



TECHNICAL REPORT



**Communication networks and systems for power utility automation –
Part 90-22: SCD based substation network automated management with with
visualization and supervision support**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

ISBN 978-2-8327-0064-8

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**COMMUNICATION NETWORKS AND SYSTEMS –
FOR POWER UTILITY AUTOMATION –**

**Part 90-22: SCD based substation network automated management with
visualization and supervision support**

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IEC TR 61850-90-22 has been prepared by IEC technical committee 57, Power systems management and associated information exchange. It is a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
57/2692/DTR	57/2737/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 61850 series, published under the general title *Communication networks and systems for power utility automation*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION

As an international standard, IEC 61850 currently serves thousands of substations around the world. Meanwhile, SCD configuration is subject to changes that could be brought up by retrofit, addition or removal of IED(s), etc., and the configuration of bridges needs to be updated accordingly. The procedures of these works have always relied on manual approaches.

Some questions raised naturally are the following.

- How does a bridge in the substation network update its configuration (e.g. VLAN setting) dynamically in case of SCD changes?
- How does a GOOSE/SV path rebuild automatically following the SCD update instead of being done manually?
- How does the bridge learn that a newly added IED is connected to it?
- How does a bridge discover the change in case of substation network connectivity changes?

These questions are the drivers to set up a Task Force to investigate the above questions and develop IEC TR 61850-90-22. These issues were demonstrated, gaps were identified, requirements were analysed and use cases are described in this document, which is a Technical Report.

To address these, the concept of auto-routing is introduced in this document.

At present, auto-routing is a system-level functionality of substation network performing through a combination of a variety of advantages of AR-Bridges as specified in this document. AR-Bridges could provide sophisticated function compared with IEC 61850 bridges that are employed in existing network systems. Auto-routing is an independent functionality and can co-exist with HSR/PRP and RSTP within a network.

The recovery time of auto-routing network is not addressed in this document. The key reason for this is that the system or AR-bridge should take out of service for the testing of the functionality after distribution or updating of the new SCD.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 90-22: SCD based substation network automated management with visualization and supervision support

1 Scope

This part of IEC 61850, which is a Technical Report, aims to provide analysis, principles, use cases and guidance on how to use GOOSE/SV static-routing or auto-routing based on System Configuration Description (SCD) file to automated manage the substation network while without changing the requirements of IEDs. Furthermore, this document also intends to give novel practices on network and GOOSE/SV path condition monitoring which support visualization and supervision from higher level application side.

Using the concepts developed in the IETF's Transparent Interconnection of Lots of Links (TRILL) using IS-IS protocol that is defined in RFC 6326 and ISO/IEC 10589 standards, this document defines network and system management data object models that are specific to power system operations. These data objects will be used to monitor the health of networks and systems, to detect abnormal behaviours of IEDs which contradict SCD file, such as unexpected IEDs or unexpected GOOSE/SV flows, and to support the management of the performance and reliability of the information infrastructure.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61850 (all parts), *Communication networks and systems for power utility automation*

IEC 62351 (all parts), *Power systems management and associated information exchange – Data and communications security*

IEC 62351-7:2017, *Power systems management and associated information exchange – Data and communications security – Part 7: Network and System Management (NSM) data object models*

IEC TR 62351-90-3:2021, *Power systems management and associated information exchange – Data and communications security – Part 90-3: Guidelines for network and system management*

IEC 62439-1, *Industrial communication networks – High availability automation networks – Part 1: General concepts and calculation methods*

IEC 62439-3:2021, *Industrial communication networks – High availability automation networks – Part 3: Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR)*

IEC 62443 (all parts), *Security for industrial automation and control systems*

IEEE Std 802.1AB™, *IEEE Standard for local and metropolitan area networks – Station and Media Access Control Connectivity Discovery*

IEEE Std 802.1D™, *IEEE Standard for local and metropolitan area networks –Media Access Control (MAC) Bridges*

IEEE Std 802.1Q™, *IEEE Standard for local and metropolitan area networks – Bridges and bridged networks*

IETF RFC 6325, *Routing Bridges (RBridges): Base Protocol Specification*

IETF RFC 6326, *Transparent Interconnection of Lots of Links (TRILL) Use of IS-IS*