

TECHNICAL REPORT



Power systems management and associated information exchange – Part 1: Reference architecture



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Power systems management and associated information exchange – Part 1: Reference architecture

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CONTENTS

FOREWORD	7
1 Scope	9
2 Normative references	9
3 Terms, definitions and abbreviated terms	10
3.1 Terms	10
3.2 Abbreviated terms	12
4 Drivers and objectives for Reference Architecture	13
5 Overview	15
5.1 Standardisation context	15
5.2 Relevant business domains	16
5.3 Intended audience	19
5.3.1 General	19
5.3.2 Implementing actors	19
5.3.3 Standardization actors	20
5.4 Reference to relevant sources	20
6 Reference Architecture	21
6.1 Underlying methodology	21
6.1.1 General	21
6.1.2 The Smart Grids architectural methodology	22
6.1.3 SGAM levels of abstraction	24
6.1.4 The use case methodology	25
6.1.5 Data modelling	27
6.1.6 Profiling methodology	28
6.2 Reference Architecture overview	29
6.3 Elements of Reference Architecture	30
6.3.1 General	30
6.3.2 Elements as Interface Reference Model abstract components	31
6.3.3 Elements as some typical Smart Grids Systems	33
6.3.4 Elements as 61850 Intelligent Electronic Devices	34
6.4 Relationships of Reference Architecture	35
6.4.1 General	35
6.4.2 Communication inside substation	37
6.4.3 Communication between substations	38
6.4.4 Communication to support distributed automation along the feeder	39
6.4.5 Communication between substation and control centres and between control centres	39
6.4.6 Communication at the enterprise level	42
6.4.7 Communication to connect DERs (see Figure 26)	43
6.4.8 Communication to or within power plants (hydro, gas, thermal, wind) (see Figure 27)	44
6.5 Security standard landscape for Reference Architecture	45
6.5.1 General	45
6.5.2 Evolving security requirements for power system management	47
6.5.3 Resilience and security measures for power system operations	48
6.5.4 Overview and correlations of IEC 62351 security standards	50
6.6 Relationships applied to telecommunication	52

6.6.1	General	52
6.6.2	Applicability statement of communication technologies to the Smart Grids sub-networks	54
6.7	Interoperability	56
7	Use of Reference Architecture	56
7.1	General	56
7.2	Development of Enterprise Architecture	56
7.2.1	General	56
7.2.2	Model Driven Architecture	57
7.2.3	The Open Group Architecture Framework	57
7.3	How to evolve from a Present User Architecture to Reference Architecture	58
7.4	Example: how to map a use case using Reference Architecture	58
7.5	Development of information exchange specification	67
7.6	Integrating security in Reference Architecture	68
7.6.1	General	68
7.6.2	Identification of security requirements	69
7.6.3	Mapping of security to power system domains	70
7.6.4	Security controls	71
8	Main areas of future standardisation work	73
8.1	General	73
8.2	Increase standard usage efficiency through digitalisation	73
8.3	Harmonise data modelling	73
8.4	Other future topics	74
9	Conclusion	74
	Annex A (informative) SGAM Layer description	75
	Annex B (informative) Elements examples	76
	B.1 Example of control centre distribution systems	76
	B.2 Example of a system, the case of network model management system	76
	B.3 Example of a power flow component	77
	Annex C (informative) Relationship examples	79
	C.1 General	79
	C.2 Data transformation via gateways and adapters	79
	C.3 Example of a Message Exchange	80
	Annex D (informative) TC 57 standards descriptions and roadmaps	84
	D.1 TC 57 Working Group 03	84
	D.2 TC 57 Working Group 10	85
	D.2.1 General	85
	D.2.2 IEC 61850 standard overview	85
	D.3 TC 57 Working Group 13	87
	D.3.1 General	87
	D.3.2 IEC 61970 standard overview	87
	D.4 TC 57 Working Group 14	89
	D.4.1 General	89
	D.4.2 IEC 61968 standard overview	89
	D.5 TC 57 Working Group 15	91
	D.5.1 General	91
	D.5.2 IEC 62351 standard overview	91
	D.6 TC 57 Working Group 16	100

D.6.1	General	100
D.6.2	IEC 62325 standard overview	100
D.7	TC 57 Working Group 17	105
D.8	TC 57 Working Group 18	105
D.9	TC 57 Working Group 19	106
D.9.1	General	106
D.9.2	IEC 62357 and IEC 62361 related standard overview	106
D.10	TC 57 Working Group 20	107
D.11	TC 57 Working Group 21	108
D.11.1	General	108
D.11.2	IEC 62746 related standard overview	108
D.12	Supplemental standards developed by the IEC and other bodies	109
Bibliography.....		110
Figure 1 – Core domain of Reference Architecture.....		16
Figure 2 – IEC TS 62913 conceptual model		17
Figure 3 – Two infrastructures (OT/IT) must be designed, operated, and secured		18
Figure 4 – Relevant sources for IEC TR 62357-1:2016		21
Figure 5 – SGAM plane.....		22
Figure 6 – SGAM Model.....		23
Figure 7 – SGAM levels of abstraction		24
Figure 8 – Interactions between the Business and Function layers.....		27
Figure 9 – Data modelling and harmonization work mapping		28
Figure 10 – Information Models, Profiles and Messages		29
Figure 11 – Reference Architecture.....		30
Figure 12 – Power systems information related standards.....		31
Figure 13 – Distribution IRM Model		32
Figure 14 – Flexibility for assignment of element “Volt/Var Control” to SGAM segments (M490 C-Reference Architecture).....		33
Figure 15 – SGCG/M490 Smart Grids systems on SGAM Plane.....		34
Figure 16 – IEC 61850 Data Modelling.....		35
Figure 17 – Functions of a substation automation system allocated logically on three different levels (station, bay/unit, or process).....		36
Figure 18 – IEC 61850 related standards		37
Figure 19 – Communication inside substation		38
Figure 20 – Communication between substations.....		38
Figure 21 – IEC 61850 Telecontrol and control equipment and systems related standards.....		40
Figure 22 – Communication between substation and control centres.....		41
Figure 23 – Communication between control centre		41
Figure 24 – CIM Communication layer standards		42
Figure 25 – Communication from control centre / trading system to a market place.....		43
Figure 26 – Communication to connect DER		44
Figure 27 – Communication to/or within power plants		44
Figure 28 – Generic security architecture.....		45

Figure 29 – Architecture of key power system management security standards and guidelines	46
Figure 30 – Typical cyber security requirements, threats, and possible attack techniques	48
Figure 31 – Interrelationships between IEC communication standards and IEC 62351 security standards.....	51
Figure 32 – Mapping of communication networks on SGAM	54
Figure 33 – Use of Reference Architecture in TOGAF	58
Figure 34 – CIM circuit breaker application view	59
Figure 35 – Real world devices	61
Figure 36 – Operate a circuit breaker with IEC 61850	62
Figure 37 – SCL for LNs	63
Figure 38 – SCL POS attribute.....	64
Figure 39 – ACSI service example	65
Figure 40 – Mapping of an ACSI service	66
Figure 41 – Hierarchical model for a circuit breaker	66
Figure 42 – SGAM analysis for the function “Monitoring inside the distribution grid”	67
Figure 43 – IEC mapping tool.....	68
Figure 44 – Security assessment types supporting Security Architecture design	69
Figure 45 – Security requirements and tasks per SGAM Layer depending on the abstraction layer	71
Figure 46 – Security Controls.....	72
Figure 47 – Addressing security requirements with security means of different strength.....	72
Figure 48 – RA through time	73
Figure A.1 – SGAM layer description	75
Figure B.1 – Example of control centre distribution system and relationships with other typical distribution systems	76
Figure B.2 – Network Model Management and other involved systems.....	77
Figure B.3 – Parts of a CIM network case	78
Figure C.1 – SCADA data interfaces	80
Figure C.2 – IEC 61968 associated communication technologies	81
Figure C.3 – XMPP architecture concept.....	82
Figure C.4 – Use of XMPP example	83
Figure D.1 – IEC 61850 standard series	85
Figure D.2 – IEC 61970 standard series	88
Figure D.3 – IEC 61968 standard series	90
Figure D.4 – NSM object models.....	94
Figure D.5 – RBAC concepts in IEC TS 62351-8.....	95
Figure D.6 – Architecture of IEC information exchange standards.....	96
Figure D.7 – Hierarchical architecture of DER system operations.....	98
Figure D.8 – IEC 62325 standard series	101
Figure D.9 – MADES overview	102
Figure D.10 – MADES scope	102
Figure D.11 – Interface Reference Model or the North American Style ISO/RTO market operations.....	104

Figure D.12 – IEC 62361, IEC 62357 standard series	107
Figure D.13 – IEC 62746 standard series.....	109
Table 1 – Business and System Use Case	26
Table 2 – Standards Guidelines	47
Table 3 – Overview of IEC 62351 standards	50
Table 4 – Technologies covered by SDOs in function of SGAM Communications Sub-Networks	55
Table 5 – Message types	60
Table 6 – Information assets and their relation to system security.....	70

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**POWER SYSTEMS MANAGEMENT AND
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IEC 62357-1, which is a technical report, has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This new edition cancels and replaces the first edition published in 2012 and constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) The new edition provides updates and defines layered Reference Architecture to help direct longer term goals and activities, specifically to ensure compatibility of all new

standards developed in the IEC by benefitting from lessons learned during development of the current standards and their application to actual utility projects as well as through application of other internationally recognized architecture standards.

- b) This edition reflects the progress recently achieved with the international Smart Grids (SG) initiatives and the CIGRE D2.24 large system architecture vision. It also leverages the work done by NIST-SGIP, CEN-CELELEC-ETSI SGCG M490, IEC SG3 Smart Grids Roadmap, and IEC SyC Smart Energy working groups.

The edition also reflects the most recent editions of the IEC standards relating to power systems management and associated information exchange, including the IEC 61850 series and the IEC 61968, IEC 61970 and IEC 62325 Common Information Model (CIM) standards.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
57/1688/DTR	57/1745/RVC

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

In this technical report, the following print types are used:

- *obligations: in italic underlined type.*

A list of all parts in the IEC 62357 series, published under the general title *Power systems management and associated information exchange*, can be found on the IEC website.

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

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

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POWER SYSTEMS MANAGEMENT AND ASSOCIATED INFORMATION EXCHANGE –

Part 1: Reference architecture

1 Scope

Electricity grids from generation to consumers, including transmission and distribution, as well as energy markets are facing many new challenges while integrating an increasing variety of digital computing and communication technologies, electrical architectures, associated processes and services. The new challenges lead very often to support an increasing level of interaction between involved actors, components and systems.

Thus, it is key for the IEC to propose a clear and comprehensive map of all standards which are contributing to support these interactions, in an open and interoperable way.

The purpose of this document is to provide such a map (as available in 2016), but also to bring the vision of the path which will be followed by the concerned IEC technical committees and working groups in the coming years, to improve the global efficiency, market relevancy and coverage of this series of standards.

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 60870-5 (all parts), *Telecontrol equipment and systems – Part 5: Transmission protocols*

IEC 60870-6 (all parts), *Telecontrol equipment and systems – Part 6: Telecontrol protocols compatible with ISO standards and ITU-T recommendations*

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

IEC 61968 (all parts), *Application integration at electric utilities – System interfaces for distribution management*

IEC 61970 (all parts), *Energy Management System Application Program Interface (EMS-API)*

IEC 62325 (all parts), *Framework for energy market communications*

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

IEC TR 62357-200, *Power systems management and associated information exchange – Part 200: Guidelines for migration from Internet Protocol version 4 (IPv4) to Internet Protocol version 6 (IPv6)*

IEC 62361 (all parts), *Power systems management and associated information exchange – Interoperability in the long term*

IEC 62746 (all parts), *Systems interface between customer energy management system and the power management system*

3 Terms, definitions and abbreviated terms

3.1 Terms

3.1.1 Architecture

The purpose of architecture is to define or improve systems. The architectural process encompasses understanding the scope of interest, understanding stakeholder requirements, and arriving at a design to satisfy those requirements.

The two word-senses in which architecture is used are:

- A set of models with the purpose of representing a system of interest.
- The activity and/or practice of creating the set of models representing a system.

Model Driven Architecture advocates the application of modelling to the architectural process and formalizes the resulting artefacts such that the realization or improvement of the system may be more actionable, less expensive and less risky.

3.1.2 Reference Architecture

A Reference Architecture describes the structure of a system with its element types and their structures, as well as their interaction types, among each other and with their environment. Describing this, a Reference Architecture defines restrictions for an instantiation (concrete architecture). Through abstraction from individual details, a Reference Architecture is universally valid within a specific domain. Further architectures with the same functional requirements can be constructed based on the Reference Architecture. Along with Reference Architectures comes a recommendation, based on experiences from existing developments as well as from a wide acceptance and recognition by its users or per definition. [ISO/IEC 42010]

3.1.3 System

A system is a collection of parts and relationships among these parts that may be organized to accomplish some purpose.

In Model Driven Architecture, the term ‘system’ can refer to an information processing system but it is also applied more generally. Thus a system may include anything: a system of hardware, software, and people, an enterprise, a federation of enterprises, a business process, some combination of parts of different systems, a federation of systems – each under separate control, a program in a computer, a system of programs, a single computer, a system of computers, a computer or system of computers embedded in some machine, etc.

One of the key strengths of modelling, and one that distinguishes it from implementation technologies like software source code, is that it is an excellent way to represent, understand and specify systems.

In Smart Grids Architecture Model (SGAM) a system is a boundary which include all layers of SGAM

3.1.4 Functional Architecture / Concept

- A “function” represents a logical entity which performs a dedicated function. Being a logical entity, a function can be physically implemented in various ways (in devices or applications).
- A “function group” is a logical aggregation of one or more functions.