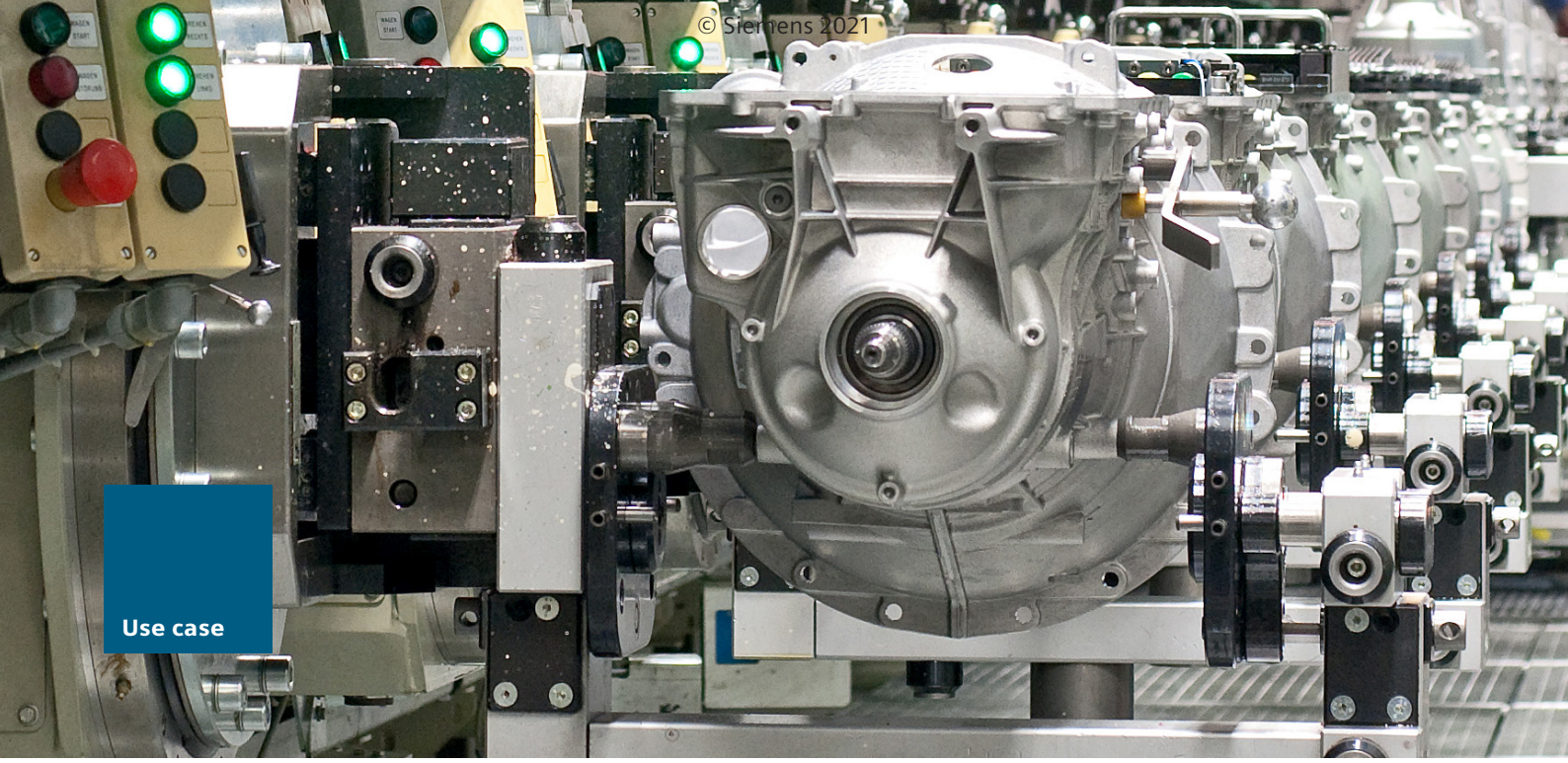

Use case

Digital Connectivity – the decisive factor for predictive quality

What if you could do without the final quality check?

The idea: Already during the production process, measurement and test data is collected and then evaluated in the cloud in order to forecast the quality level being achieved. This data can be, for example, test information of the individual processing steps, camera images of the workpiece, as well as additional information from IT systems regarding typical rejection reasons, parts suppliers, and much more.

The basis of such an idea is the networking of the sensor and automation data with the information from IT systems already during the production process. From the field level, various measurement values are connected via a connectivity layer to platforms with their data lake. Sensors retrieve measurement and test values of the workpiece (e.g., electrical parameters, dimensional accuracy, or even a photo) as well as collect process parameters (temperature or vibration at the individual processing stations). SIMATIC MV500 2D code readers or SIMATIC RFID readers are used to assign the data to the correct workpiece.

Can the production time for workpieces be reduced by omitting the final quality check? Thus saving time and money and perhaps even achieve a higher level of quality? What was previously unthinkable can be realized through the new concept of “predictive quality”.

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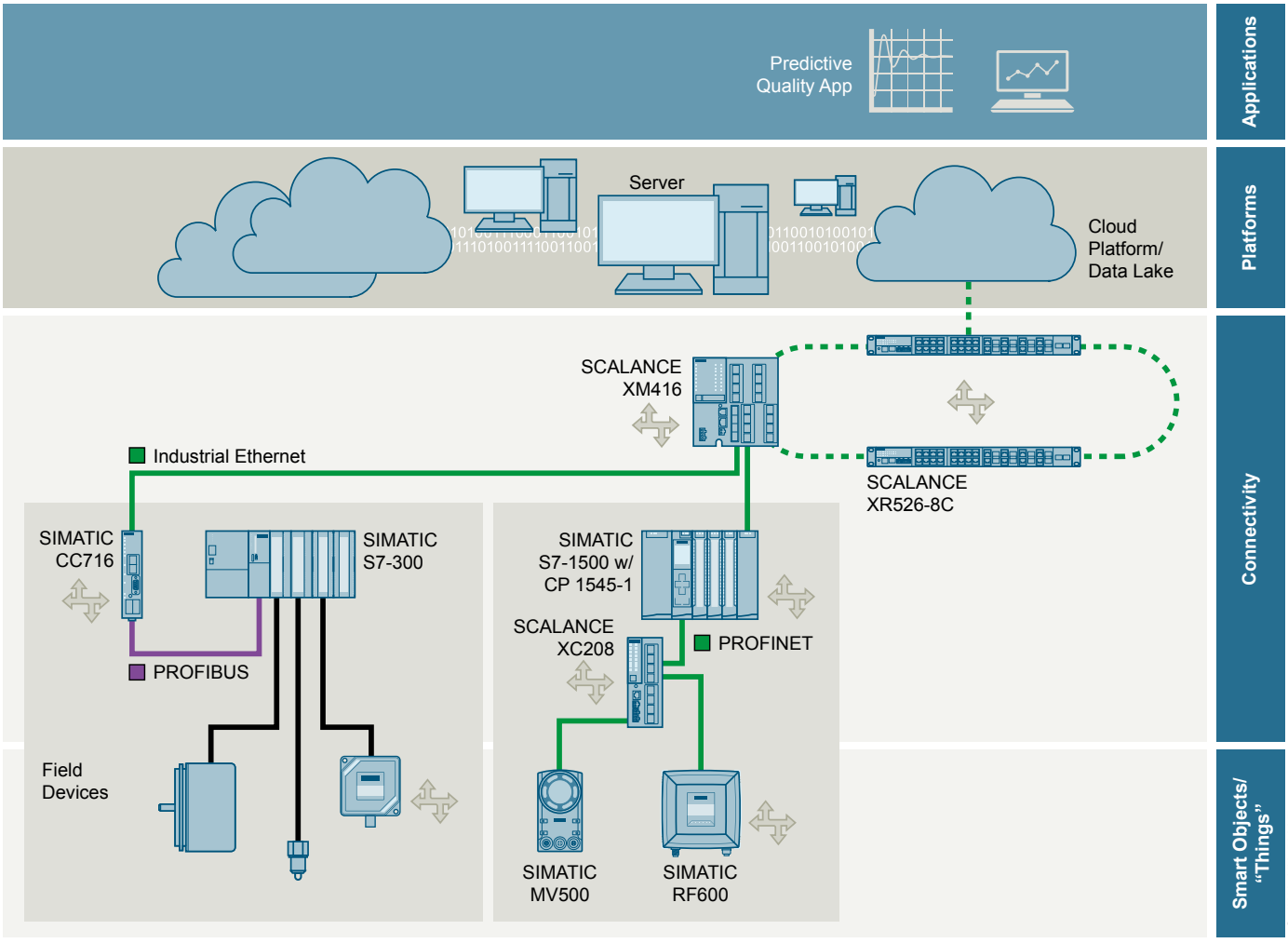

Many of the required sensors are present in the machines as OK/not-OK statements are already made today at each processing step. Since these sensors are usually associated with a programmable logic controller (PLC), their data can also be retrieved from there. The advantage: through the process logic of the PLC, the process context is taken into account as well, for example, whether a machine is in productive operation or in maintenance mode. The relevance of the data is thus significantly improved. Data transmission is ensured either by a SIMATIC CP 1545-1 communications processor for the SIMATIC S7-1500 or the SIMATIC CloudConnect 7 Industrial IoT Gateway for the SIMATIC S7-300. The event-driven MQTT protocol allows the connection to cloud platforms of different manufacturers, for example, MindSphere.

However, network separation is important for safeguarding maximum machine availability. If the data for predictive quality is transported via a separate network segment, a machine or plant can still produce even if there is a fault in the higher-level network (although every product must then be checked again at the end). The transition between the cell network and the cloud connection is especially protected by a firewall: either using a SCALANCE S Industrial Security Appliance or through the firewall integrated into the CP 1545-1 communications processor.

In addition to networking, the formatting of the data and its semantic context are particularly important. For instance, each variable requires a symbolic identifier, an object hierarchy, a data type, a valid value range, etc., so that further

processing without specific engineering knowledge from automation can take place in the platform. Ideally, semantics are even standardized across manufacturers. As modeling tool, the OPC Unified Architecture (OPC UA) lends itself. This data architecture is becoming increasingly widespread and provides all the necessary means of description and communication. Even at the field level, OPC UA models can be employed, e.g., with the SIMATIC RF600 RFID systems.

In the cloud, the evaluation of the measurement and test values now takes place combined with information from other IT systems: data on product returns, information from suppliers of individual components, and much more. The determination of previously unknown correlations with Big Data or even a learning AI system deliver a forecast of the actual product quality, which goes beyond the mere measurement of tolerances. This result, though, must also be communicated back to the production line in order to sort out a questionable workpiece and to reanalyze the problematic parameter more precisely. The Industrial Internet of Things (IIoT) therefore does not remain a one-way street when it comes to real benefits in terms of cost, cycle times, and product quality.

Digital Connectivity – the decisive factor for predictive quality

- High-performance and flexible network architecture
- Transmission of field data to the cloud and back to the controllers
- Assignment of measurement and test data to products via code reading systems or RFID
- Maximum data security thanks to VPN and firewalls

Security information

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept. For additional information on industrial security measures that may be implemented, please visit **https://www.siemens.com/industrial-security**

Siemens AG
Digital Industries
Process Automation
Östliche Rheinbrückenstr. 50
76187 Karlsruhe, Germany

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