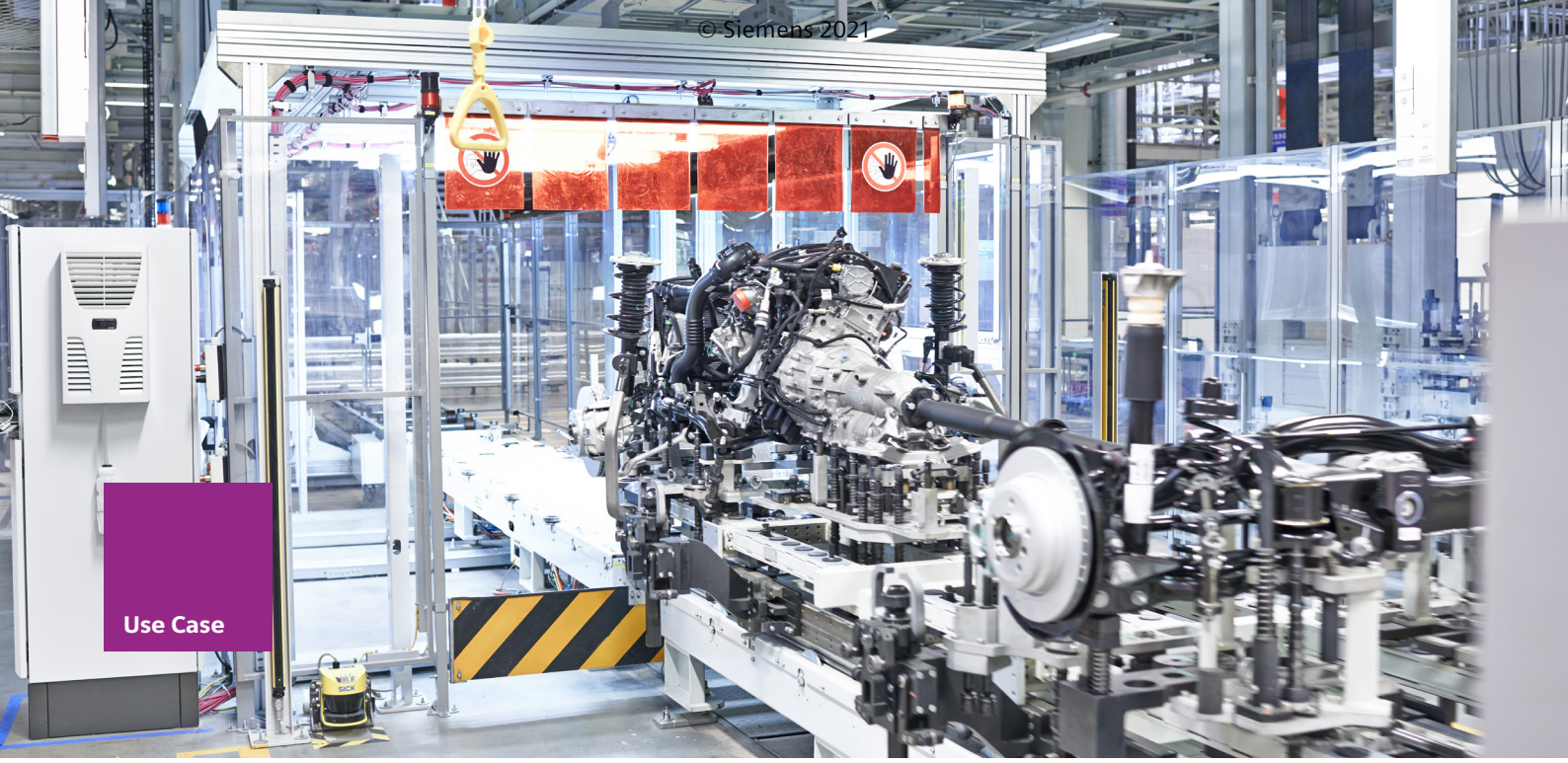

Use Case

Digital Connectivity – the decisive factor for digital production files

How about getting all information at the push of a button?

In modern factories, there is a wealth of data and information in production processes, in logistics as well as from suppliers. And increasingly also data concerning environmental conditions such as temperature, humidity, pressure, and vibration. A so-called digital production file contains all required data and information. Practically at the push of a button – easier than you think. For each product, the digital production file individually provides information about production steps, materials used, test results, and much more. It is based on the principles of the Industrial Internet of Things (IIoT). It offers many advantages and can already be implemented today!

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The idea:
Data and information must no longer be tediously put together from different information sources. A digital production file always gives you complete transparency – about what is happening in your factory. Tailored analyses, e.g., which routes materials and products take, assist in optimizing the production. Errors can be traced back quickly and easily, and their cause can be remedied in a targeted approach.

The basis for the digital production file and for benefitting from its use is as much data and information as possible from a wide variety of sources. Data comes from PLC controllers, logistics, sensors, or also from suppliers and even end customers.

The use of this data is almost limitless and only depends on the needs and objectives of the users.

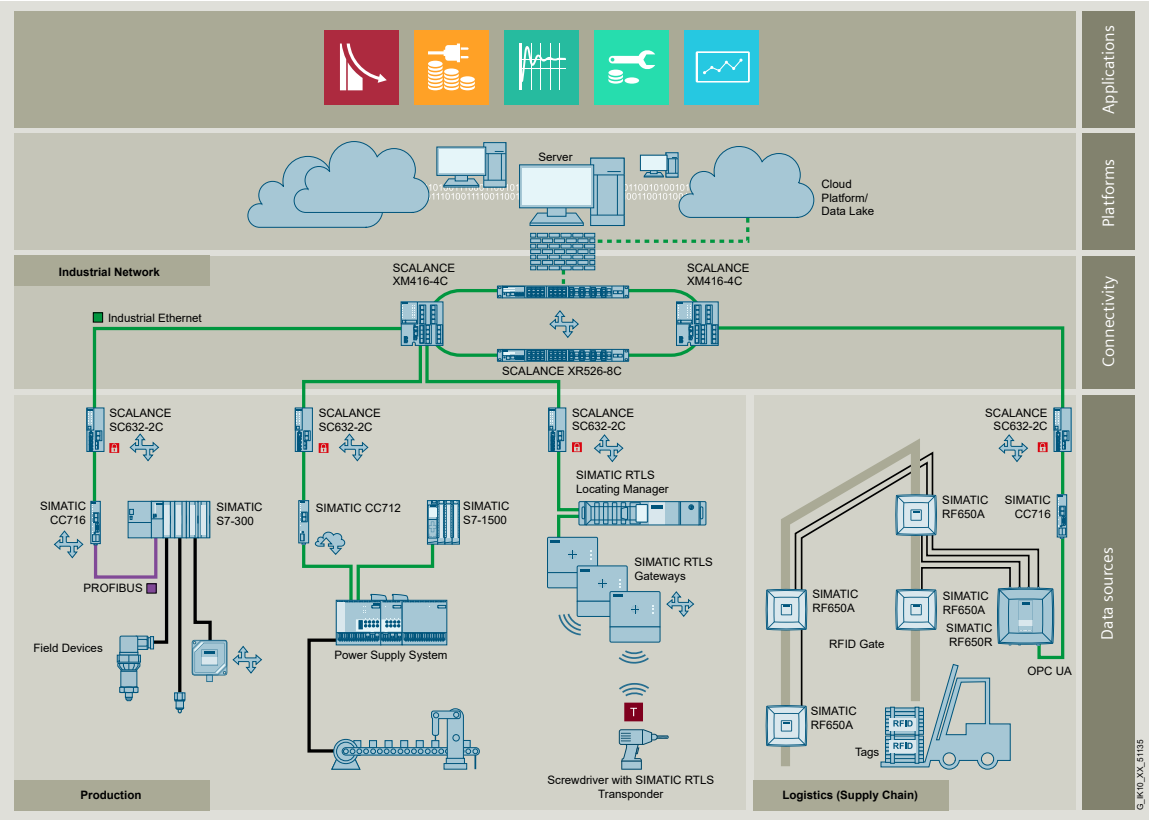
What immense potential can be gained from such a digital production file?

Example 1 – Smooth supply chain
Faulty parts from suppliers endanger the production operation, quality, and ability to deliver. Errors are often not noticed when the goods are received, but only discovered later during final inspection. This results in production stops and lengthy troubleshooting.

By analyzing the data using the production file, it is immediately apparent which parts from which delivery entered the warehouse and therefore need to be blocked. The unaffected parts are released so that production can resume after a short time. In this way, downtimes and delivery bottlenecks are effectively reduced or avoided completely.

Example 2 – Optimized production processes
In the production facility itself, countless sensor, measurement and test data accumulates – including electrical parameters, mechanical values for dimensional accuracy, but also influencing factors such as temperature or vibration at machines. By linking this data with the produced workpieces, a correlation between the product and the production facility is established. To be assigned to the correct workpiece, industrial identification – such as RFID readers or optical readers – is employed. In the cloud, the data is linked to the workpiece, which then becomes virtually available in real time at the push of a button.

The use of this data is up to the individual user. For instance, later test steps can be omitted because data is available from earlier production steps. This can significantly shorten the production time. But the opposite could also occur. For example, if strong vibration in a specific plant necessitates additional tests of the products. This may extend production time, but also ensures the required quality. The crucial point is that a flexible response only becomes possible through transparency all around the production facility. This is the case with the correct data in the digital production file.



Example 3 – Ensuring customer satisfaction
Even in the best production, mistakes can happen. It is crucial that in this case the negative impact on customer usage is as low as possible. It is therefore advisable to withdraw affected products from circulation as soon as possible. However, if a defective product is actually delivered, the product ID and logistics data can be used to quickly determine where it was shipped to, enabling a targeted recall. In this way, reputational damage and replacement costs are kept as low as possible.

Comprehensive production and logistics data from the field into the cloud
As you can see from the examples, it is especially important to use as many sources of information as possible to “feed” the production file – since every piece of information creates added value. The digital production file can then provide information when seemingly random fluctuations occur in the production process. It can provide potential for optimization. It can be a starting point for uncovering sporadic errors.

When looking at the overall picture of the possible data sources, the complexity may initially appear daunting. However, the digital production file can be introduced in small steps and is scalable as required.

At first, all data relating to the goods produced is needed. RFID and optical identification systems are a building block for identifying these goods. Together with the data from the automation system, the basic data record is created. The first step is done as soon as the data record has been transported to a cloud platform, for example via an industrial IoT gateway such as SIMATIC CC712/ CC716. Valuable statements can be derived from this data.

Transparency in the factory is the right keyword here: cycle times in the production, recording of downtimes, plant utilization, etc. All this is important information that helps to measure productivity and – much more importantly – helps to find starting points for improvements.

Once the first step has been implemented successfully, the data record is enriched with data accrued from the automation. This includes measured values from sensors – such as force, temperature, pressure, or humidity.

Modern power supplies – such as SITOP PSU8600 – deliver real-time voltage and current values via PROFINET. This information can be used to carry out analyses on the quality and condition of the production facility. Even more interesting is linking sensor and product data. In this way, connections between the condition of the plant and the product produced can be derived. This creates a new dimension in terms of quality assurance and preventive maintenance.

For a few years now, systems have been available that enable a precise position determination even in industrial environments – so-called real-time locating systems (RTLS) such as SIMATIC RTLS. This opens up another dimension when it comes to transparency, which is based on the link between goods and location. An example to illustrate the principle:

In the assembly of critical components, meeting the correct tightening torques is of great importance. A torque too high may cause damage, a torque too low can result in the loosening of the component over time.

With the locating system, a data record can now be created that contains

- what amount of torque,
- at what time,
- with what product,
- was applied at which location.

This data is then available in the digital production file for quality assurance, audits, tracing, and much more.

Once the production has been covered adequately, the next step is to incorporate logistics data. Labeling of parts from suppliers is increasingly done with a unique code, e.g., using an RFID smart label. These RFID transponders can be read out even in large quantities at the incoming goods department via a gate with RFID readers and antennas, e.g., from the SIMATIC RF600 product family. This way you know when which goods were delivered where. In the further course, the transponders can then be registered at the warehouse, during intralogistics movements, and finally at the assembly place. The history of the component goes into the digital production file, which makes its route traceable and thus transparent.

The basis of all of this is that all data is available in the cloud. The data can thus be used flexibly and across sites around the world.

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
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Generate added value from data

The secret of a successful digital production file lies in the skillful merging, linking, evaluation, and analysis of the data in applications, the so-called apps. Here is where the added value arises, where THE information is created that can only come from a combination of different data sources. This end-to-end transparency of the data and the added value generated from it represent the practical implementation of the Industrial Internet of Things (IIoT).

With the right cloud platform, the data can be utilized flexibly. There could be smartphone apps that immediately inform maintenance staff in the event of anomalies. Dashboards on tablets or large screens in the production show the status of the plant at a glance or enable targeted inquiries about specific products. Web-based apps show statistics on delivery reliability, throughput times, utilization, energy consumption, and much more.

There are countless ways of bringing information and data into the digital production file. The recipe for the perfect production file does not exist – and it doesn't have to. The only thing that matters is to take the first steps and to utilize the benefits that result from them. It will quickly become apparent where additional data will provide the greatest leverage and where a possible extension brings further benefits.

Digital Connectivity –
the decisive factor for digital production files

- End-to-end data transparency across all levels – flexible and across sites
- Added value from production and logistics data
- Integration of external data sources, e.g., from suppliers
- Individual solutions tailored to the user

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