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First edition
2003-05

Communication networks and systems in substations –

Part 9-1: Specific Communication Service Mapping (SCSM) – Sampled values over serial unidirectional multidrop point to point link

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Part 9-1: Specific Communication Service Mapping (SCSM) – Sampled values over serial unidirectional multidrop point to point link

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMUNICATION NETWORKS AND SYSTEMS IN SUBSTATIONS –

**Part 9-1: Specific Communication Service Mapping (SCSM) –
Sampled values over serial unidirectional multidrop
point to point link**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organisation for standardisation comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardisation in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organisations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organisation for Standardisation (ISO) in accordance with conditions determined by agreement between the two organisations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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International Standard IEC 61850-9-1 has been prepared by IEC technical committee 57: Power system control and associated communications.

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

FDIS	Report on voting
57/619/FDIS	57/636/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.

IEC 61850 consists of the following parts, under the general title *Communication networks and systems in substations*.

- Part 1: Introduction and overview
- Part 2: Glossary ¹
- Part 3: General requirements
- Part 4: System and project management
- Part 5: Communication requirements for functions and devices models ²
- Part 6: Configuration description language for communication in electrical substations related to IEDs ¹
- Part 7-1: Basic communication structure for substation and feeder equipment – Principles and models
- Part 7-2: Basic communication structure for substation and feeder equipment – Abstract communication service interface (ACSI)
- Part 7-3: Basic communication structure for substation and feeder equipment – Common data classes
- Part 7-4: Basic communication structure for substation and feeder equipment – Compatible logical node classes and data classes
- Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO/IEC 9506-1 and ISO/IEC 9506-2) and to ISO/IEC 8802-3 ¹
- Part 9-1: Specific communication service mapping (SCSM) – Sampled values over serial unidirectional multidrop point to point link
- Part 9-2: Specific communication service mapping (SCSM) – Sampled values over ISO/IEC 8802-3 ¹
- Part 10: Conformance testing ¹

The relationship between IEC 60044-8 and this standard is as follows:

IEC 60044-8 defines a merging unit as interface to electronic current and voltage transformers. Data objects provided by that merging unit are specified in IEC 60044-8. This standard specifies a serial communication interface between the merging unit and equipment using the digital output of the merging unit like protection or metering equipment. For the specification of that serial interface, a subset of the abstract communication services defined in IEC 61850-7-2 are mapped on an ISO/IEC 8802-3 based communication link.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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

A bilingual version of this standard may be issued at a later date.

¹ Under consideration.

² To be published.

INTRODUCTION

This part of IEC 61850 applies to electronic current and voltage transformers (ECT and EVT) with a digital output via a merging unit, for use with electronic measuring instruments and electronic protective devices.

The transformer technology can be based on optical arrangements equipped with electronic components, on air core coils (with or without a built-in integrator) or, on iron core coils with integrated burden and used as a current to voltage converter, alone or equipped with electronic components.

For digital output, this standard takes into account a point to point connection from the merging unit to electronic measuring instruments and electronic devices.

This mapping allows interoperability between devices from different manufacturers.

This standard does not specify individual implementations or products, nor does it constrain the implementation of entities and interfaces within a computer system. This standard specifies the externally visible functionality of implementations.

Reading Guide

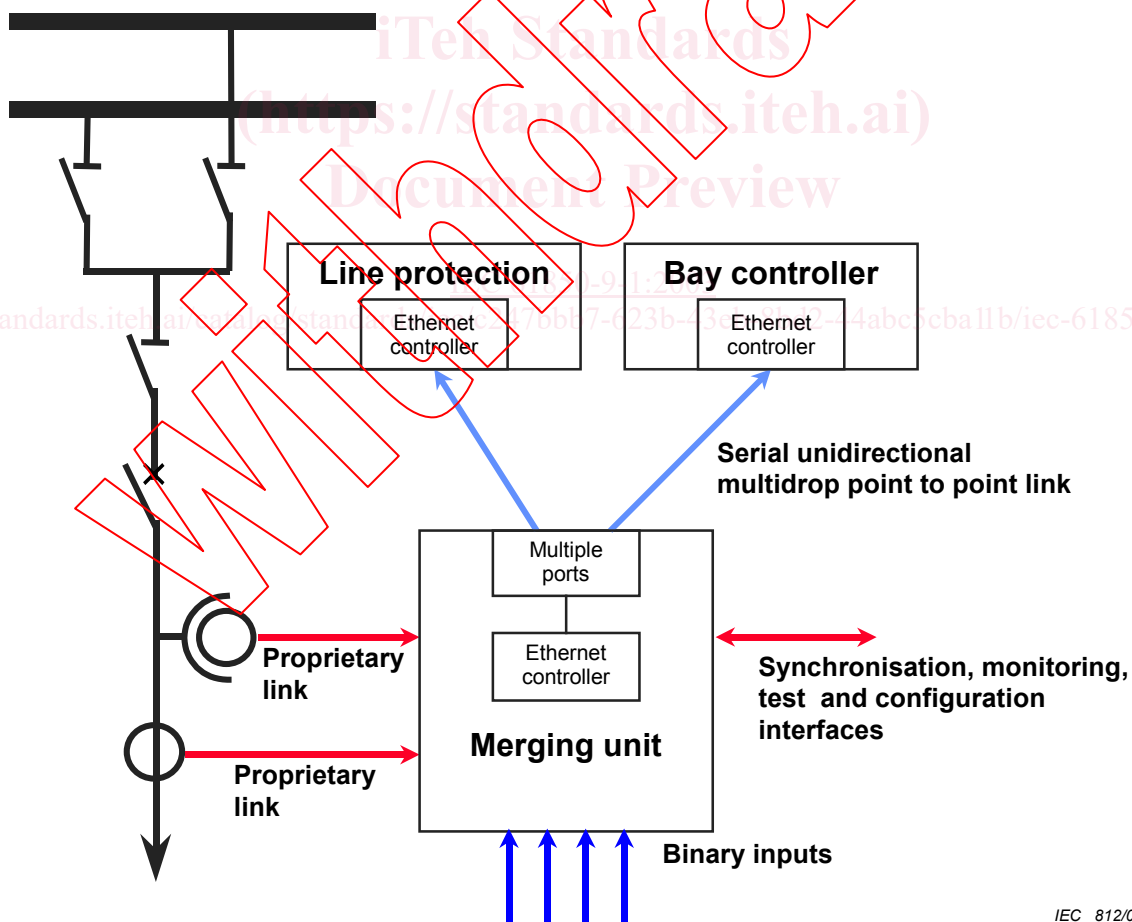
- The point to point transformer interface as defined here is based on the concepts described in IEC 60044-8. This standard extends this concept and proposes an alternative link layer to provide a solution for transmitting sampled measured values via Ethernet based interfaces. For the definition and measurement of the accuracy, synchronisation methods, data rates etc. of the transformers, refer to IEC 60044-8.
- This document can best be understood if the reader is thoroughly familiar with Parts 7-1, 7-2, 7-3 and 7-4 of this Standard.
- No explanations to the ACSI services are given in this part of the standard. For detailed information about the use of the ACSI services, refer to IEC 61850-7-2.

COMMUNICATION NETWORKS AND SYSTEMS IN SUBSTATIONS –

**Part 9-1: Specific Communication Service Mapping (SCSM) –
Sampled values over serial unidirectional multidrop point to point link**

1 Scope

This part of IEC 61850 specifies the specific communication service mappings for the communication between bay and process level and it specifies a mapping on a serial unidirectional multidrop point to point link in accordance with IEC 60044-8. This part of IEC 61850 specifies a mapping of the abstract service for the transmission of sampled values (as defined in IEC 61850-7-2) on a serial unidirectional multidrop point to point link in accordance with IEC 60044-8. It applies to the communication between merging units of electronic current (ECT) or voltage-transformers (EVT) and bay devices such as protection relays. If higher requirements on sampling rate, further sampled measured value data sets in addition to the universal data set, inter-bay communication and synchronisation apply, these will be covered by IEC 61850-9-2³. Figure 1 shows the schematics of this interface.



IEC 812/03

Figure 1 – Example for the use of the serial unidirectional multidrop point to point link

³ Under consideration.

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 60044-7: *Instrument Transformers – Part 7: Electronic voltage transformers*

IEC 60044-8: *Instrument Transformers – Part 8: Electronic current transformers*

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 61850-7-2: *Communication networks and systems in substations – Part 7-2: Basic communication structure for substation and feeder equipment – Abstract communication service interface (ACSI)*

IEC 61850-7-3: *Communication networks and systems in substations – Part 7-3: Basic communication structure for substation and feeder equipment – Common data classes*

ISO/IEC 8802-3: *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 8825-1: *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

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

IEEE 802.3: *Information Technology – Telecommunication and Information Exchange Between Systems – LAN/MAN – Specific Requirements – Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications*

3 Terms and definitions

For the purpose of this part of IEC 61850, the definitions of IEC 61850-24, IEC 60044-7 and IEC 60044-8 apply.

4 Abbreviations

ACSI	Abstract Communication Service Interface
ASDU	Application Service Data Unit
ASN.1	Abstract Syntax Notation number One
APCI	Application Protocol Control Information
APDU	Application Protocol Data Unit
AUI	Attachment Unit Interface
BER	ASN.1 Basic Encoding Rules
CFI	Canonical format identifier

⁴ Under consideration.

CSMA/CD	Carrier Sense Multiple Access/Collision Detection
DF	Data Frame
DO	Data Object
DSG	Data Set Group
ECT	Electronic Current Transformers
EVT	Electronic Voltage Transformers
LSDU	Link Layer Service Data Unit
MAC	Media Access Control
MSVCB	Multicast Sampled Value Control Block
MU	Merging Unit
PDU	Protocol Data Unit
SBO	Select Before Operate
SC	Secondary Converter
SCSM	Specific Communication Services Mapping
SIG	Status Indication Group
SAV	Sampled Analogue Value
TCI	Tag Control Information
TPID	Tag Protocol Identifier
VID	VLAN Identifier
VLAN	Virtual Local Area Network

5 Principle of mapping to the serial unidirectional multidrop point to point link

This Clause gives an overview of the mapping to the serial unidirectional multidrop point to point link. It defines the communication stack and data unit structures for the application layer. Restrictions to the application that are a consequence of this mapping are defined as well.

5.1 Communication stack

Figure 2 gives an overview of the communication stack. The link layer is in conformity with ISO/IEC 8802-3. This standard is usually referred to as Ethernet. In the following, the term Ethernet will be used instead of ISO/IEC 8802-3 (CSMA/CD).