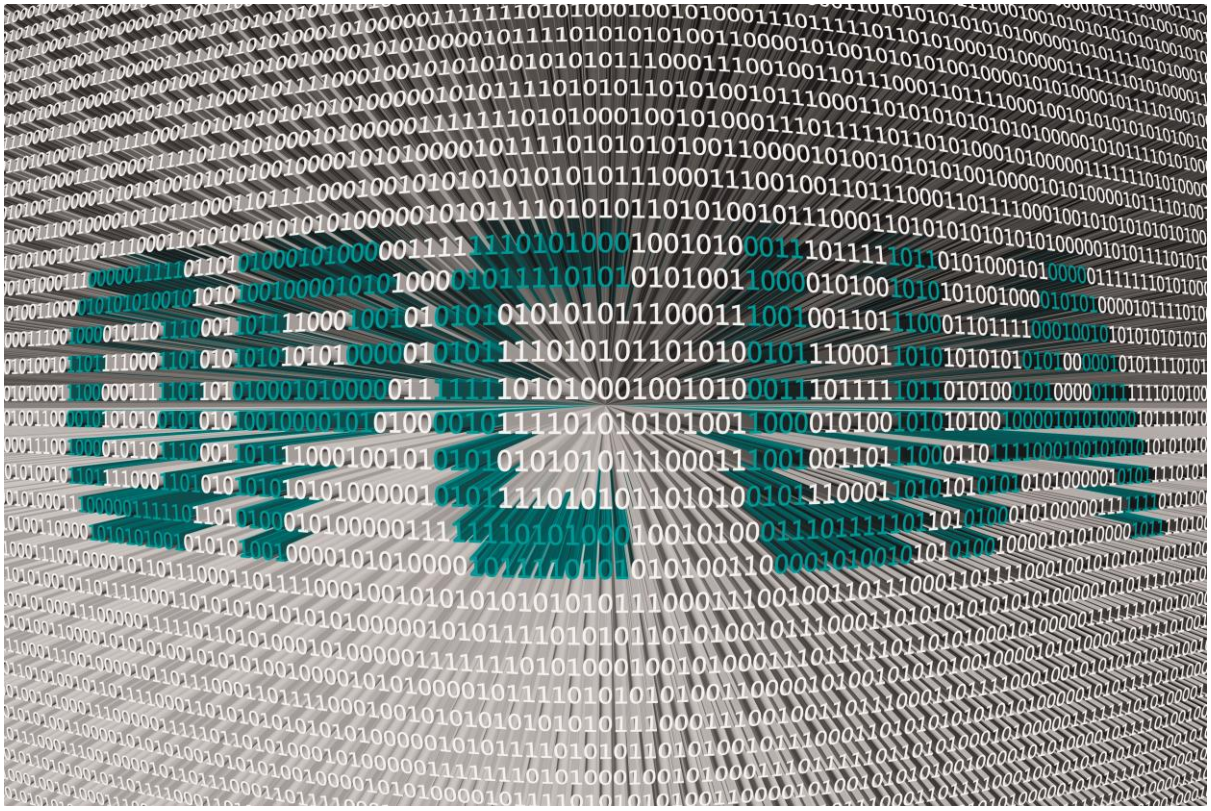
HART gateway with integrated OPC UA server

Easy incorporation of additional data

Sensors contain lots of additional information that could potentially be used to optimise processes, but is not actually read. Based on the NOA concept, this data can be forwarded via HART protocol to a HART gateway with integrated OPC UA server, from which higher-level systems can then be operated via OPC UA. Phoenix Contact's portfolio now includes a corresponding device.



The NOA concept from NAMUR aims to finally utilise all the unused information available in the field devices of a plant that is not currently being read. For example, in addition to the flow, a flow meter provides data concerning the pressure, the rate of flow, and the temperature of the medium. There is also information regarding the sensor, such as the name of the manufacturer, the serial and version numbers, the measuring range, and much more. So how can the plant operator access this data? One option is to use the HART protocol. With this communication standard, the sensor is connected to a control system via a conventional 4 … 20 mA connection and also has a modulated HART signal that can be tapped with a branch line. For the most part, this HART connection is only used to parameterise the sensor and then goes unused. This connection is particularly useful in

older plants equipped with a conventional control system, as there is no need to intervene in the control system (Figure 1).

Secure cloud-based access

One area of focus for NAMUR is the security of the NOA concept. Data may only be obtained from the plant in a controlled manner. There must be no detrimental impact on the application, whatever form it takes. The data diode model was developed based on this principle. It means that the data can only flow in one direction. If the HART protocol is used and write access is blocked, this approach comes very close to the ideal concept. Other possible security components include secure links that can be established by security routers. The data source and the target are linked by means of a secure tunnel. In this context, it is generally irrelevant whether the communication path travels via the Internet or through the complex plant infrastructure of a chemical park (Figure 2).

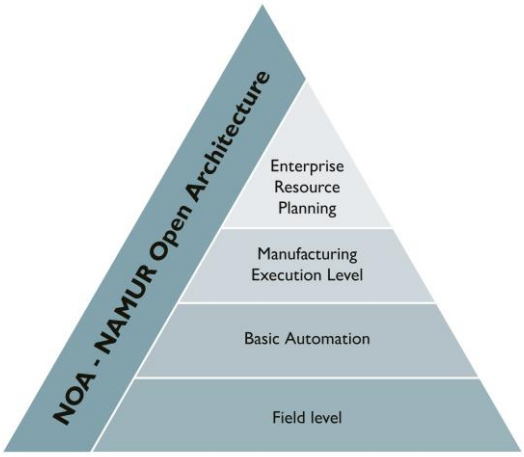


Figure 1 The pyramid of automation extended by NOA

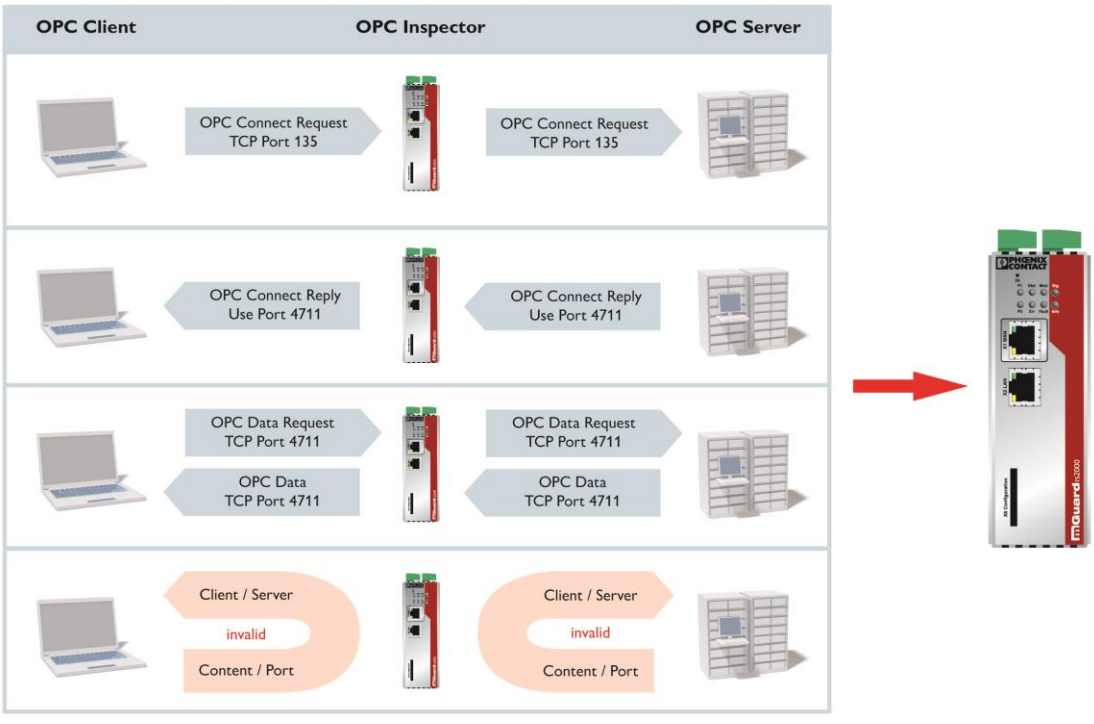


Figure 2 OPC security mechanism of a security router from the FL mGuard product family

The storage location of information can vary significantly. A local database provides maximum protection against unauthorised access. This statement is initially convincing. But what about the availability of the server? Who deals with the maintenance of the hardware? And does the server have a redundant design, thereby preventing the loss of data in the event of a hardware fault? Plant operators who opt to use a cloud solution from a professional service provider like IBM, Microsoft or Amazon Web Services do not need to consider such aspects. Another potential advantage of a cloud solution is accessibility. Evaluation services and analyses can be distributed globally. External service providers are also able to easily access the information (Figure 3).

Improved processes and maintenance

What can a plant operator now do with the additional data available to them? Firstly, they could use it to optimise their plant. For example, the additional measured values that are now obtained can be used to identify unfavorable system states. Based on the extra temperature value from the flow sensor, it may be possible to detect excessive cooling of the medium in transit. Furthermore, the newly obtained data allows additional plausibility checks to be implemented.

Another possible application is the “digital twin”. Originally coined as part of the Industrie 4.0 future project, this term refers to the detailed digital mapping of a plant. This means that all the information concerning actuators, sensors, and the other components of the plant can be accessed via one system. If the relevant data is available, for example, maintenance can be performed in a much smarter way. When you consider that a sensor installed in the plant can be clearly identified at the touch of a button and service personnel can access what is essentially its life story, incredible possibilities lie ahead. This solution also offers an easier and better way to

Exploiting new possibilities

In line with Industrie 4.0, NOA (NAMUR Open Architecture) is a concept which enables previously unutilised data to be used to analyse and optimise a process engineering plant. For existing plants in particular, NOA is intended to provide a secure and impact-free way of managing the data from the plant – without requiring major intervention in the application. But what kind of technology is needed for this? When plant operators ask this question, they frequently get the same answer: OPC UA. OPC UA is a new interface in industrial communication which makes data transmission flexible, scalable, and secure. Development has now come to a point where miniaturisation has progressed to such an extent that an OPC UA server can be integrated into a HART gateway. This opens up new possibilities, as demonstrated by the corresponding Phoenix Contact device.

compare sensors installed in the field. It quickly becomes clear which sensor, together with its specific measuring range, is best suited to perform an actual measuring task. The collected data consequently aids the decision-making process.

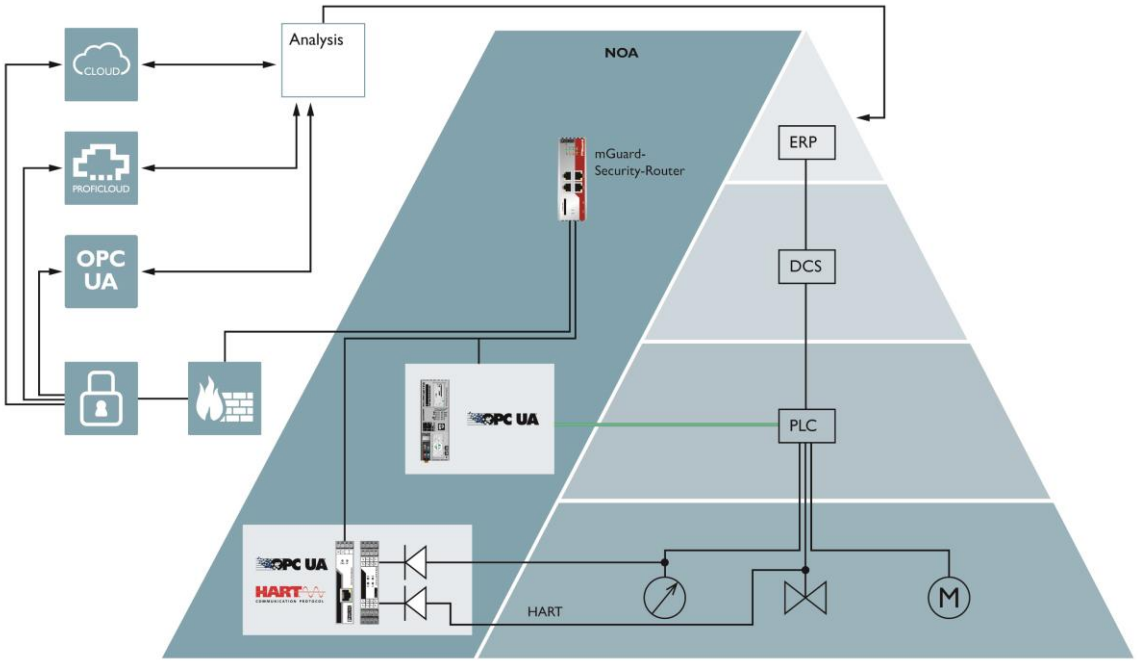


Figure 3 Possible arrangement of the NOA technology

Transparent transfer of information

OPC UA can be used as the interface to forward the data acquired in the field to higher-level systems. On account of its flexibility, scalability, and access security, OPC UA is one of the most cutting-edge industrial communication protocols. The standard encompasses more than a classic interface like Modbus/RTU, as it offers users complex services that will make their work easier. What's more, OPC UA is a state-of-the-art protocol when it comes to security, as it supports various security measures. The OPC UA server transfers the information transparently to systems that wish to collect the data and are authorised to do so.

The higher-level systems can then decide what data they want to use. Previously, the process for tapping data could be compared to an old fashioned shop. You had to tell the assistant behind the counter exactly what you wanted, as it was unclear whether it was actually for sale. With OPC UA on the other hand, it's like walking through the aisles of a supermarket, looking around, and in the end only taking what you actually need. Unlike classic Modbus/RTU, where the user has to know in advance which register a specific

variable has been stored in, with OPC UA the user browses through the server and checks what is available. They are informed about the formats in which the data was saved, precisely when it was stored or whether the connection is still working properly. All these functions are contributing to the ever-growing use of OPC UA in automation.

Flexible connection of up to 40 sensors

A HART gateway is the missing link required for the practical implementation of the scenario described. The device establishes the connection to the HART-compatible sensors installed in the field and makes the acquired data available to the higher-level systems on an OPC UA server. Phoenix Contact has therefore extended its proven HART gateway to include an OPC UA server. Up to five input modules can be added to the gateway, enabling the connection of up to 40 sensors. Each channel is electrically isolated from the HART signal (Figure 4).

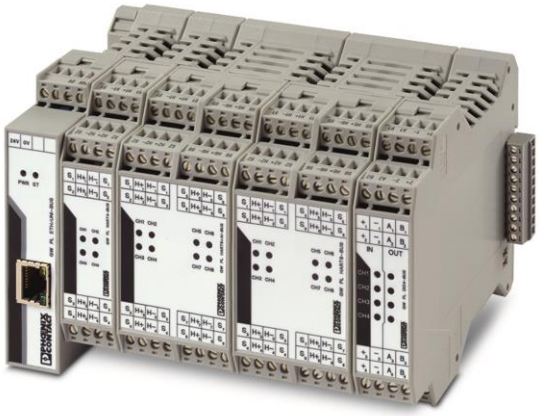


Figure 4 Up to 40 sensors can be connected to the GW-PL-ETH/BASIC-BUS modular HART gateway

Information, such as identifiers, the values of all process data or the messages stored by maintenance personnel on the sensor, is read cyclically. Up to 40 additional items of information can be obtained from a normal pressure sensor – without any configuration effort. There is no need for a device description (DD) or device type manager (DTM) with manufacturer-specific interface descriptions. Communication is limited to the standard commands of the HART protocol. As the gateway also supports the HART-IP standard, it can be used as a communication device in conjunction with the PACTware FDT frame application or the M&M container in order to parameterise the sensors in the field.

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