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Communication networks and systems in power utility automations – Part 90-16: Requirements of system management for Smart Energy Automation

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COMMUNICATION NETWORKS AND SYSTEMS IN POWER UTILITY AUTOMATIONS –

Part 90-16: Requirements of system management for Smart Energy Automation

FOREWORD

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IEC 61850-90-16 has been prepared by IEC technical committee TC57: 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
57/2315/DTR	57/2352/RVDTR

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

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

This publication is split into two parts:

- This document, providing an overview of the main content, and high-level diagrams
- This document has an associated machine-readable version of the use-cases in the form of a zipped HTML code component IEC_TR_61850-90-16_HTML_2020_FullDC2.zip. It uses Active X components and is compatible with Microsoft Internet Explorer

The same copyright and licensing conditions apply to the "paper" part (this document) and the complementary HTML part provided within the IEC_TR_61850-90-16_HTML_2020_FullDC2.zip file.

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/standardsdev/publications.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

The distribution grid is facing a massive roll out and refurbishment of automation equipment to implement deeper monitoring and new smart grid applications. The new equipment to be deployed in order to solve today's issues (MV voltage and reactive power regulation for example) will necessarily have to be adjustable and updatable in order to face challenges of tomorrow (for example massive electric vehicles fleets, low voltage automation, etc.) which will arrive long before the end of its 20 years' service life. Furthermore, there is a necessity for the equipment to adapt to the evolving and growing cybersecurity threats.

The equipment will therefore need to be patched, updated and reconfigured, and this has to be done remotely due to the great number of equipment. This is a cornerstone of the System Management (SM), which refers to functionalities that are not directly linked to the operational role of the equipment but allow it to perform its operational functions in the best conditions possible. System Management or Smart Grid Devices Management also includes other functions such as asset management or supervision.

These functionalities need to be managed by the grid operator and address multiple devices from different vendors through independent Information Systems and thus the requirements and exchanges need to be standardized. As these are to be applied to IEC 61850 compliant equipment, these mechanisms need to be integrated in the standard.

COMMUNICATION NETWORKS AND SYSTEMS IN POWER UTILITY AUTOMATIONS –

Part 90-16: Requirements of system management for Smart Energy Automation

1 Scope

This part of IEC 61850, which is a technical report, specifies the mechanisms for the system management of Smart Grid Devices as IEC 61850 equipment in power utility automation as well as telecommunication and cybersecurity equipment.

System Management of Smart Grid Devices or Smart Grid Device Management refers to functionalities that are not directly linked to the operational role of the equipment (which for grid automation equipment would be to protect and allow remote supervision and control on the grid) but allow it to perform its operational functions in the best conditions possible.

The main functions of Smart Grid Device Management can be categorized as illustrated in Figure 1 and described below. These actions being available from remote information systems, they affect system automation functions, telecommunication functions and cybersecurity functions as these three categories are interacting in a Smart grid Device or system.

The Smart Grid domain has been chosen for these use cases, including distributed energy resources. This content is expected to be applicable to other domains, such as industrial automation domain and grid user domain.

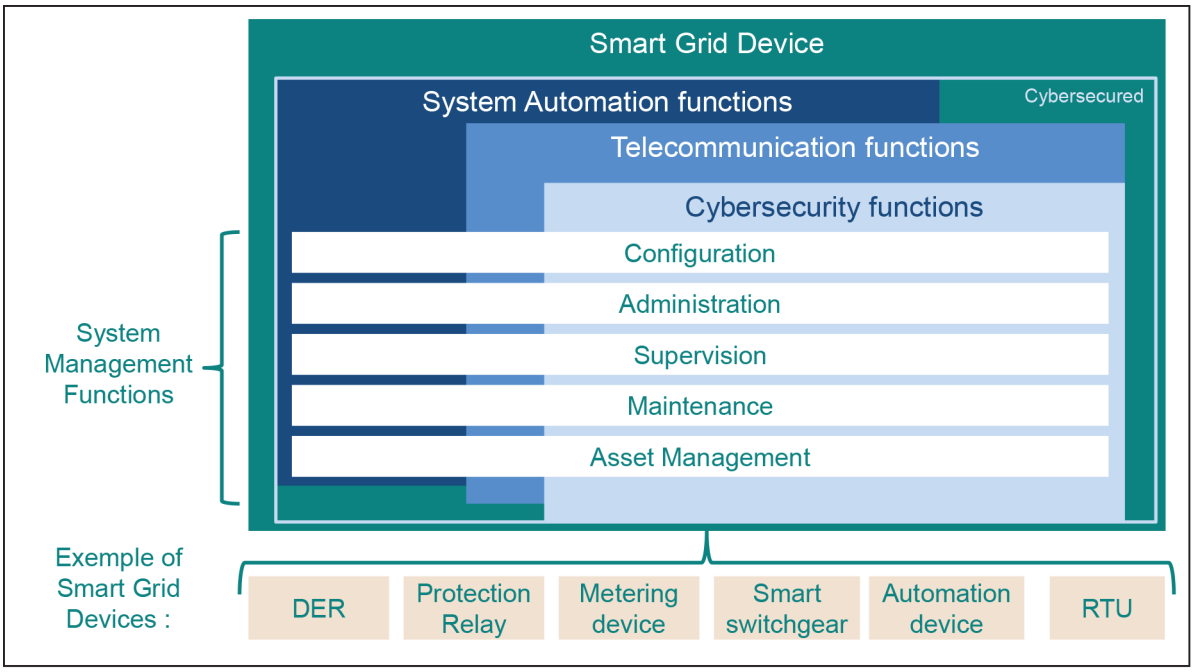

Figure 1 – Scope of the functions and objects covered by the Smart Grid Device Management

IEC TR 62351-10, *Power systems management and associated information exchange - Data and communications security - Part 10: Security architecture guidelines.* The main five functions for System Management are listed below:

1) IEC TR 62351-90-1, *Power systems management and associated information exchange - Data and communications security - Part 90-1: Guidelines for handling role-based access control in power systems*
2) Managing the software (administration): download, update and manage the firmware versions of automation equipment;
3) Supervising: active supervision of Smart Grid devices in order to ensure the required quality of service of the system, to diagnose potential problems and if possible to suggest resiliency solutions in case of deficiency;
4) Maintaining the system: collect data concerning the operational state of the equipment in order to be able to initiate predictive analysis, perform maintenance actions and reduce failure probabilities;
5) Managing one's assets: collect and transfer patrimonial data to the information systems in charge of asset management and maintenance.

This part of IEC 61850 specifies these functions through use cases associated state machines, requirements and processes necessary for their implementation.

Since the outcome of that work will affect several parts of IEC 61850, in a first step, this technical report has been prepared, which addresses the topic from an application specific viewpoint across all affected parts of IEC 61850. That approach is similar to what is done for example with IEC 61850-90-1 for the communication between substations. Once the report is approved, the affected parts of the standard can be amended with the results from the report.

The major part of the work consists in designing the use cases with the appropriate requirements.

Smart Grid Devices Management Use Cases will also be used for extracting requirements on cybersecurity:

– These steps and requirements will "surround" the Use Case functional steps for the most part, but may require some validation steps within the procedures as well.
– The IEC 62351 series should address those requirements (For example: modifying RBAC parameters in an IED, install RBAC parameters inside the IED).
– Those cybersecurity workflows and requirements will be considered as pre-requisites in Smart Grid Devices Management Use Cases.

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 61850-7-2, *Communication networks and systems for power utility automation - Part 7-2: Basic information and communication structure - Abstract communication service interface (ACSI)*

IEC 62351-8, *Power systems management and associated information exchange - Data and communications security - Part 8: Role-based access control for power system management*

IEC 62351-9, *Power systems management and associated information exchange - Data and communications security - Part 9: Cyber security key management for power system equipment*

IEC TR 62351-10, *Power systems management and associated information exchange - Data and communications security - Part 10: Security architecture guidelines*

IEC TR 62351-90-1, *Power systems management and associated information exchange – Data and communications security – Part 90-1: Guidelines for handling role-based access control in power systems*

IEC TR 62443-2-3:2015, *Security for industrial automation and control systems - Part 2-3: Patch management in the IACS environment*

IEC 62443-3-3, *Industrial communication networks - Network and system security - Part 3-3: System security requirements and security levels*

IEC 62443-4-2, *Security for industrial automation and control systems - Part 4-2: Technical security requirements for IACS components*