

Advanced Machine Monitoring

Whitepaper

Sensorik

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 **PEPPERL+FUCHS**

Abstract

Most Internet platforms in use today initially collect all available sensor data so that it can be statistically evaluated at a later time. This procedure prevents the loss of data points, but is relatively slow due to the sequential method of operation. It also requires very high storage capacities for the expected process data, which does not contain any information in the context of fault analysis. Streaming platforms offer a solution. They allow data streams from the sensors to be processed and evaluated immediately. If there is a deviation from the expected value, they generate a warning message and can thus independently request help to check the technical system. Archiving of historic sensor data is not essential for this function.

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Classification

Sensorik4.0®-Solutions for Industrie 4.0 Applications

Industrie 4.0 is the pioneering concept of totally interconnected production systems that support the exchange of small or large amounts of data within a process—via the cloud—and can also communicate with higher-level information systems outside conventional corporate boundaries. In contrast to the classical strategy of hierarchically structured communication (horizontally, vertically), this modern interconnected methodology offers the advantage that communication can occur anytime, between any participant, on any hierarchical layer. Sensors having the ability to communicate is a significant characteristic of Sensorik4.0®: This term embodies Pepperl+Fuchs' innovative sensor solutions for applications within the Industrie 4.0 framework.

The Solutions Park Brings Industrial Sensors to the Internet of Things

The Solutions Park demonstrates real-world sensor solutions that highlight the customer benefits of Industrie 4.0. The customer benefits of Industrie 4.0 stem from the availability of process and diagnostic data from sensors and actuators within a company's internal or external IT systems. For instance, using this data, these IT systems can perform visualization, realize model-based optimization processes, and schedule demand-based preventive maintenance processes. For such applications, Pepperl+Fuchs and our IT partners offer solutions that allow sensing technologies to be directly connected to a company's IT infrastructure.

Pepperl+Fuchs offers a wide range of products designed to collect data from spatially dispersed sensors. Then, we make that data available to application-relevant databases on the internet. This data is accessible on these internet portals through mobile devices or can be used by downstream processes. In the context of Industrie 4.0, the idea of continuous engineering throughout the entire product life-cycle plays a crucial role: All data must first be collected in a digital format, then be made available for electronic processing. To this end, Pepperl+Fuchs has developed a system that directly compares quality data obtained during the manufacturing process to the design data—deviations are automatically identified.

Sensor Data within the Corporate IT-System

Replacing hierarchically organized machine communication with networked solutions offers several advantages: all data from field devices like sensors and actuators can be transmitted directly and without a loss of fidelity due to intermediate translation and processing transmitted to a corporate IT system. The information concerning availability and state of a machine or system allows early intervention, reducing the risk of product faults and costly downtime. With our IT partners, we developed solutions where a separate communication path brings sensor data directly from the field into the corporate IT systems.

Description

Streaming Platforms for On-The-Spot Processing of Sensor Data

Most Internet platforms in use today initially collect all available sensor data so that it can be statistically evaluated at a later time. This procedure prevents the loss of data points, but is relatively slow due to the sequential method of operation. It also requires very high storage capacities for the expected process data, which does not contain any information in the context of fault analysis.

Streaming platforms offer a solution. They allow data streams from the sensors to be processed and evaluated immediately. If there is a deviation from the expected value, they generate a warning message and can thus independently request help to check the technical system. Archiving of historic sensor data is not essential for this function.

This case demonstrates the use of a streaming platform for sensor data. It monitors the correct function of a linear drive and detects deviations between the measured movement speed and the expected movement speed. Such a change occurs if, for example, the friction in the mechanical transfer chain increases due to problems with the bearings, or the required torque can no longer be generated by the electric motor due to aging. If a deviation is too large, a push notification is generated within the streaming platform and sent to the responsible service personnel.

Demonstrator Design

The exhibit provides a visualization of monitoring a mechanical linear axis. The VDM28 photoelectric distance sensors are used to detect the current position of the carriage within the plant. The process data from the sensors can be used to determine whether a target position cannot be reached, or can only be reached with reduced speed. A reduced speed indicates wear in the drive train. In contrast, an invalid sensor signal can indicate an anomaly in the measured section. Within the demonstrator, wear of the drive axis can be simulated by adjusting the movement speed or blocking the carriage.

If the fault scenario occurs, it is identified by the sensor data platform and a corresponding event is generated. Predefined

actions are triggered depending on the event quality: for example, a message is sent via mQuest to the responsible technician's smartphone. If the operation request is resolved, the result of the operation—for instance, the replacement of a bearing or other findings—is documented and reported back to the platform.

In parallel to this automated monitoring process, the operator can also view the current status of the machine via a Web-based front end. A reactive Web display guarantees constantly up-to-date live data from the monitoring system. The view can be configured to specific applications.

What Else Is Possible?

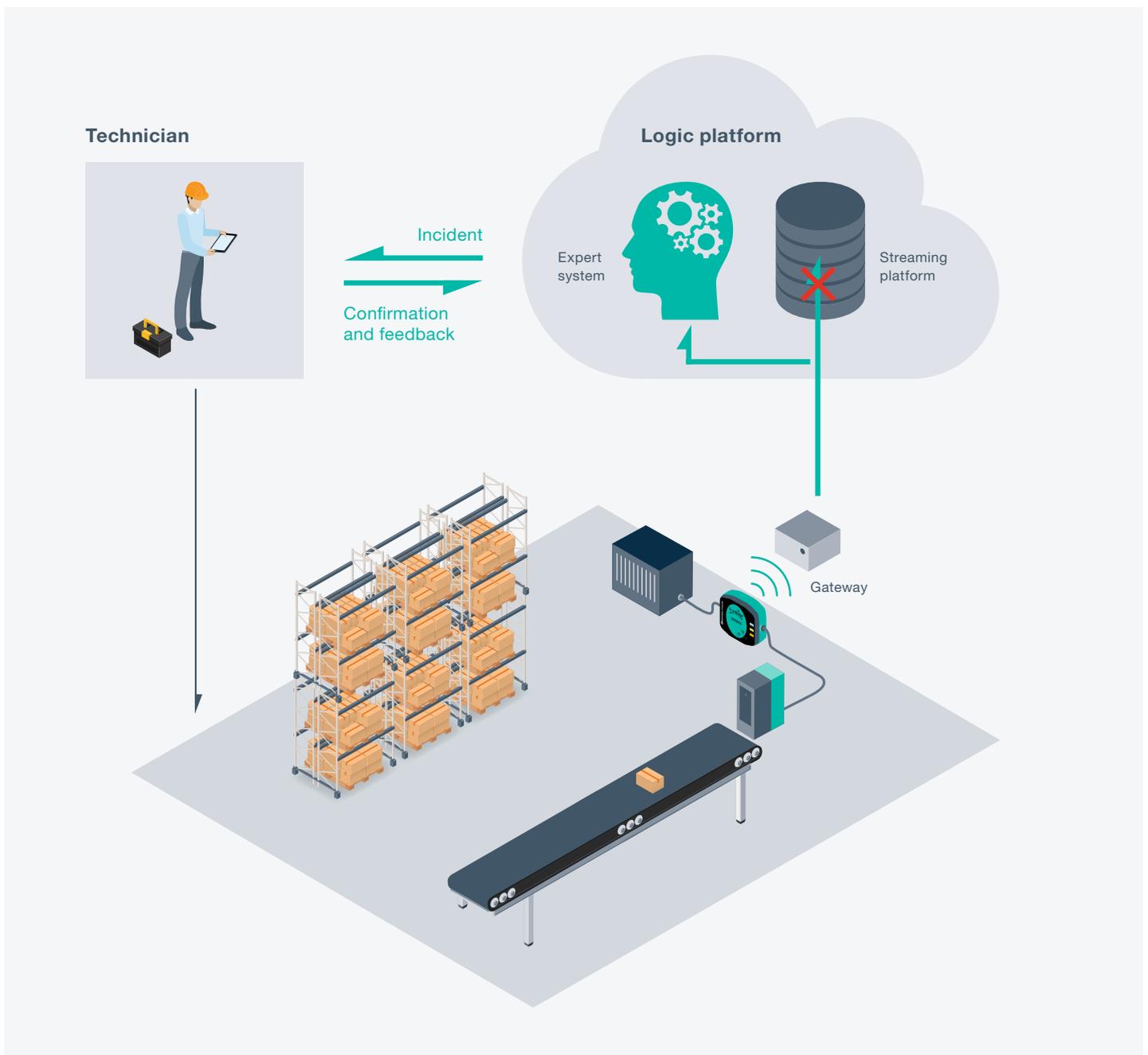
The demonstrator only gives a small outlook on what is possible by using reactive streaming platforms. It is possible to monitor different functions simultaneously. The dynamically configurable front end provides customized information about each function at any time.

Using the findings that are fed back, the decision-making logic can be continually optimized based on an expert system, and the monitoring parameters of the machine can be corrected in line with the spare parts that have been used as replacements.

Additional applications or services can be added: for example, another expert system for direct access on raw data or a long-term backup.

Streaming platforms thus provide the user with a range of benefits:

- Needs-based online evaluation of sensor data
- Dynamic signals to the responsible personnel
- Simple integration of IO-Link-compatible industrial sensors
- Direct access to data for analyses in expert systems
- Optimization of the service process thanks to continual feedback from the field
- Live visualization thanks to a reactive dashboard
- Use of established and open basic technologies (e.g. Apache Kafka—distributed streaming platform)



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Explosion Protection

- Intrinsically Safe Barriers
- Signal Conditioners
- Fieldbus Infrastructure
- Remote I/O Systems
- HART Interface Solutions
- Wireless Solutions
- Level Measurement
- Purge and Pressurization Systems
- Industrial Monitors and HMI Solutions
- Electrical Explosion Protection Equipment
- Solutions for Explosion Protection

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- Fieldbus Modules
- AS-Interface
- Identification Systems
- Displays and Signal Processing
- Connectivity