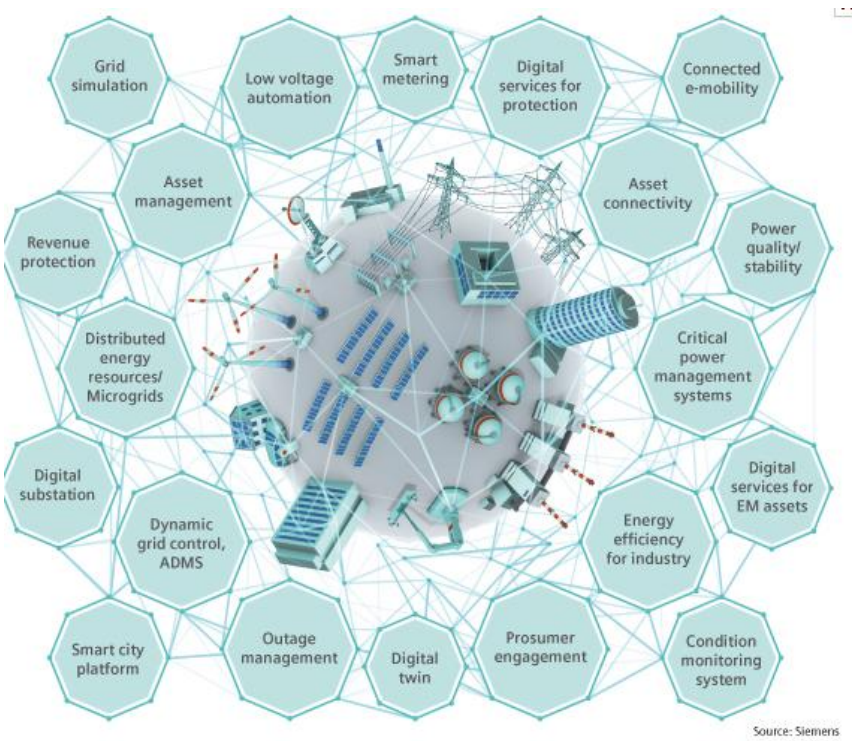

Figure 1: IoT in the energy sector offers a broad range of possible applications

So-called smart equipment or equipment with communicative sensors makes a wide range of data available. Intelligently linked, it contributes to an improved evaluation of the equipment status. Based on the analysis data, preventive maintenance and service including circuit-breaker or transformer monitoring, for example, can be implemented, which will only trigger action when it is really necessary (**Figure 2**).

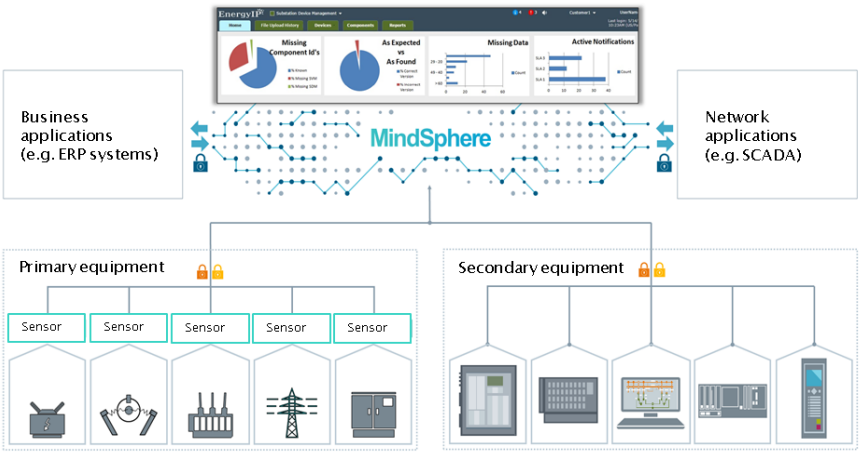

Figure 2: Modern asset management based on IoT technologies

Prerequisites for the internet of energy

Vendor-neutral communication standards are an important prerequisite for the internet of energy. These standards alone can ensure the vendor-neutral communication capabilities of all components and the value adding use of the information. From today's view, the communication standard OPC UA PubSub already provides the required services for the future-proof implementation of new applications in the field of power supply.

The safe transmission and processing of the data plays a particularly important role, as particularly large volumes of data have to be communicated and processed. It must be absolutely impossible to falsify or manipulate data, and in addition it must be ensured that the overall system cannot be compromised in any way. To achieve this, modern cyber security technologies and standards must be applied, which ensure a maximum degree of safety on all levels.

Finally, scalable IoT platforms based on state-of-the-art IoT technologies with sufficient performance capacity are necessary. They must be able to integrate and process a multitude of assets with a substantial volume of data in a safe and highly reliable way. Standard operating system services like data base, user administration, support of mobile end devices as well as open application programming interfaces (APIs) ensure solutions that can continuously be adapted to the relevant requirements throughout their entire service life.

MindSphere – the solution for the IoT in the energy sector

MindSphere, the open IoT operating system from Siemens, delivers the basis for the successful digital transformation in the energy sector and the realization of profit-making new applications. A wide range of assets can be safely integrated with the IoT platform from Siemens. It also comes with comprehensive analytics tools and a development environment for the realization of new, customized applications for all users.

Applications like the Mobile Dashboard quickly provide the user with relevant information on the current operating state and the geographical location of the field devices (**Figure 3**). This makes it possible to take rapid, targeted and appropriate action.

Figure 3: Example for a field device monitoring application

Summary

It was only a question of time until IoT technologies entered the energy sector. Although they may be new to this field, the first solutions prove that the technology makes a positive contribution. Data which were unused before can now be utilized and deployed to increase profits by optimizing processes. So-called IoT platforms ensure that assets can be quickly linked with each other, regardless of their manufacturer, and guarantee the smart processing of the derived information. Tailored applications visualize the assets for the user. This opens up many new opportunities to realize solutions and services in the energy sector, which help the user manage the constantly increasing requirements for modern power supply.

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