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NORME INTERNATIONALE

Communication networks and systems for power utility automation – Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3

Réseaux et systèmes de communication pour l'automatisation des systèmes électriques – Partie 8-1: Mise en correspondance des services de communication spécifiques (SCSM) – Mises en correspondance pour MMS (ISO 9506-1 et ISO 9506-2) et pour l'ISO/CEI 8802-3

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3

FOREWORD

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International Standard IEC 61850-8-1 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This second edition cancels and replaces the first edition, published in 2004, and constitutes a technical revision.

The main changes with respect to the previous edition are listed below:

– the support of gigabit Ethernet,
– the link layer redundancy,
– the extension of the length of the object reference,
– the extension of the reason for inclusion type for comprehensive logging,
– the mapping of the tracking services,

– a second mapping of the objectReference when used in the tracking services, or as linking,
– the extension of the AdditionalCause enumeration,
– the simulation of GOOSE telegram,
– the so-called fixed-length encoded GOOSE,
– the removal of the SCL Control Block,
– the mappings of ACSI service error codes and ISO 9506 error codes have changed (see 8.1.3.4). One change that should be noted is the change in usage of object-undefined. The object-undefined code has been replaced by object-non-existent in many responses.

The text of this standard is based on the following documents:

FDIS	Report on voting
57/1109/FDIS	57/1127/RVD

Full information on the voting for the approval of this standard 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.

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

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site 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.

INTRODUCTION

This document is part of a set of specifications which details layered utility communication architecture.

This part of IEC 61850 is intended to provide inter-device operation of a variety of devices to achieve interoperability providing detailed information on how to create and exchange concrete communication messages that implement abstract services and models specified in IEC 61850-7-4, IEC 61850-7-3, and IEC 61850-7-2.

The mapping allows for data exchange over ISO/IEC 8802-3 Local Area Networks between all kinds of utility devices. Some of the protocol stacks used within this document are routable. Therefore the actual communications path may not be restricted to the LAN. Data exchange consists of real-time monitoring and control data, including measured values, to name just a few.

NOTE This part of IEC 61850 does not provide tutorial material. It is recommended that IEC 61850-5 and IEC 61850-7-1 be read in conjunction with IEC 61850-7-2.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3

1 Scope

This part of IEC 61850 specifies a method of exchanging time-critical and non-time-critical data through local-area networks by mapping ACSI to MMS and ISO/IEC 8802-3 frames.

MMS services and protocol are specified to operate over full OSI and TCP compliant communications profiles. The use of MMS allows provisions for supporting both centralized and distributed architectures. This standard includes the exchange of real-time data indications, control operations, report notification.

It specifies the mapping of the objects and services of the ACSI (Abstract Communication Service Interface, IEC 61850-7-2) to MMS (Manufacturing Message Specification, ISO 9506) and ISO/IEC 8802-3 frames.

This standard also specifies the mapping of time-critical information exchanges to non-MMS protocol. The protocol semantics are defined in IEC 61850-7-2. It contains the protocol syntax, definition, mapping to ISO/IEC 8802-3 frame formats and any relevant procedures specific to the use of ISO/IEC 8802-3.

This mapping of ACSI to MMS defines how the concepts, objects, and services of the ACSI are to be implemented using MMS concepts, objects, and services. This mapping allows interoperability across functions implemented by different manufacturers.

This part of IEC 61850 defines a standardized method of using the ISO 9506 services to implement the exchange of data. For those ACSI services defined in IEC 61850-7-2 that are not mapped to MMS, this part defines additional protocols. It describes real utility devices with respect to their external visible data and behaviour using an object oriented approach. The objects are abstract in nature and may be used to a wide variety of applications. The use of this mapping goes far beyond the application in the utility communications.

This part of IEC 61850 provides mappings for the services and objects specified within IEC 61850-7-2, IEC 61850-7-3, and IEC 61850-7-4.

2 Normative references

The following referenced documents are indispensable for the application 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 60874-10-1:1997, *Connectors for optical fibres and cables – Part 10-1: Detail specification for fibre optic connector type BFOC/2,5 terminated to multimode fibre type A1*

IEC 60874-10-2:1997, *Connectors for optical fibres and cables – Part 10-2: Detail specification for fibre optic connector type BFOC/2,5 terminated to single-mode fibre type B1*

IEC 60874-10-3:1997, *Connectors for optical fibres and cables – Part 10-3: Detail specification for fibre optic connector type BFOC/2,5 for single and multimode fibre*

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

IEC 61850-2, *Communication networks and systems in substations – Part 2: Glossary*

IEC 61850-5, *Communication networks and systems in substations – Part 5: Communication requirements for functions and device models*

IEC 61850-6:2009, *Communication networks and systems for power utility automation – Part 6: Configuration description language for commincation in electrical substations related to IEDs*

IEC 61850-7-1:2011, *Communication networks and systems for power utility automation – Part 7-1: Basic communication structure – Part 7-1: Principles and models*

IEC 61850-7-2:2010, *Communication networks and systems for power utility automation – Part 7-2: Basic communication structure – Abstract communication service interface (ACSI)*

IEC 61850-7-3:2010, *Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes*

IEC 61850-7-4:2010, *Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes*

IEC 61850-9-1:2003, *Communication networks and systems in substations – Part 9-1: Specific Communication Service Mapping (SCSM) – Sampled values over serial unidirectional multidrop point to point link*

IEC 61850-9-2:2011, *Communication networks and systems for power utility automation – Part 9-2: Specific Communication Service Mapping (SCSM) – Sampled values over ISO/IEC 8802-3*

IEC 62351-6, *Power systems management and associated information exchange – Data and Communication Security – Part 6: Security for IEC 61850*

IEC 62439-3:2010, *Industrial communication networks – High availability automation networks – Part 3: Parallel Redundancy Protocol (PRP) and High availability Seamless Redundancy (HSR)*

Amendment 1[1]

ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*

ISO/IEC 7498-3:1997, *Information technology – Open Systems Interconnection – Basic Reference Model: Naming and addressing*

ISO/IEC 8072:1996, *Information technology – Open systems interconnection – Transport service definition*

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1 To be published.

ISO/IEC 8073:1997, *Information technology – Open Systems Interconnection – Protocol for providing the connection-mode transport service definition*

ISO/IEC 8326:1996, *Information processing system – Open Systems Interconnection – Session service definition*

ISO/IEC 8327-1:1997, *Information technology – Open Systems Interconnection – Connection-oriented session protocols: Protocol specification*

ISO/IEC 8348:2002, *Information technology – Open Systems Interconnection – Network service definition*

ISO/IEC 8473-1:1998, *Information technology – Protocol for providing the connectionless-mode network service: Protocol specification*

ISO/IEC 8473-2:1996, *Information technology – Protocol for providing the connectionless-mode network service – Part 2: Provision of the underlying service by an ISO/IEC 8802 subnetwork*

ISO/IEC 8602:1995, *Information technology – Protocol for providing the OSI connectionless-mode transport service*

ISO/IEC 8649:1996, *Information technology – Open Systems Interconnection – Service definition for the Associated Control Service Element*

ISO/IEC 8650-1:1996, *Information technology – Open Systems Interconnection – Connection-oriented protocol for the Association Control Service Element: Protocol specification*

ISO/IEC 8802-2:1998, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 2: Logical link control*

ISO/IEC 8802-3:2000, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

ISO/IEC 8822:1994, *Information technology – Open Systems Interconnection – Presentation service definition*

ISO/IEC 8823-1:1994, *Information technology – Open Systems Interconnection – Connection-oriented presentation protocol: Protocol specification*

ISO/IEC 8824-1:2008, *Information technology – Abstract Syntax Notation One (ASN. 1): Specification of basic notation*

ISO/IEC 8825-1:2008, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

ISO/IEC 8877:1992, *Information technology – Telecommunications and information exchange between systems – Interface connector and contact assignments for ISDN Basic Access Interface located at reference points S and T*

ISO/IEC 9542:1988, *Information processing systems – Telecommunications and information exchange between systems – End system to Intermediate system routeing exchange protocol*

for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO 8473)

ISO/IEC 9548-1:1996, *Information technology – Open Systems Interconnection – Connectionless Session protocol: Protocol specification*

ISO/IEC 9576-1:1995, *Information technology – Open Systems Interconnection – Connectionless Presentation protocol: Protocol specification*

ISO/IEC 10035-1:1995, *Information technology – Open Systems Interconnection – Connectionless protocol for the Association Control Service Element: Protocol specification*

Amendment 1 (1997)

ISO/IEC ISP 10608-1:1992, *Information technology – International Standardized Profile TAnnnn – Connection-mode Transport Service over Connectionless-mode Network Service – Part 1: General overview and subnetwork-independent requirements*

ISO/IEC ISP 10608-2:1992, *Information technology – International Standardized Profile TAnnnn – Connection-mode Transport Service over Connectionless-mode Network Service – Part 2: TA51 profile including subnetwork-dependent requirements for CSMA/CD Local Area Networks (LANs)*

ISO/IEC ISP 11188-1:1995, *Information technology – International Standardized Profile – Common upper layer requirements – Part 1: Basic connection oriented requirements*

ISO/IEC ISP 11188-3:1996, *Information technology – International Standardized Profile – Common upper layer requirements – Part 3: Minimal OSI upper layer facilities*

ISO 9506 series, *Industrial automation systems – Manufacturing Message Specification*

ISO 9506-1:2003, *Industrial automation systems – Manufacturing Message Specification – Part 1: Service definition*

ISO 9506-2:2003, *Industrial automation systems – Manufacturing Message Specification – Part 2: Protocol specification*

ISO/ISP 14226-1:1996, *Industrial automation systems – International Standardized Profile AMM11: MMS General Applications Base Profile – Part 1: Specification of ACSE, Presentation and Session protocols for use by MMS*

ISO/ISP 14226-2:1996, *Industrial automation systems – International Standardized Profile AMM11: MMS General Applications Base Profile – Part 2: Common MMS requirements*

ISO/ISP 14226-3:1996, *Industrial automation systems – International Standardized Profile AMM11: MMS General Applications Base Profile – Part 3: Specific MMS requirements*

IEEE C37.111:1999, *IEEE Standard Common Format for Transient Data Exchange (COMTRADE) for Power Systems*

IEEE 754:1985, *IEEE Standard for Binary Floating-Point Arithmetic*

IEEE 802.1Q:1998, *IEEE Standards for Local and Metropolitan Networks: Virtual Bridged Local Area Networks*

IEEE 802.1D:2004, *IEEE Standard for Local and Metropolitan Area Networks: Media access control (MAC) Bridges*

RFC 614, *Comments on the File Transfer Protocol, IETF,* available at http://www.ietf.org

RFC 640, *Revised FTP reply codes, IETF,* available at http://www.ietf.org

RFC 768, *User Datagram Protocol, IETF, available at http://www.ietf.org*RFC 791, *Internet Protocol – DARPA Internet Program – Protocol Specification, IETF,* available at http://www.ietf.org

RFC 791, *Internet Protocol – DARPA Internet Program – Protocol Specification, IETF,* available at http://www.ietf.org

RFC 792, *Internet Control Message Protocol – DARPA Internet Program – Protocol Specification, IETF,* available at http://www.ietf.org

RFC 793, *Transmission Control Procedure – DARPA Internet Program – Protocol Specification, IETF,* available at http://www.ietf.org

RFC 826, *An Ethernet Address Resolution Protocol or Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware, IETF,* available at http://www.ietf.org

RFC 894, *A Standard for the Transmission of IP datagrams over Ethernet Networks, IETF, available at http://www.ietf.org*RFC 919, *Broadcasting Internet Datagrams, IETF,* available at http://www.ietf.org

RFC 922, *Broadcasting Internet Datagrams in the presence of subnets, IETF, available at* http://www.ietf.org

RFC 950, *Internet Standard Subnetting Procedure, IETF,* available at http://www.ietf.org

RFC 1006, *ISO Transport Service on top of TCP: Version 3, IETF,* available at http://www.ietf.org

RFC 1112, *Host Extensions for IP Multicasting, IETF,* available at http://www.ietf.org

RFC 1122, *Requirements for Internet Hosts – Communication Layers, IETF,* available at http://www.ietf.org

RFC 1123, *Requirements for Internet Hosts – Application and Support, IETF*, available at http://www.ietf.org

RFC 4330, *Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI, IETF,* available at http://www.ietf.org

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61850-2 as well as the following apply.

3.1
(*n*)-layer
any specific layer