

## Whitepaper

# Simplifying Multi-Substation Testing Configuration

## How to Manage Configurations for Multiple Subnets with StationScout

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### Abstract:

Testing communication across multiple substations and control centers is increasingly complex due to network segmentation and distributed IP ranges. Traditional testing approaches often require multiple tools, complex configurations, or cannot simulate missing devices effectively.

This whitepaper presents StationScout's multiple subnet configuration, which enables engineers to simulate IEDs across up to four subnets from a single interface. By simplifying multi-subnet testing, it allows comprehensive end-to-end verification, reduces setup complexity, and improves efficiency in commissioning and system validation.



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## 1 Summary

In modern substation automation, testing the interoperability between multiple substations and a control room often presents a significant networking challenge. Testing tools often prove inadequate when IEDs reside on different IP ranges or are physically separated by subnets. This whitepaper explores how **StationScout's multiple subnet configuration** allows engineers to simulate hundreds of IEDs across up to four distinct subnets simultaneously, enabling them to perform comprehensive end-to-end testing from a single interface.

## 2 Challenge: network segregation in complex projects

Large-scale projects, such as offshore wind farms connected to onshore substations, rely on seamless client/server communication between remote sites and a control center. However, these environments typically use different IP subnets for geographical or security isolation.

### Pain points:

- > **Hardware limitations:** Testing tools often require multiple units or complex Network Address Translation (NAT) configurations to communicate with different subnets.
- > **Simulation gaps:** During FAT or early commissioning, physical IEDs are often unavailable. Simulating missing IEDs that span different subnets usually requires a complex engineering setup.
- > **Verification complexity:** Verifying signals that trigger the same logic at a control center but originate from different subnets is a cumbersome process.

## 3 Solution: StationScout's multi-subnet configuration

StationScout eliminates these barriers by enabling the MBX/RBX hardware to function as a multi-homed simulation node. This feature is specifically designed for **Client/Server communication simulation**, allowing an engineer to represent multiple substations within a single test environment.

### Key functional capabilities:

- > **Simultaneous multi-subnet simulation:** Connect to and simulate IEDs on up to four different subnets.
- > **Flexible port mapping:** Users can assign subnets to physical ports on the StationScout hardware or, more efficiently, run **multiple subnets on a single port**.
- > **Unified visualization:** View and monitor the status of IEDs from different substations (and different IP ranges) on a single screen.

## 4 Implementation: a "hands-on" approach

The StationScout interface is designed to make configuring a multi-subnet environment intuitive for automation and protection engineers.

### Step-by-step configuration flow:

1. **Physical/Logical connection:** Connect StationScout (on MBX or RBX) to the station bus. If multiple subnets are consolidated via a dummy switch, only one cable to a port is needed.
2. **Network configuration:** In the StationScout settings, navigate to the *Network Configuration* page. Here, define the IP addresses and subnet masks for the up to four required segments. Once the communication is established, StationScout is ready to communicate across those ranges.
3. **IED simulation:** Import the SCL files (SCD/CID) for multiple substations. Simply click on *Simulation*. There is no need for additional manual assignment because StationScout intelligently routes the simulated IED traffic to the matching configured subnet.
4. **Automated testing execution:** Include signals from all subnets in a single automated test case to verify control center logic.

## 5 Case study: offshore-to-onshore integration

In a recent high-voltage project, a utility company needed to verify how the control center would respond to conditions that required synchronized signals from both an offshore platform and an onshore landing station.

- > **Scenario:** The IEDs had not yet been installed during the engineering phase. Both sites operated on different IP ranges.
- > **StationScout's advantage:** By utilizing the multiple subnet feature, the engineering team simulated all missing offshore and onshore IEDs with one StationScout unit.
- > **Result:** The team performed complex test scenarios in which signals from the offshore subnet and onshore subnets were triggered sequentially. This verified the control center's logic in a single pass, drastically reducing the time spent on manual configuration and repatching cables.

## 6 Conclusion

The ability to simulate across multiple subnets is a necessity for modern, interconnected power systems. StationScout provides automation and protection engineers with an easy-to-configure, powerful solution that simplifies the simulation of missing IEDs and ensures that the communication between the substation and the control center robust, verified, and ready for operation.

The engineering benefits can be summarized as follows:

- > **Reduced complexity:** No need for complex routing or multiple testing laptops.
- > **Enhanced verification:** Allows for "system-wide" testing rather than "unit" testing.
- > **Efficiency:** Automated testing features can now span the entire project scope, regardless of network topology.

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