IN THE
DEPTHS OF
THE SAS

StationScout makes Substation Automation Systems (SAS) transparent

What is the key focus of commissioning secondary technology? Traditionally, it is testing the protection devices and the way that the entire system functions. SAS are starting to be used in modern installations. When it comes to individual protection devices, they not only monitor important components and feeders in energy transmission, but they also communicate with one another. This communication is key when it comes to the SAS functioning smoothly and predictably.

If you compare the effort that it takes to test the functionality of the protection system with what it takes to test the automation and control system, there is a significant difference, with the SAS losing by a long shot. This is due in large part to the increasing complexity of the structure and the signals being transmitted. The system requires these signals in order to function properly and communicate with the control center.

However, the IEC 61850 engineering process and the data available in the SCD (substation configuration description) files, open the door to new testing methods that make commissioning and factory acceptance tests faster and much more efficient.
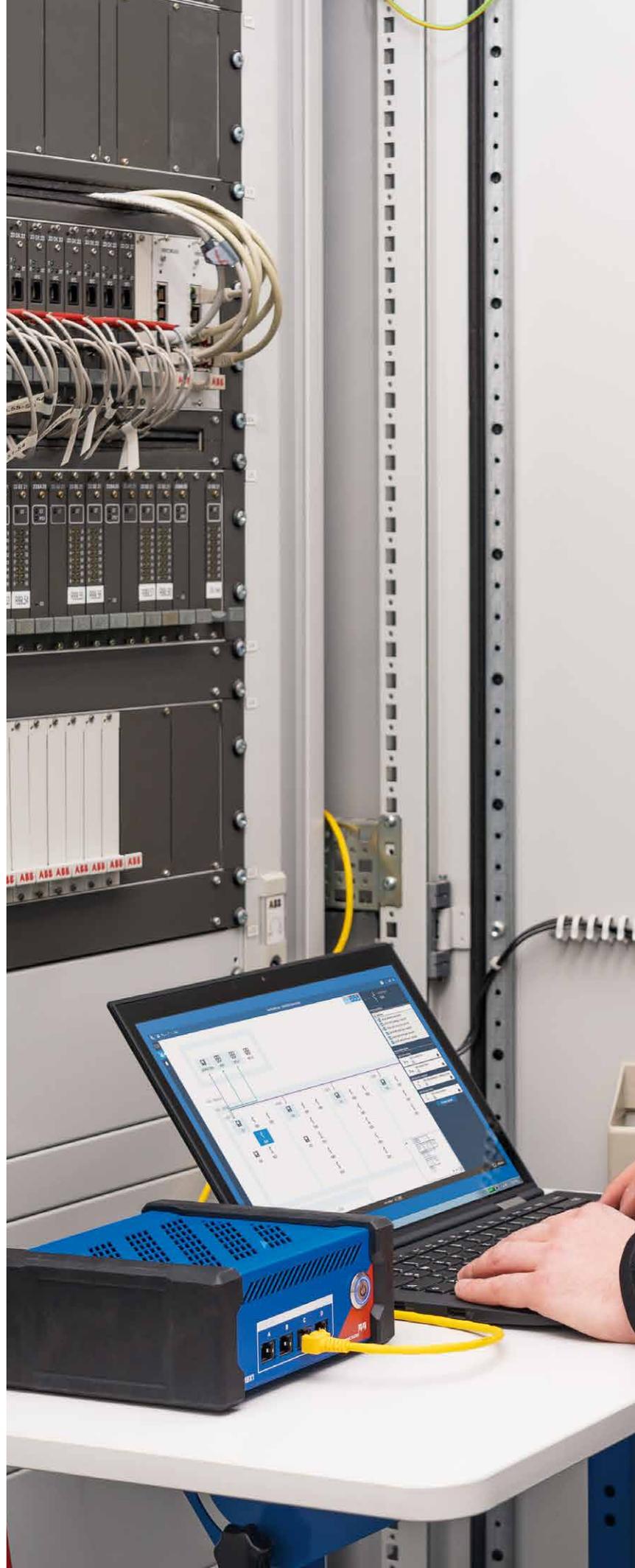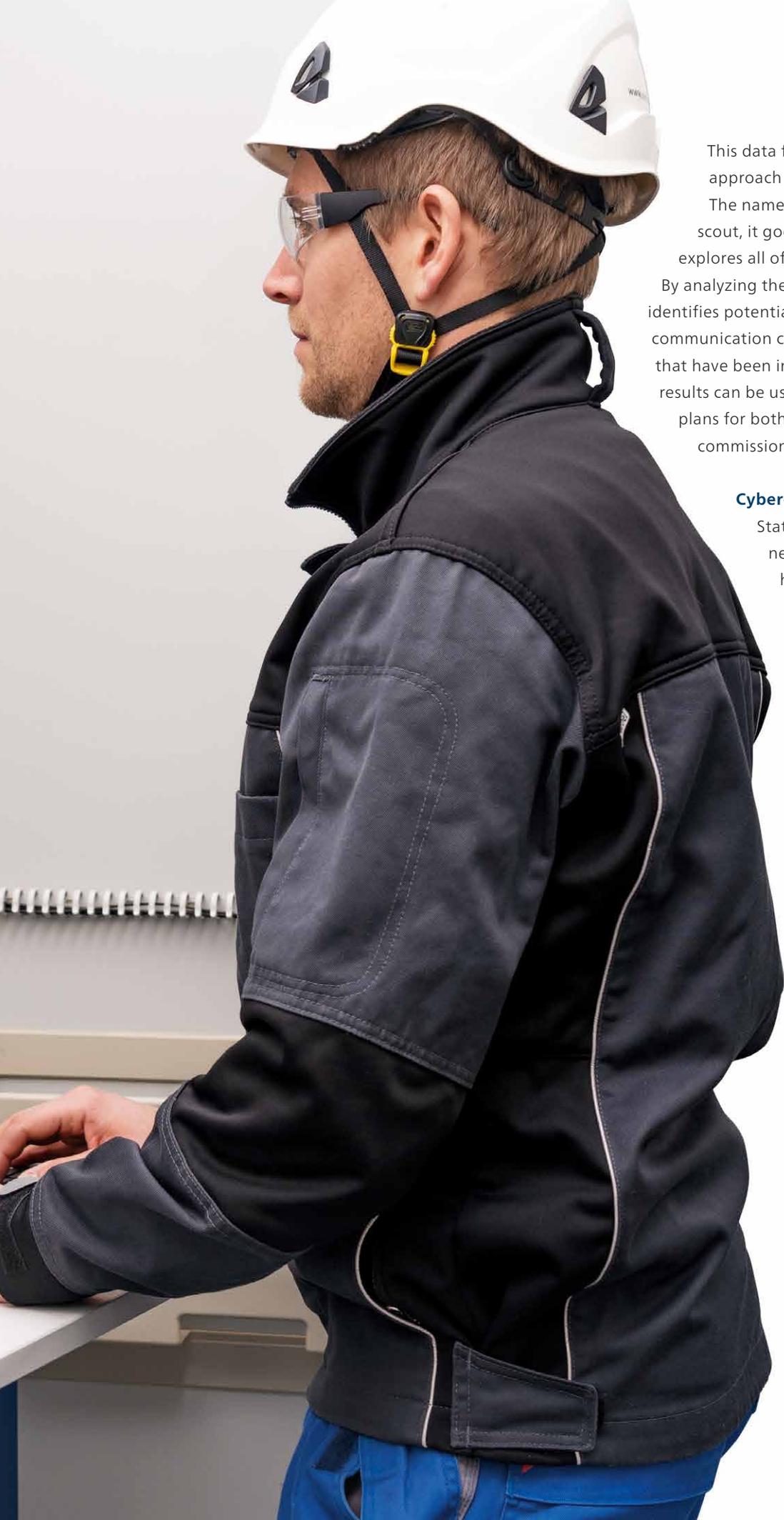
This data forms the basis of a completely new approach that is embodied by StationScout. The name speaks for itself because, like a scout, it goes into the depths of the SAS and explores all of the components and connections. By analyzing the SCD file, the system independently identifies potential signals for testing. It also detects communication connections and IEC 61850 services that have been implemented. Afterwards, the results can be used by the tester to create testing plans for both factory acceptance tests and commissioning tests.

Cyber-secure connection

StationScout comprises two components: the high-performance MBX1 hardware and the software that runs on it with all of the necessary tools. MBX is controlled via a Windows PC. The additional firewall integrated into the system separates the testing solution (MBX1 and laptop) from the substation network, thus ensuring cyber security.

Because the SAS operation is often organized into several networks at once, MBX1 comes with four Ethernet interfaces for connection and analysis.

Simple and comprehensive presentation

One of the main problems that surrounds testing components and communication in SAS are the complicated terms described in the IEC 61850 standard. StationScout detects the names and purposes of the respective elements in the data model. It then visualizes them with clear names and the corresponding connections in a graphic interface. These names can also be adapted, for example, to the respective national language. ▶

This visualization is performed with all of the available data in the SCD file. This includes all of the important data from the substation, such as the voltage level and the switchboard section. For this purpose, there is also an option for modeling in single-line diagrams, according to the standard. Because the majority of the current SCD files do not contain the information necessary for this, we have introduced the new ZeroLine presentation. This reproduces the respective status in real time. Navigation in a large SAS can be carried out in the same way that it is done in a cartographic system.

Intuitive signal tracing

Within an SAS, GOOSE messages are transmitted by multicast from their source to all of the recipients. If an error occurs during this communication exchange, the protection testers must follow the signal on its route through the SAS, which has previously been difficult and very time-consuming, even with copper cable networks. In systems with IEC 61850, manual signal tracing is no longer possible.

Therefore, StationScout visualizes all of the connections, shows how the signals propagate through the SAS and shows where they go and where they don't. In addition, special filters reduce the overall complexity by allowing the display to focus on the relevant elements and then displaying them in the intuitive "Smart Overview". This also includes tracing messages and signals sent as GOOSE, which simplifies error corrections in the communication structure significantly.

Anything missing will be simulated

One of the key features of StationScout is its ability to simulate individual components through the entire SAS, which can take place at any time during project planning. This can begin as early as the design, specification and engineering phase, and the test plans created at this point are available for the entire life cycle of the SAS.
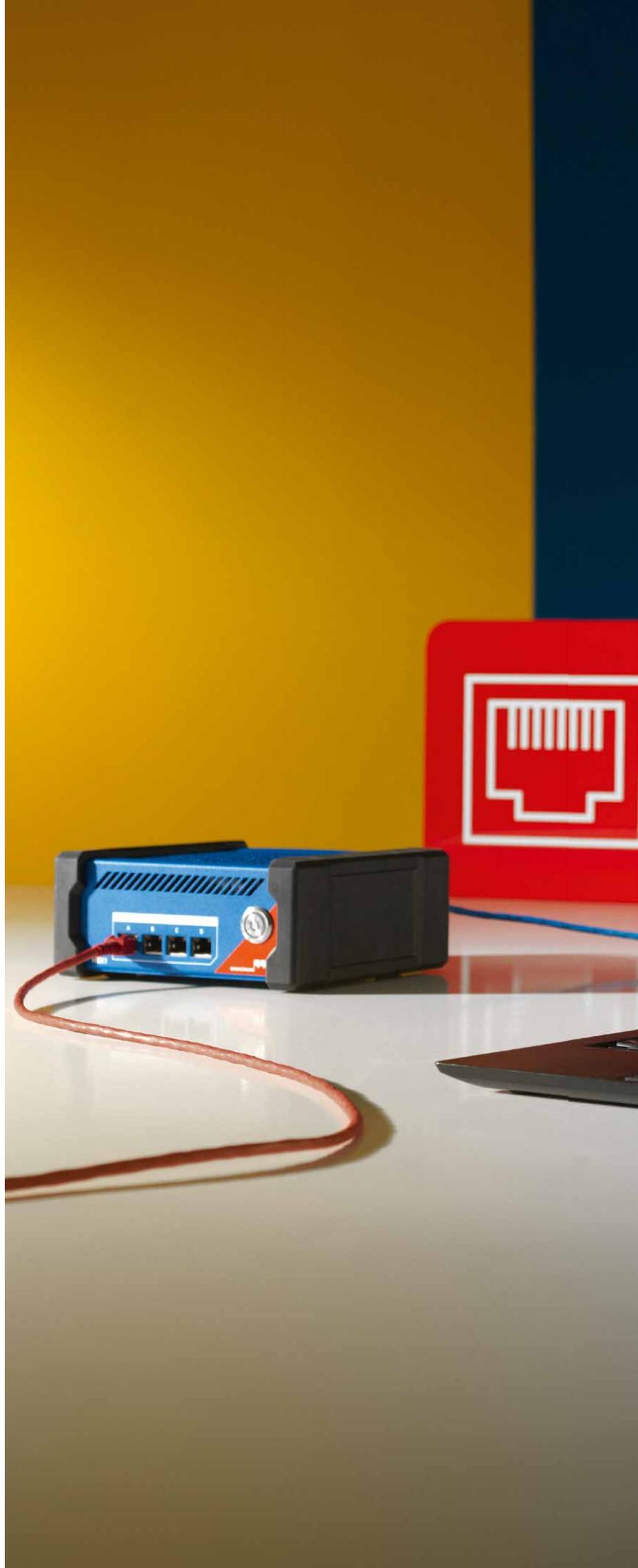
Real-time values can even be worked on and tested during the factory acceptance test (FAT), which can then be verified again during commissioning. Using this feature speeds up the process considerably. All of this data then forms the basis of a quick and successful maintenance check, which also refers to these plans. In each of these steps, StationScout can simulate any IEDs that are missing so that the entire testing process can run smoothly.

What does the future hold?

With these functionalities, StationScout already offers huge advantages for increasing the effectiveness of SAS testing in accordance with IEC 61850. In the future, there will also be features available for protection testers which will allow them to run logic tests and perform simple tests in connection with firmware upgrades. These tools can also be added to the test plans, which will also contribute to the automation and acceleration of the testing procedures, thus heightening security. 🚩

ADVANTAGES

› Guarantees cyber-secure connection to the substation automation system
› Clear live overview of signal flows in the IEC 61850 system
› Quicker rectification of communication and logic errors
› Simulation of missing components or the whole SAS
› Connection to multiple substation networks
› Re-use of test plans for recommissioning and following security patches (Commissioning Package coming 2019)