OMICRON

StationScout

Substation Automation System Testing

Smart testing for automation, control and SCADA communication

Visualize IEC 61850 and make testing easy

Testing automation and communication systems is as time consuming as testing the protection. StationScout simplifies these tests and reduces the required effort significantly.

Firstly, StationScout provides a clear status overview of your substation during commissioning and operation. Secondly, it makes it possible to trace signals through the whole system.

Finally, by using the powerful simulation features, the time needed for testing the whole SCADA signalling can be shortened significantly.

Innovative views support commissioning and maintenance engineers during the entire lifecycle of Substation Automation Systems (SAS) based on IEC 61850. When working with IEC 61850, StationScout becomes the ideal solution.

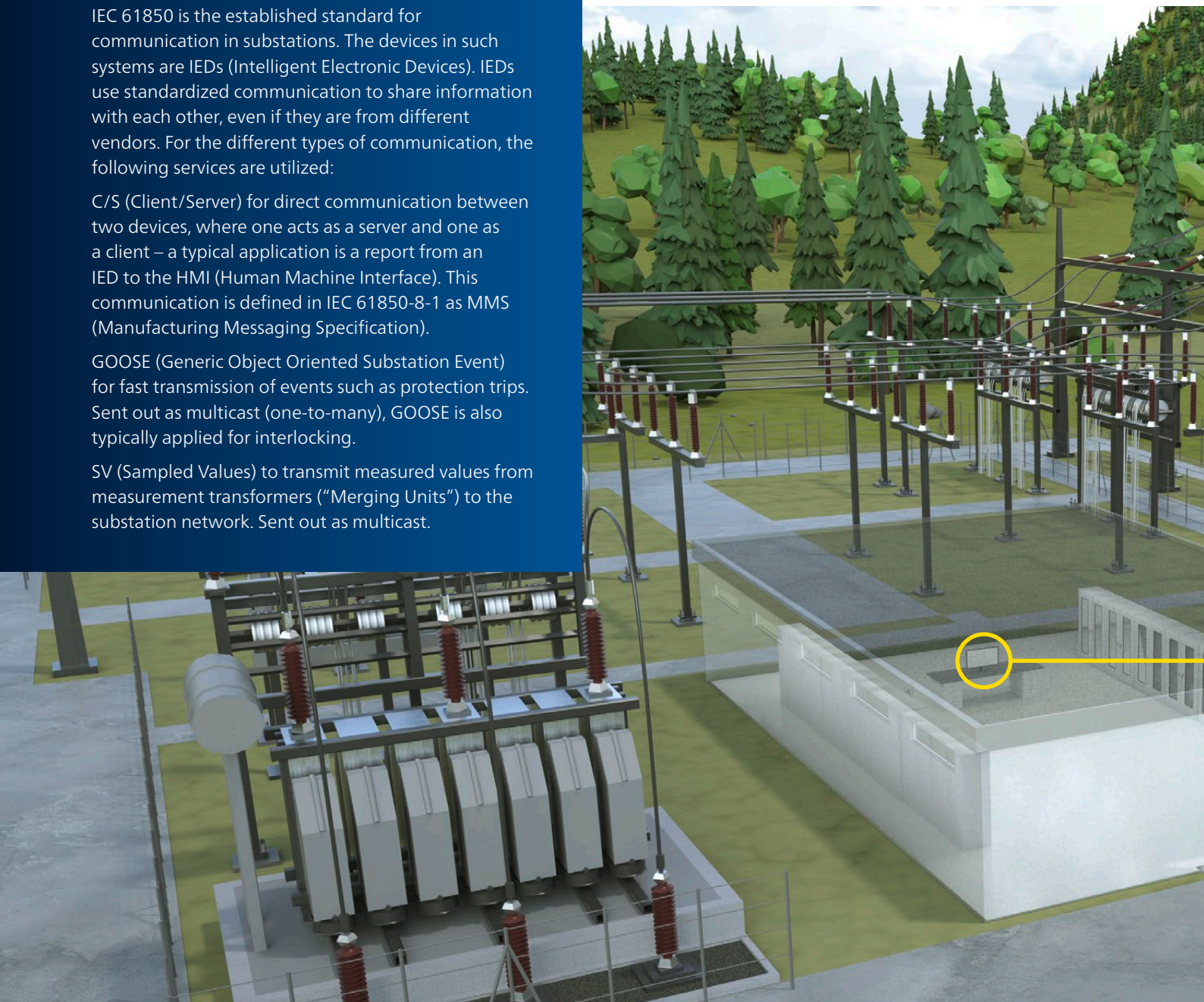
What is IEC 61850?

IEC 61850 is the established standard for communication in substations. The devices in such systems are IEDs (Intelligent Electronic Devices). IEDs use standardized communication to share information with each other, even if they are from different vendors. For the different types of communication, the following services are utilized:

C/S (Client/Server) for direct communication between two devices, where one acts as a server and one as a client – a typical application is a report from an IED to the HMI (Human Machine Interface). This communication is defined in IEC 61850-8-1 as MMS (Manufacturing Messaging Specification).

GOOSE (Generic Object Oriented Substation Event) for fast transmission of events such as protection trips. Sent out as multicast (one-to-many), GOOSE is also typically applied for interlocking.

SV (Sampled Values) to transmit measured values from measurement transformers (“Merging Units“) to the substation network. Sent out as multicast.



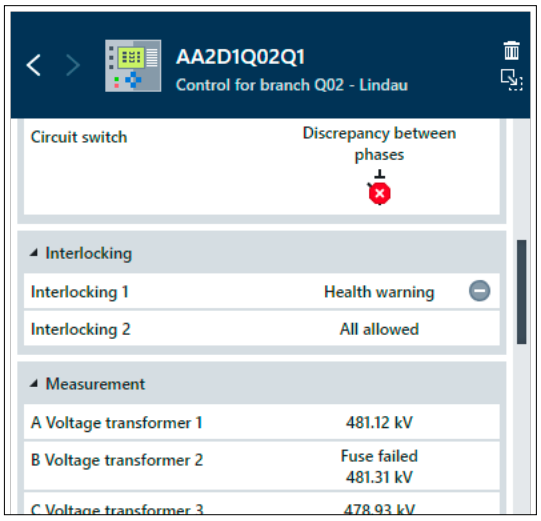
The concept

StationScout comes with innovative software and the digital substation test set, MBX. The test set allows cyber secure connection to the substation network and can simulate dozens of IEDs with C/S and GOOSE.

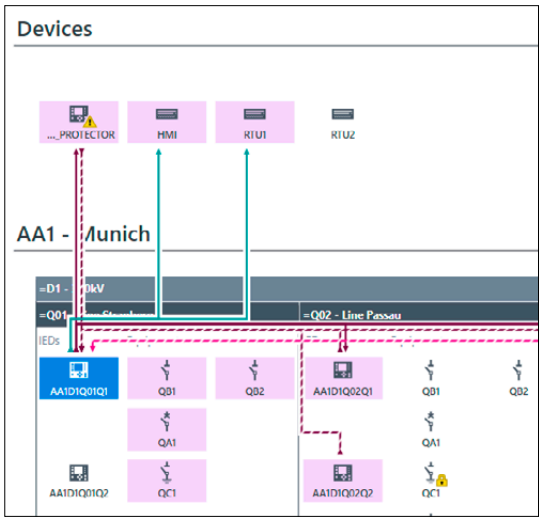
The intuitive user interface visualizes communication in the SAS, delivering the characteristics of an IED in an easy to read manner and supports the user in finding relevant information quickly.

When connected to the substation network, the values within the IED data models, as well as the connected assets, can be seen and communication signals can be easily traced through the SAS. All IEDs which are not available may be simulated to make testing of the entire SAS possible.

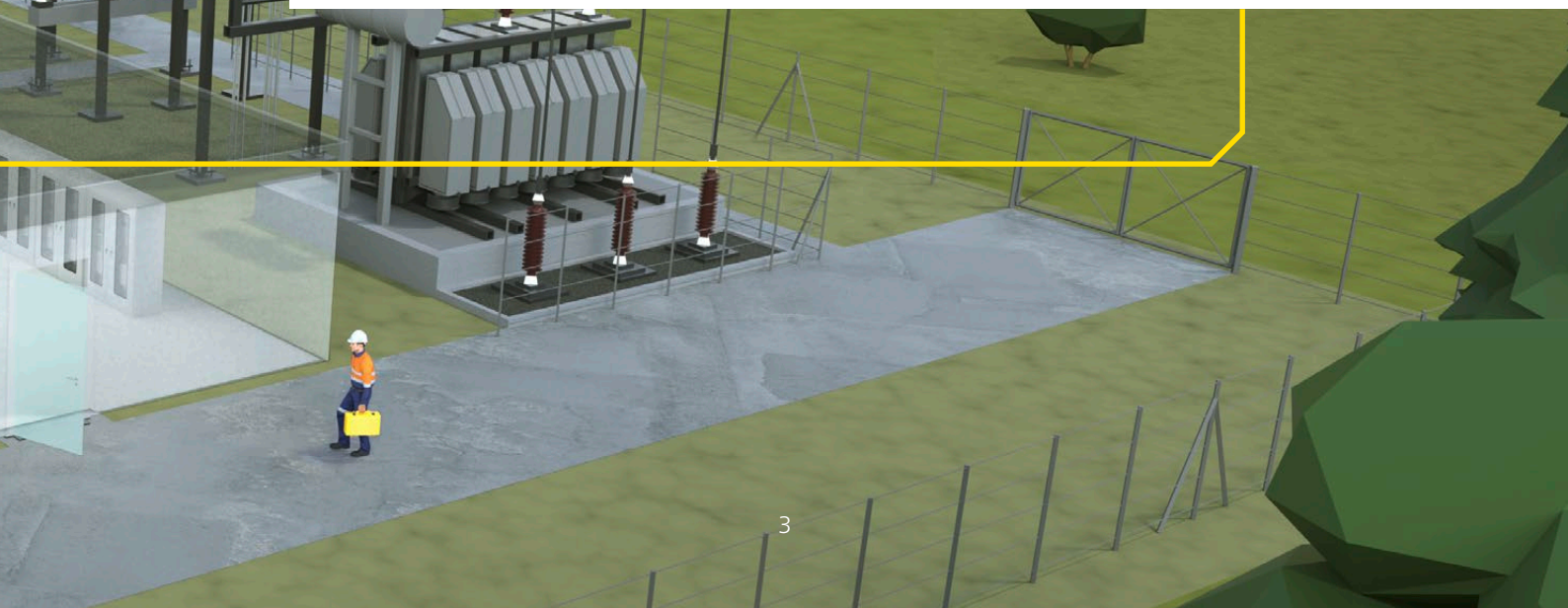
StationScout supports **all project phases** of IEC 61850 SAS.



The IED summary uses clearly understandable and editable names instead of IEC 61850 abbreviations. Information is grouped according to their application, which helps the engineer trace signals. Easy to use browsing and navigation elements support this task.



Smart Overview visualizes communication links and status information of IEDs and primary assets. GOOSE subscription and report issues can be observed.



RTU/Gateway testing for SCADA communication

Import signals and track changes

It is essential to monitor and control substations remotely from SCADA (also known as Control Center). Testing this communication, where the IEC 60870-5-104 (IEC 104) communication protocol is widely used, is a time-consuming process but crucial for the substation automation system.

StationScout offers a solution for importing the IEC 61850 to IEC 104 signal mapping and clearly visualizing the mapped signals in the Overview section of a selected IED, bay, or any level configured within the ZeroLine diagram.

StationScout allows you to filter the mapped signals based on the data types. You can observe the reflection of the related signals change from IEC 61850 to IEC 104 without losing focus.

What is IEC 60870-5-104 (IEC 104)?

IEC 60870-5-104 (often referred to as IEC 104) is a communication standard widely used in substations within power grids. It enables information exchange between substations and SCADA/Control Center, even if they are engineered by different vendors.

In practical terms, IEC 104 ensures that substations communicate effectively with the Control Center/SCADA system. This communication is vital for remote monitoring, control, and management of power grid assets.

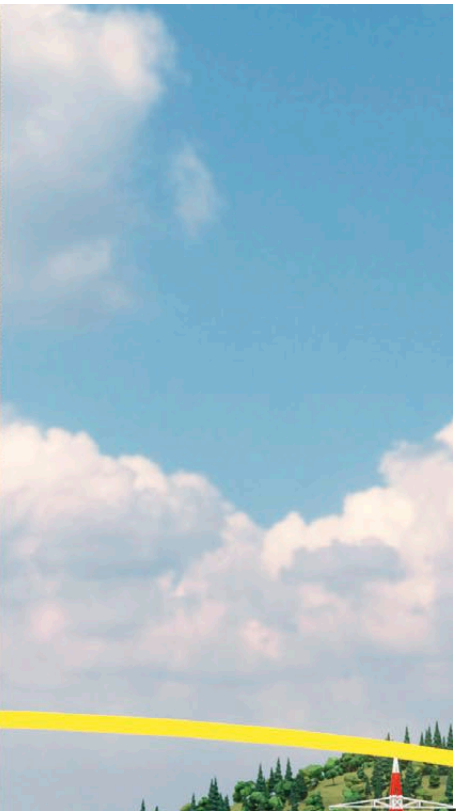
To bridge the gap between different communication protocols, RTUs (Remote Terminal Units) / Gateways play a crucial role. RTUs/Gateways act as bridges, collecting data from substations and transmitting it to the Control Center/SCADA system. They facilitate protocol conversion, allowing IEDs which communicate via IEC 61850 or legacy protocols within substations to the IEC 104 protocol and send this information to the Wide-Area Network.

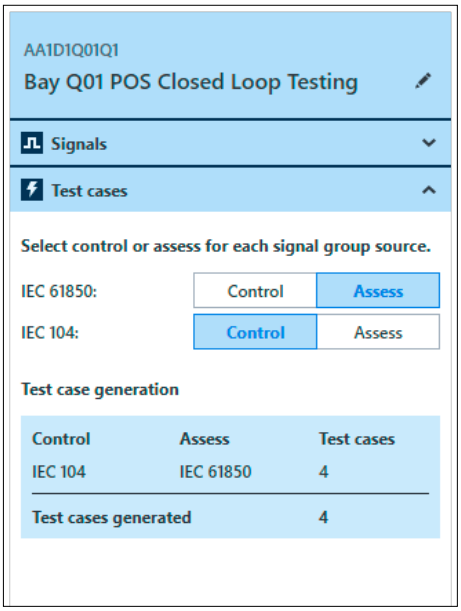
The concept

StationScout's ground-breaking testing features allow you to test the IEC 104 output of the RTU with minimal effort. You can combine testing with the simulation of missing IEDs to test the IEC 104 server output of the RTU – even at the early stages of SAS engineering.

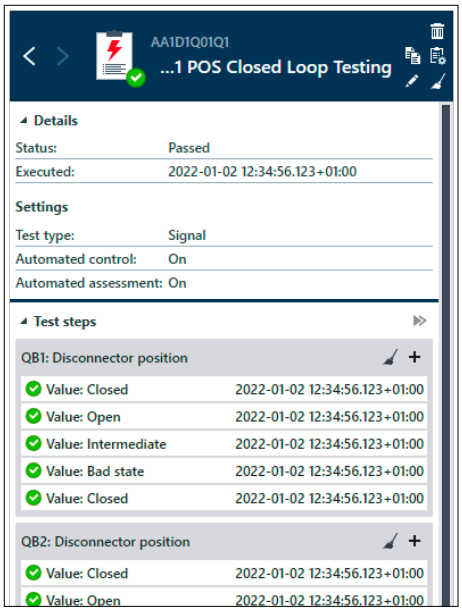
The test setup can be set as manual or automated. StationScout's automated testing concept controls simulated IEC 61850 signals and assesses IEC 104 output automatically. This allows users to automatically set up test steps for bulk amounts of signals, create an editable report, and easily observe the errors in the mapping without the need for an observing eye.

The test cases created for testing at the early stages of the engineering phase or the FAT can be easily used for the SAT and commissioning stages. When an observing eye is needed on these stages, the test cases can be converted to assessments manually, allowing the observing eye to catch up at ease.

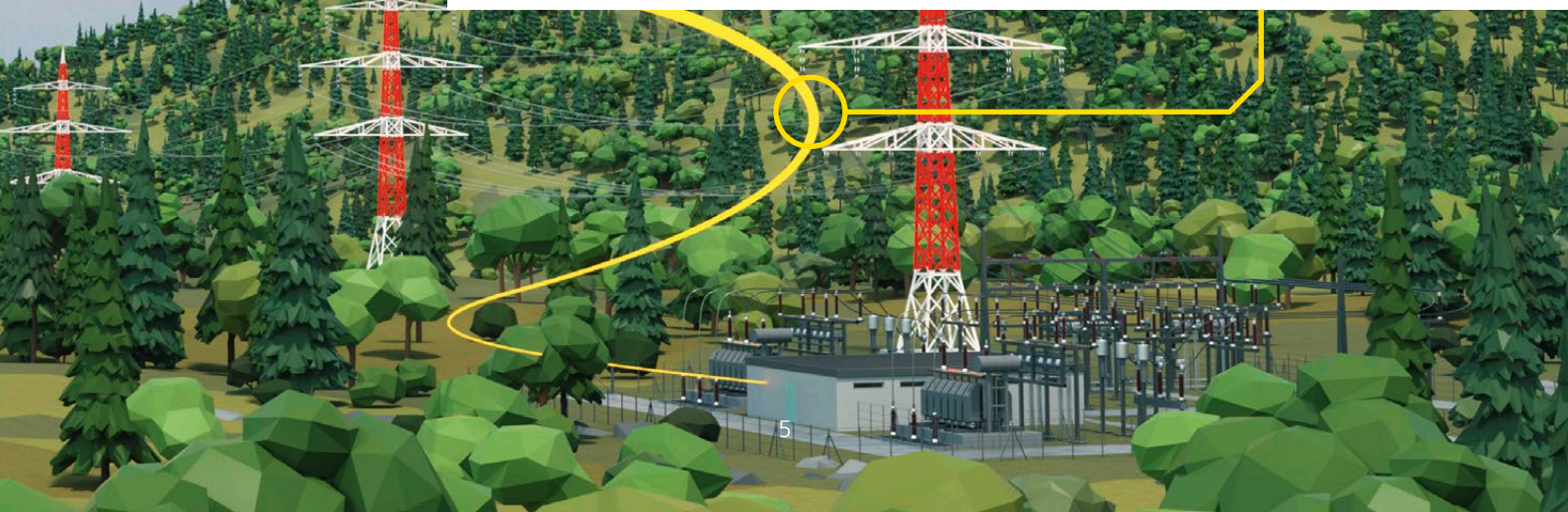




Once the desired signals have been imported for testing, StationScout will ask you to define the control and assessment route and provide you with summary of the test cases it will automatically create.



Once you've activated the automated control and assessment options, StationScout will run the command and assessment automatically for the test steps you've created and generate a test report.

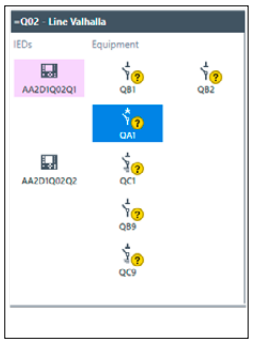


From overview to the details

No configuration required

The substation HMI (Human Machine Interface) visualizes the status of all assets and collects alarms and warnings – but during commissioning and troubleshooting this system might not be available. StationScout comes with its own kind of visualization. Since single line information is not available in most IEC 61850 engineering files (SCD), OMICRON introduces the **ZeroLine View**.

IEDs are automatically imported from the substation section of the SCD, without any additional information, and grouped into bays and primary assets such as switchgear. They are displayed with live status information.



Clear presentation with ZeroLine View

Clear IED summary

StationScout visualizes each IED data model in a new and innovative way. All information is summarized, translated and updated with the current value. Semantic values for over 150 Logical Nodes (LN) and over 200 different Data Objects (DOs) are implemented.

Summary status values

Clear names, can be modified

Protection status and measurement values

Straightforward signal tracing

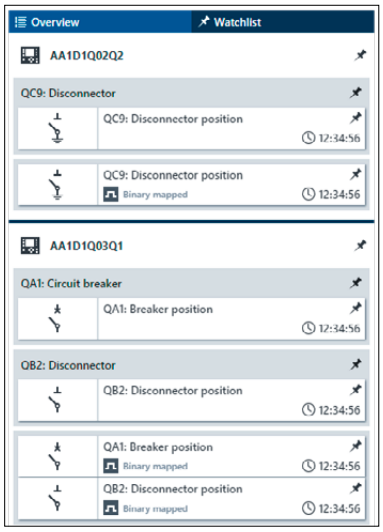
To find communication errors in the SAS, commissioning engineers have to trace signals all the way from the source to each receiver. In hardwired systems this "point-to-point" testing is very time consuming, IEC 61850 systems are even more challenging in this regard. With StationScout it becomes easy to follow signals. The propagation of GOOSE and Report signals through the SAS are visualized in an intuitive diagram – the **Smart Overview**.

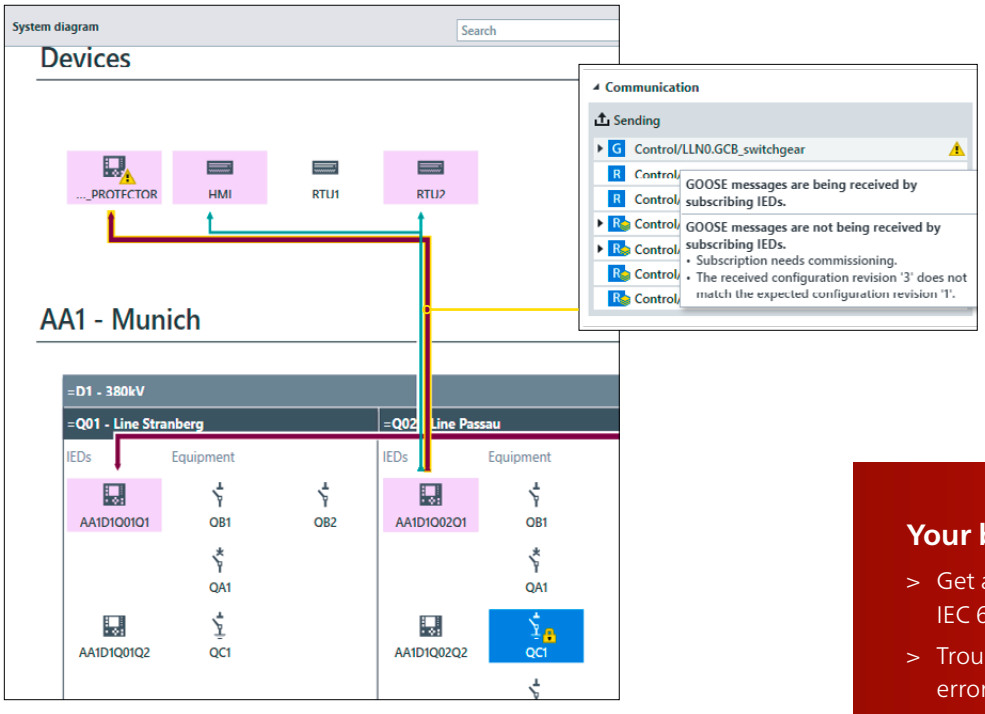
Being able to trace any signal in the overview screen significantly, reduces troubleshooting time.

Furthermore, communication errors from both the sending and receiving side are displayed on the diagram making troubleshooting even simpler (receiving side errors are only shown if LGOS is supported by the IED). Immediately after loading an SCL configuration file (SCD file), StationScout visualizes all communication relationships in the SAS. When StationScout is connected to the substation, this information is augmented with live data.

Watch signals

Collect signals from the entire substation into a single list to watch and to change values comfortably during simulation.





Trace signals in GOOSE and reports from primary assets to subscribers and RTUs

Being able to **trace any signal** in the overview screen, significantly reduces troubleshooting time.

Your benefits

- Get an overview of the signal flows in the IEC 61850 substation
- Troubleshoot communication and logic errors faster
- Simulate missing components or the whole SAS
- Reuse test plans at recommissioning and after security patches
- Track real-time IEC 104 values

www.omicronenergy.com/StationScout

Covering the whole lifecycle of a SAS

Simulation of IEDs with their inputs and outputs.

Clear visualization of communication and status overview of the SAS.

Simulated equipment

Design, specification and engineering

Start with IEC 61850 on your desk, check a new concept or adapt an existing one. StationScout visualizes the whole system and simulates missing equipment – if required, it can even simulate the entirety of the system.

Tests created in the design phase are available for repetition through the whole lifecycle.

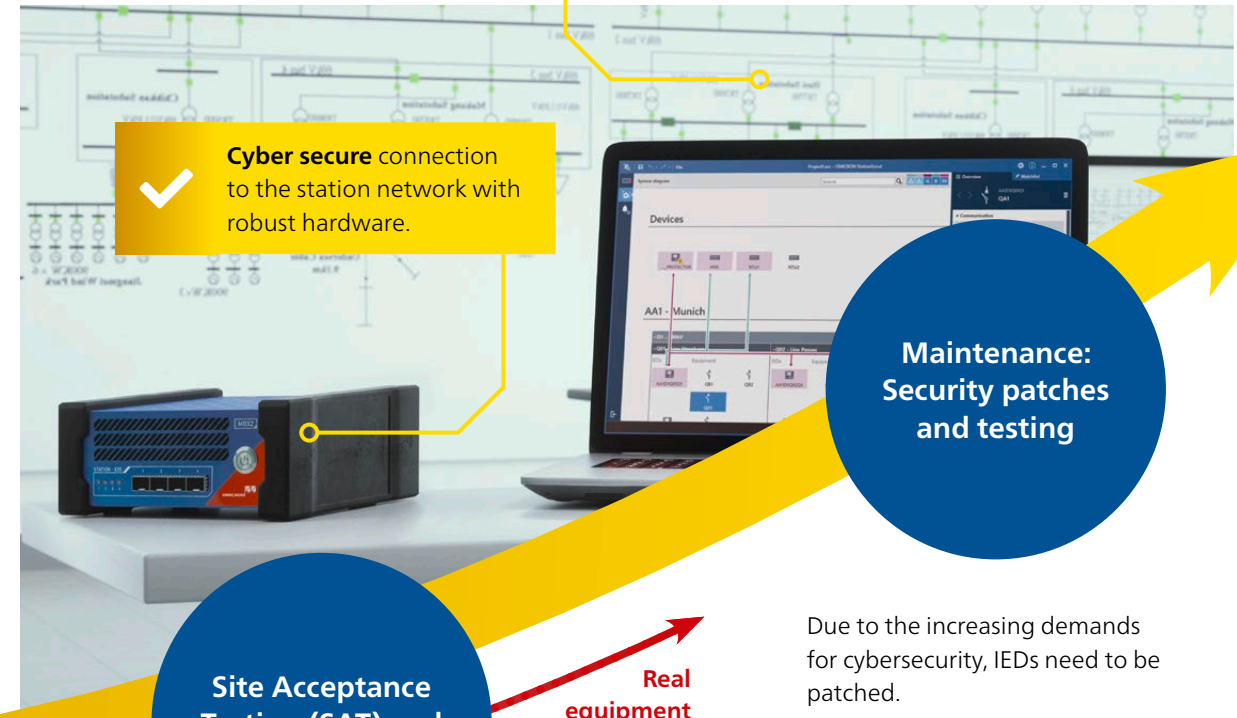
Factory Acceptance Testing (FAT)

Partly simulated

Modern SAS are rigorously tested in the factory. Missing servers (IEDs) and clients (SCADA or RTU) can be simulated, making real testing possible right from the beginning.

See live values with a single click

IEC 104 client support for SCADA.



Cyber secure connection to the station network with robust hardware.

Maintenance: Security patches and testing

Site Acceptance Testing (SAT) and commissioning

Real equipment

Due to the increasing demands for cybersecurity, IEDs need to be patched.

With StationScout you can use the prepared tests and simulate equipment that can not be taken out of service for testing. Even complex logic can be re-tested easily.

✓ **Formerly created test cases can be reused**

On-site tests have to be performed at least once with real equipment. Testing every point within the SCADA system (including all details) can be performed by simulating the client even without a control center.

✓ **Repeat previous tests and simulations**

Who uses StationScout?

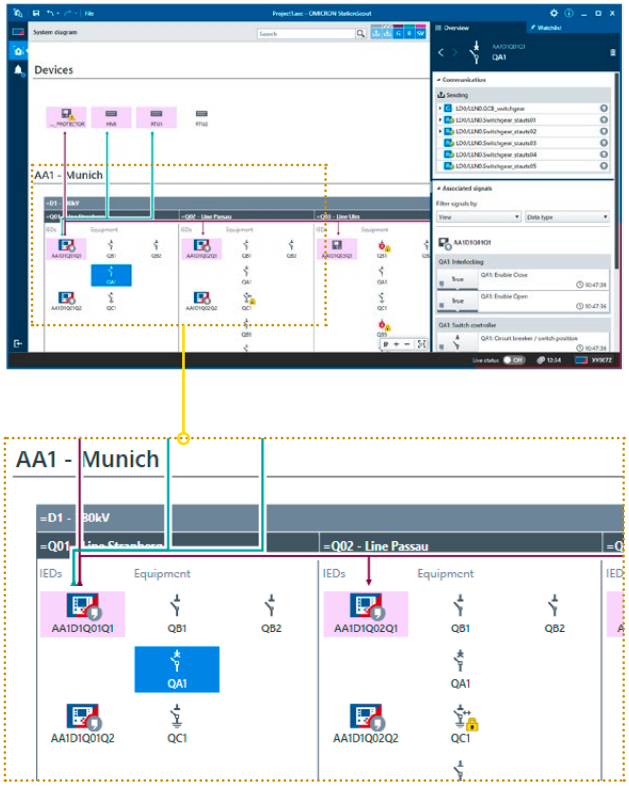
- Utilities performing factory- or site acceptance-tests
- SAS commissioning experts
- Protection testers
- Communication and commissioning engineers
- Developers of IEDs and SAS
- Planners, certification labs, system integrators, SAS maintenance engineers, …

Simulation and security

Simulation when needed

Depending on the project stage and the testing situation, not all assets may be available during the testing process. For instance, the RTU's IEC 104 mapping configuration might be ready in advance, but the HMI might be missing while the protection is engineered. Similarly, the SCADA/HMI developers might need the protection staff for simulating certain messages, and, of course, during the FAT, none of the primary assets are available.

StationScout is designed to offer simulations as needed, during any stage and for any circumstance. Should you require it, we can simulate missing IEDs, RTUs, gateways, HMI clients, or any other equipment that may not be available. We can also simulate binary I/O for switchgear positions and provide IEC 104 client support for SCADA/Control Center simulation.



Simulate IEDs, SCADA/HMI, and switchgear positions

Maximum cybersecurity in IEC 61850 substations

To connect to the substation network, perform tests, and simulate IEDs, StationScout comes with the special MBX test set.

This test set ensures maximum security, reliability, and performance when connected to the substation network. Therefore, the industrial-grade MBX hardware is equipped with encrypted storage, a cryptoprocessor module (TPM), and a secure firmware. MBX can be used in combination with IEDScout, StationScout as well as future OMICRON solutions for the testing of power utility communication.

MBX represents the license of the software and can be shared within teams. An IEDScout license is also included in all StationScout packages.

Additionally, the RBX, a 19" rack-mountable platform, and the VBX, a virtual platform, are available.

Powerful and secure: the MBX test set

Cybersecure rack-mountable RBX platform

Easy backup and maintenance: virtualized VBX application

Troubleshooting and communication testing

Putting substation automation systems into operation is a time-consuming task. Wiring and configuration errors have to be fixed – even after a successful factory acceptance test (FAT).

The **Smart Overview** in StationScout assists protection and control engineers by depicting what is configured in the engineering file as well as in the real substation. For example:

- Are the GOOSEs published and subscribed to properly?
- Are the Report Control Blocks correctly used by the gateway?
- How is a particular signal transmitted?

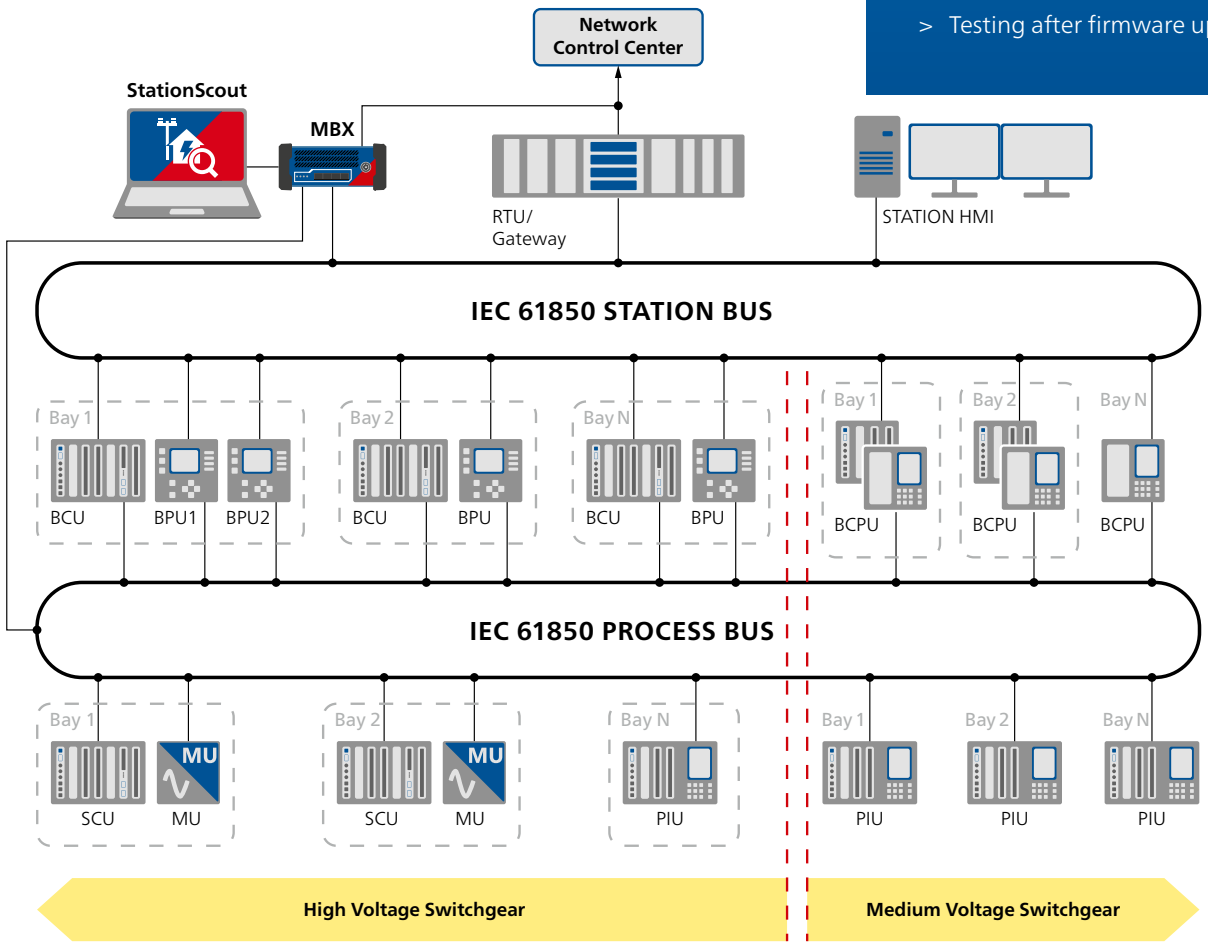
By clicking on an IED, a summary is shown detailing its relevant functions. Filters support selecting the communication of interest. Colored lines illustrate the signal flow. Engineering signal names are used from the SCL. If unavaiblable, useful names are generated by StationScout, or the utility's own naming conventions can be imported. Setup, workspace, and configuration are stored in a file.

IEC 61850 terminology is avoided, drilling down to IEC 61850 level is still possible, but not necessary. Of course details, such as Report Control Blocks and GOOSE information, are still available if requested.

Main applications

- SAS and SCADA testing
- Logic testing
- Commissioning
- Maintenance HMI
- Communication testing
- SCL validation/verification
- Testing after firmware upgrade

StationScout works with **any network topology –** just connect it to the substation LAN:



Commissioning features

SCADA, RTU/Gateway & closed-loop testing

During substation commissioning, it is essential to test data transmission to both local and remote SCADA systems meticulously. StationScout streamlines and speeds up SCADA signal testing by simulating IEDs to inject alerts, switchgear status signals, and measurement values.

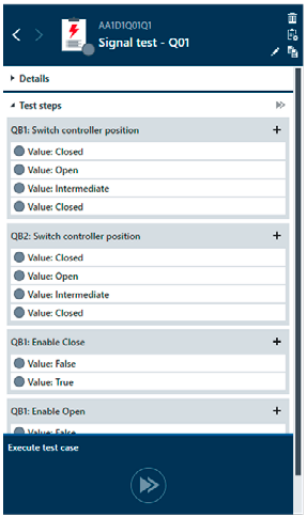
With the StationScout commissioning license, you can define test cases, assess signals, and record results, offering significant cost savings. Test results can be exported and printed for documentation.

You can also set testing to "auto-assess," allowing StationScout to automatically verify IEC 104 communication to SCADA over RTU/Gateways. Alternatively, manual assessment ensures correct signal display in the HMI and control center. By using a process simulator and importing the Binary I/O mapping of the Process Interface Unit (PIU), StationScout executes an end to end flow verification from the I/O terminals up to the RTU/Gateway output.

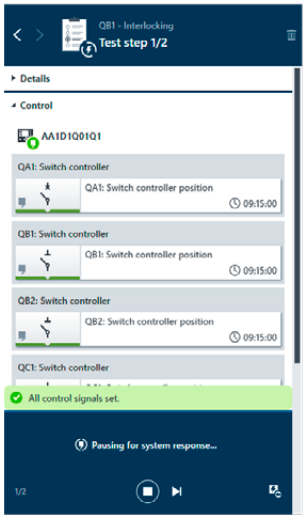
For a faster way to create signal tests, you can directly import signals and have StationScout generate test steps for switch states and single-point status signals. Test steps for masurements can then be added manually as needed.

Automated testing of interlocking conditions and logics

Logic is used in interlocking as well as in many other substation automation functions. Testing such logic functions is an essential part of FAT and SAT. To speed up testing, StationScout allows you to prepare test cases in the office and run it on your system with automated execution of control commands and automated assessments. The assessments include checking values from logical nodes like CILO, issuing switching commands, and checking the command response and switch state. Unavailable assets can be simulated, allowing testing during any project phase.



Signal testing

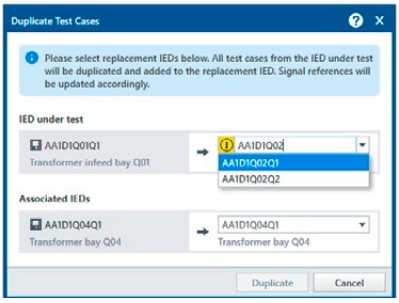


Interlocking test plan

A test case can be executed, duplicated to other IEDs, and repeated.

Write tests only once

Tests can already be developed in the specification phase and test cases can be re-used as templates from bay to bay. During engineering and FAT/SAT, IED configurations will likely be supplemented and adapted, which also means that the SCL file is updated. StationScout allows you to re-import single IEDs or the whole substation configuration from the updated SCL file while keeping your test cases and custom signal names.
Test cases can be exchanged between different projects.



Duplication of test cases

Export and share test cases

Substation automation systems are typically created using templates. StationScout saves time by creating a test case template for similar IEDs and exporting the test cases as JSON files. These JSON files can be easily edited for minor changes, saving users time for the same-purpose IEDs in different projects. Importing this template test case into the new environment allows users to import the entire project and share it with different departments.

Ordering information

StationScout consists of a test set and either the Smart Overview License or the Commissioning License. For the test set, there are two options available. The mobile MBX test set or the rack-mountable RBX platform for permanent installation in substations.

Software licenses

The **Smart Overview License** helps you visualize substations' data models and communications in a tidy overview.

Features:

- Smart Overview
- ZeroLine View shows substation topology, feeders, and bays
- Multiple bays or whole substations with dozens of IEDs can be simulated comfortably
- Simulation of IEDs
- Detects communication problems
- Live IEC 61850 signal visualization
- Watchlist signals
- IEDScout included

The **Commissioning License** has all the functionality of the Smart Overview License and comes with dedicated powerful features for testing and commissionig of IEC 61850 SAS.

Features:

- Smart Overview License functionality included
- IEC 104 client support
- Creation of own test cases
- Repeat tests previously created
- Re-apply test cases to other bays
- Export/Import test cases
- Documentation of all tests performed
- Assessment of test cases
- Automated execution of test cases
- SCADA signal testing support
- Live signal mapping tracking
- Binary I/O mapping for Process Simulaton

Licenses
StationScout Smart Overview on platform (MBX*)
StationScout Smart Overview on platform (RBX)
StationScout Smart Overview on platform (VBX**)
StationScout Commissioning on platform (MBX*)
StationScout Commissioning on platform (RBX)
StationScout Commissioning on platform (VBX**)

Upgrades
Upgrade IEDScout for MBX/RBX to StationScout Smart Overview
Upgrade IEDScout for MBX/RBX to StationScout Commissioning
Upgrade StationScout Smart Overview to Commissioning

*Platform MBX2 configurations "AC", "DIN Rail 48/60 VDC" or "DIN Rail 110/220 VDC"
**The virtualized testing platform, VBX, is available as part of a subscription package.

We create customer value through ...

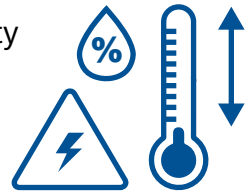
Quality

You can rely on the highest safety and security standards

Superior reliability with up to

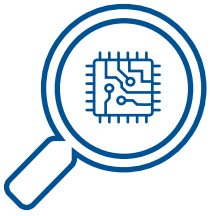
72

hours burn-in tests before delivery



100%

routine testing for all test set components



ISO 9001
TÜV & EMAS
ISO 14001
OHSAS 18001

Compliance with international standards

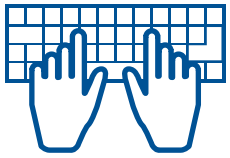
Innovation

... a product portfolio tailored to my needs

More than

200

developers keep our solutions up-to-date



More than

15%

of our annual sales is reinvested in research and development

Save up to

70%

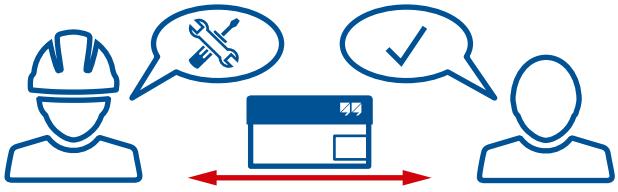
testing time through templates, and automation

Support

24/7

Professional technical support at any time

Loaner devices help to reduce downtime



Cost-effective and straight-forward repair and calibration

25

offices worldwide for local contact and support

Knowledge

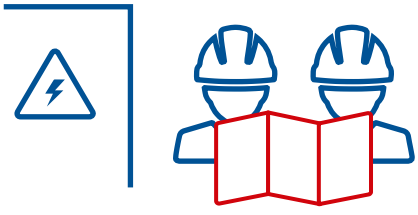
More than

300

Academy and numerous hands-on trainings per year

Frequently OMICRON hosted user meetings, seminars and conferences

to thousands of technical papers and application notes



Extensive expertise in consulting, testing and diagnostics

OMICRON is an international company that works passionately on ideas for making electric power systems safe and reliable. Our pioneering solutions are designed to meet our industry's current and future challenges. We always go the extra mile to empower our customers: we react to their needs, provide extraordinary local support, and share our expertise.

Within the OMICRON group, we research and develop innovative technologies for all fields in electric power systems. When it comes to electrical testing for medium- and high-voltage equipment, protection testing, digital substation testing solutions, and cybersecurity solutions, customers all over the world trust in the accuracy, speed, and quality of our user-friendly solutions.

Founded in 1984, OMICRON draws on their decades of profound expertise in the field of electric power engineering. A dedicated team of more than 1.100 employees provides solutions with 24/7 support at 24 locations worldwide and serves customers in more than 170 countries.

For more information, additional literature, and detailed contact information of our worldwide offices please visit our website.

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