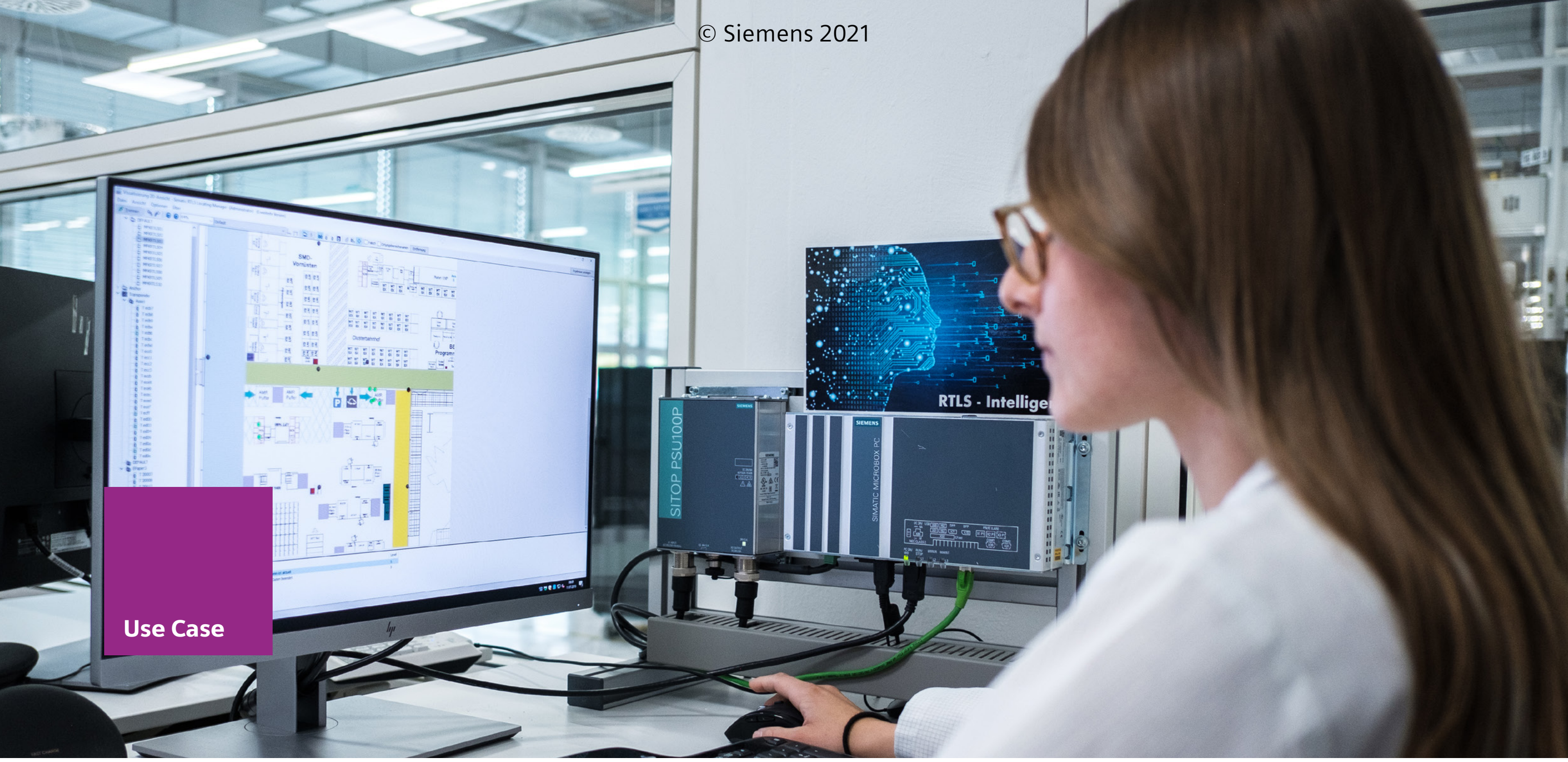

Use Case

Digital Connectivity – the decisive factor for data-driven factory management

What if production planning was carried out dynamically and in real time?

What if the entire factory was controlled dynamically and in real time instead of constantly having to react to changes with a rigid production plan? If, e.g., a production order is only started when the material is actually on site? Or parts are ordered automatically and consumption-based? The answer: an end-to-end and comprehensive integration of the data sources combined with technologies for real-time tracking of mobile assets.

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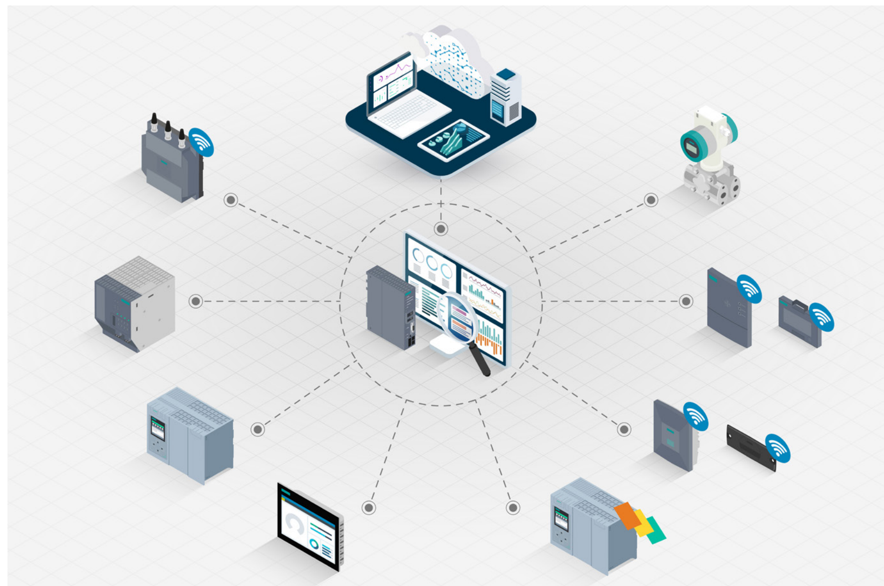
The idea:
The hierarchical architecture of the automation pyramid is designed to distribute production orders from top (control level) to bottom (field level). Network effects are difficult to represent in this way since the data is always aggregated from level to level until the relevant information actually comes together. In addition, information is often missing if certain processes are not covered by the automation.

In the data-driven factory – in addition to the IT systems – sensors, controllers, and mobile objects at the field level are also used as information sources and, depending on the communication performance, connected directly via the SIMATIC S7 as an aggregation element or via technologies such as RFID or RTLS. A comprehensive communication network makes it possible to access any information from any level. This enables, e.g., the consumption data of a power supply not only to be monitored locally, but also to be incorporated into the higher-level maintenance planning. Furthermore, this comprehensive structure allows data to be accessed that was not considered relevant for higher levels when the automation solution was created (e.g., a temperature sensor). Via the platform level, the information is made available to all relevant applications, which implement the respective use cases on the basis of this data. The data-driven factory thus enables a step-by-step learning of which information can be capitalized on. This Industrial Internet of Things (IIoT) thus provides the basic information for a data-driven management of the processes.



In the industrial IoT, all automation components and smart objects are flexibly linked together and connected to cloud systems.

What does this mean specifically for production management? In the data-driven factory, for example, a production order is not simply put into production but automatically reconciled with the actual availability of the material at the assembly site. This eliminates search and waiting times, which can be utilized productively instead. By integrating predictive maintenance, it is possible to synchronize unplanned maintenance work with production planning in advance. Ultimately, the IIoT architecture provides the basis for new factory layouts, in which only a loose coupling between individual machinery exists instead of a fixed production chain. The control and the coordination of machine utilization, mobile transport vehicles and robots, material flow, and employees are crucial here – and can only be regulated by means of “real-world information”.

Which technologies and concepts are required for this?

- **Mobile machines and robots**
  Industrial Wireless LAN (IWLAN) and Industrial 5G are used for the communication between mobile machines and robots. Here, 5G in particular will offer an infrastructure that also meets real-time requirements/offers with significantly greater bandwidth for the implementation of complex applications (e.g., use of autonomous transport vehicles on a large scale).
- **Integration of assets without communication capability – things become smart objects**
  Radio frequency identification (RFID) and real-time locating systems (RTLS) for the connection of movable assets that possess no communication capability themselves, e.g., material boxes, intermediate products, and tools. RFID enables direct identification at machines or transfer points and – when using smart labels – can also serve as permanent identification. RTLS offer identification and localization in real time and – when using display transponders – can also enable new ways of human-machine communication.
- **Predictive maintenance**
  Sensors and field devices supply data from machinery and equipment on site. Intelligent devices – such as power supplies with communication capability – can feed the data directly into the factory management, e.g., to collect power consumption profiles. Since many sensors are already connected to a programmable logic controller (PLC), the PLC can also be used as a "data collector" via suitable modules.

Core of this architecture is a high-performance and flexible network infrastructure that meets the special requirements of OT (availability is the top priority with tiered quality-of-service levels) supplemented by a management platform for operation, diagnostics, and optimization.

Data captured in this way can be used in different architectures and applications. Edge devices process this data close to the process. A cloud-based solution with Data Lake enables comprehensive evaluation and is the basis for factory management. In addition, data can be distributed across multiple locations and even across company boundaries. This also allows suppliers and customers to feed the demand or delivery information into the data-driven factory system in real time.

Digital connectivity – the decisive factor for data-driven factory management

- Supplementing the factory management by the processing real-time data
- Continuous feeding of the digital twin with information from the field level
- Network infrastructure for flexible data feeding at all levels
- Integration of customers and suppliers

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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 **www.siemens.com/industrialsecurity**

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