

TECHNICAL REPORT



**Application integration at electric utilities – System interfaces for distribution management –
Part 900: Guidance for implementation of IEC 61968-9**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

ISBN 978-2-8322-2950-7

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	8
INTRODUCTION.....	10
1 Scope.....	13
2 Normative references.....	13
3 IEC 61968-100 basics.....	13
3.1 General.....	13
3.2 IEC 61968-100 message exchange patterns	14
3.3 IEC 61968-100 message types	14
3.3.1 General	14
3.3.2 Request messages.....	15
3.3.3 Response messages	17
3.3.4 Unsolicited event messages	18
3.4 IEC 61968-100 message content	19
3.4.1 General	19
3.4.2 Verb and noun elements in the message header	20
3.4.3 Get requests	20
3.4.4 Other requests	21
3.4.5 The CorrelationID element	21
3.4.6 Other elements in the message header.....	21
3.4.7 The Message.xsd XSD schema definition file.....	22
4 Request and response messages in detail.....	23
4.1 General.....	23
4.2 Several potential response messages for each request message	23
4.3 Response messages contain a status indication.....	24
4.4 Response messages containing data and error notifications.....	24
4.5 Specific error indications in the response messages	24
4.6 Implicit indication of success	27
4.7 General error indications in the response messages	28
4.7.1 General	28
4.7.2 Setting the <Reply><Result> element	28
4.7.3 Multiple response messages	29
4.8 Multiple <Request>, <Reply> and <Payload> elements.....	29
4.9 Implementation-specific messages	30
5 The naming of objects.....	30
5.1 General.....	30
5.2 Naming meters.....	30
5.3 EndDeviceGroups, UsagePoints and UsagePointGroups.....	32
5.4 Naming of other objects.....	33
5.5 Provisioning and interrogating a system.....	33
6 Meter read requests and responses	33
6.1 General.....	33
6.2 Message exchange patterns	34
6.2.1 General	34
6.2.2 Request message with a single response message.....	34
6.2.3 Request message with multiple response messages	35
6.3 GetMeterReadings request.....	37

6.3.1	General	37
6.3.2	Naming of meters.....	39
6.3.3	The ReadingType element.....	39
6.3.4	The ReadingQuality element	41
6.3.5	The TimeSchedule element	42
6.3.6	Specifying multiple constraints in a request message.....	43
6.3.7	Coincident meter reads	46
6.4	On-demand meter reads.....	47
6.4.1	General	47
6.4.2	Pinging a meter.....	49
6.5	MeterReadings response.....	49
6.5.1	General	49
6.5.2	The <MeterReading><Meter> element	51
6.5.3	The <MeterReading><Readings> element.....	52
6.5.4	The <MeterReading><Readings><ReadingQualities> element.....	53
6.5.5	The <MeterReading><Readings><ReadingType> element.....	53
6.5.6	The <MeterReading><Readings><IntervalBlocks> elements.....	53
6.5.7	The EndDeviceType, ReadingQualityType and ReadingType elements.....	53
6.6	Unsolicited meter reads.....	56
6.6.1	General	56
6.6.2	Message exchange pattern.....	56
6.6.3	Missing reads	58
6.6.4	Unsolicited MeterReads together with EndDeviceEvents	59
6.7	More about timestamps and interval data.....	60
6.7.1	General	60
6.7.2	Interval data.....	61
6.7.3	The interval block.....	62
6.7.4	Raw data	62
7	Meter control requests and responses.....	63
7.1	General.....	63
7.2	Message exchange pattern.....	64
7.3	Create(EndDeviceControls) message	65
7.3.1	General	65
7.3.2	EndDeviceControls element	66
7.4	Reply(EndDeviceControls) message.....	70
7.5	Created(EndDeviceEvents) message.....	71
7.5.1	General	71
7.5.2	EndDeviceEvents element.....	71
7.6	Unsolicited EndDeviceEvents Messages.....	74
7.6.1	General	74
7.6.2	Message exchange pattern.....	75
7.7	Premises area networks	75
7.7.1	General	75
7.7.2	Message exchange pattern.....	75
7.7.3	Pairing the Meter and PAN device	76
8	Configuration and provisioning.....	76
8.1	General.....	76
8.2	Message exchange pattern.....	77

8.3	Meter configuration	78
8.3.1	General	78
8.3.2	Create(MeterConfig) message	79
8.3.3	Reply(MeterConfig) message, success case	81
8.3.4	Reply(MeterConfig) message, failure case	81
8.4	Master data linkage	81
8.4.1	General	81
8.4.2	Create(MasterDataLinkage) message	82
8.5	OperationSets	83
8.5.1	General	83
8.5.2	OperationSet request message	84
8.5.3	OperationSet Response Message	86
9	Scheduling actions for future execution	87
9.1	General	87
9.2	Scheduling a meter read	87
9.2.1	General	87
9.2.2	Message exchange pattern	88
9.2.3	MeterReadSchedule element	89
9.3	Create(MeterReadSchedule) message	92
9.3.1	General	92
9.3.2	Reply(MeterReadSchedule) message	93
9.4	Cancelling a request	94
9.4.1	General	94
9.4.2	Cancel(MeterReadSchedule) request	94
10	Transporting IEC 61968-9 messages	95
10.1	General	95
10.2	Transporting over SOAP	95
10.2.1	General	95
10.2.2	Generic WSDL	96
10.2.3	Simple acknowledgement messages	96
10.2.4	Example message flow	97
10.3	Transporting over JMS	98
10.3.1	General	98
10.3.2	Explicit acknowledgements	99
10.3.3	JMS property details	99
10.3.4	Process details	99
10.3.5	Object details	100
11	Summary of message fields	100
11.1	General	100
11.2	Meter read operations	100
11.2.1	General	100
11.2.2	Request message	100
11.2.3	Response message	102
11.2.4	Unsolicited meter read	106
11.3	Meter control operations	106
11.3.1	General	106
11.3.2	Request message elements	106
11.3.3	Initial response message	108
11.3.4	Subsequent consequential event messages	109

11.3.5	Unsolicited meter event.....	111
11.4	Configuration and provisioning	111
11.4.1	General	111
11.4.2	Provisioning a meter	111
11.4.3	Creation of a ComModule.....	113
11.4.4	ServiceLocation	114
11.4.5	ServiceCategoryConfig.....	116
11.4.6	Service supplier	116
11.4.7	UsagePoint location	118
11.4.8	Usage point	120
11.4.9	Customer.....	122
11.4.10	Customer account.....	124
11.4.11	Customer Agreement	126
11.4.12	Pricing Structure	128
11.4.13	MasterDataLinkage	129
11.4.14	OperationSet	132
11.4.15	Adding, changing or deleting an object identifier	137
Figure 1	– Example message for a simple meter read request	16
Figure 2	– Example response message to a simple meter read request.....	17
Figure 3	– Example unsolicited event message	18
Figure 4	– RequestMessage definition according to Message.xsd	19
Figure 5	– ResponseMessage definition according to Message.xsd.....	19
Figure 6	– EventMessage definition according to Message.xsd	20
Figure 7	– Subelements allowed inside a <Header> element.....	23
Figure 8	– Example of a success indication in a Reply element.....	24
Figure 9	– Example of error indications in a Reply element (incomplete)	25
Figure 10	– Subelements allowed inside a <Reply> element	26
Figure 11	– Subelements allowed inside a <Reply><Error><ID> element.....	27
Figure 12	– Example of overall indication of success in a Reply element.....	28
Figure 13	– Example of error indications in a Reply element (corrected).....	28
Figure 14	– EndDevice definition.....	31
Figure 15	– Example of a Meter Read Request with NameType and NameTypeAuthority	32
Figure 16	– Message exchange pattern for a meter read request with a single response message.....	35
Figure 17	– Message exchange pattern for a meter read request with multiple response messages.....	37
Figure 18	– GetMeterReadings definition according to GetMeterReadings.xsd	39
Figure 19	– <GetMeterReading><ReadingType> definition	41
Figure 20	– <GetMeterReading><ReadingQuality> definition.....	42
Figure 21	– <GetMeterReadings><TimeSchedule> definition.....	43
Figure 22	– Example of a request message for two ReadingType codes over two meters.....	45
Figure 23	– Example of a request message for two meter/ReadingType combinations	46
Figure 24	– Message exchange pattern for an on-demand meter read.....	48

Figure 25 – Example of an on-demand meter read request message.....	49
Figure 26 – Example of a response to a meter read request.....	50
Figure 27 – MeterReadings definition according to MeterReadings.xsd	51
Figure 28 – <MeterReadings><Meter> definition	52
Figure 29 – <MeterReadings><Reading> definition	52
Figure 30 – <MeterReading><ReadingQuality> definition	53
Figure 31 – <MeterReadings><IntervalBlock> definition	54
Figure 32 – Example of a meter read response with named ReadingType and ReadingQuality elements	56
Figure 33 – Message exchange pattern for a set of unsolicited meter reads	57
Figure 34 – Example of an unsolicited meter read message	57
Figure 35 – Example of a missing reading in a published message	58
Figure 36 – Example of a known missing reading in a published message.....	59
Figure 37 – Example of a message showing both an event and a reading	60
Figure 38 – Reading Timestamps	61
Figure 39 – Example use of IntervalBlocks	63
Figure 40 – Message exchange pattern for a meter control operation.....	65
Figure 41 – Example of a create(EndDeviceControls) message for one meter	66
Figure 42 – Example of a create(EndDeviceControls) message for two meters	66
Figure 43 – EndDeviceControls definition	67
Figure 44 – EndDeviceControl definition.....	69
Figure 45 – EndDeviceControlType definition	70
Figure 46 – Example of a reply(EndDeviceControls) message.....	70
Figure 47 – Example of a created(EndDeviceEvents) message	71
Figure 48 – EndDeviceEvents definition	71
Figure 49 – EndDeviceEvent definition	73
Figure 50 – EndDeviceEventType definition.....	74
Figure 51 – Message exchange pattern for an unsolicited EndDevice event	75
Figure 52 – Message exchange pattern for a create(MeterConfig) message	78
Figure 53 – MeterConfig definition.....	79
Figure 54 – Example of a create(MeterConfig) message	80
Figure 55 – Example of a reply(MeterConfig) message, success case.....	81
Figure 56 – Example of a reply(MeterConfig) message, failure case.....	81
Figure 57 – MasterDataLinkageConfig Relationships	82
Figure 58 – Example of a create(MasterDataLinkageConfig) message	83
Figure 59 – Example of an execute(OperationSet) message	85
Figure 60 – Example of a reply(OperationSet) message, success case	86
Figure 61 – Example of a reply(OperationSet) message, failure case	87
Figure 62 – Message exchange pattern for scheduling a set of meter reads	89
Figure 63 – MeterReadSchedule definition	90
Figure 64 – MeterReadSchedule.TimeSchedule definition.....	92
Figure 65 – Example of a meter read schedule request.....	93
Figure 66 – Example of a response to a meter read schedule request.....	93

Figure 67 – Example of a meter read schedule cancel message.....	95
Figure 68 – Example of a simple meter read request imbedded in a SOAP message	95
Figure 69 – Example of a simple acknowledgement message	97
Figure 70 – Message exchange pattern showing the simple acknowledgement messages.....	98
Table 1 – Common EndDeviceControls and their corresponding EndDeviceEvent codes	64
Table 2 – Common EndDeviceEvent codes for unsolicited messages.....	75
Table 3 – Config Profiles.....	77
Table 4 – JMS properties	99
Table 5 – get(MeterReadings) fields.....	101
Table 6 – reply(MeterReadings) fields	103
Table 7 – create(EndDeviceControls) fields	107
Table 8 – reply(EndDeviceControls) fields	108
Table 9 – created(EndDeviceEvents) fields	109
Table 10 – create(MeterConfig) fields.....	111
Table 11 – create(ComModuleConfig) fields	113
Table 12 – create(ServiceLocationConfig) fields	115
Table 13 – create(ServiceCategoryConfig) fields	116
Table 14 – create(ServiceSupplierConfig) fields	117
Table 15 – create(UsagePointLocationConfig) fields	119
Table 16 – create(UsagePointConfig) fields.....	120
Table 17 – create(CustomerConfig) fields.....	123
Table 18 – create(CustomerAccountConfig) fields	125
Table 19 – create(CustomerAgreementConfig) fields	126
Table 20 – create(PricingStructureConfig) fields	128
Table 21 – create(MasterDataLinkageConfig) fields, example 1	129
Table 22 – create(MasterDataLinkageConfig) fields, example 2	131
Table 23 – execute(OperationSet) Header and Payload fields, example 1	132
Table 24 – execute(OperationSet) Header and Payload fields, example 2	135
Table 25 – execute(OperationSet) Header and Payload fields, example 3	139

INTERNATIONAL ELECTROTECHNICAL COMMISSION

—————

**APPLICATION INTEGRATION AT ELECTRIC UTILITIES –
SYSTEM INTERFACES FOR DISTRIBUTION MANAGEMENT –**
Part 900: Guidance for implementation of IEC 61968-9**FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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 organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 61968-900, which is a technical report, has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

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

Enquiry draft	Report on voting
57/1579/DTR	57/1616/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.

A list of all parts in the IEC 61968 series, published under the general title *Application integration at electric utilities – System interfaces for distribution management*, can be found on the IEC website.

The present technical report refers to some ambiguities occurring essentially in IEC 61968-9 and IEC 61968-100 (labelled here as “Warnings”). These issues are being addressed in Working Group 14 of IEC technical committee 57 and will be resolved in the forthcoming new editions of IEC 61968-9 and IEC 61968-100.

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.

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

General

This technical report is intended to help users to interpret IEC 61968-9:2013.

IEC 61968-9 provides a uniform means for performing meter read and control operations over a distributed network.

The most recent version of IEC 61968-9 was published in 2013 and is the second edition. This technical report therefore concentrates on this edition.

Although this technical report concentrates on IEC 61968-9, a portion of this depends on another standard, IEC 61968-100:2013.

The purpose of IEC 61968-9 is to allow heterogeneous components, possibly produced by different vendors, to interoperate with one another. Such components typically include a customer information system (CIS), an outage management system (OMS), a meter data management system (MDMS) and a head-end system (HES).

The messages that are exchanged between the various components are XML documents. IEC 61968-9 defines how these messages are expressed according to the semantics of the operations supported by this standard.

For example, a MDMS might instruct a HES to read the forward bulk energy usage from a set of meters and return the corresponding values back to the MDMS. Alternatively, the HES might be instructed to perform some control operations on a meter – for instance, disconnect the power, reset the readings of that meter and then reestablish the power again. In both cases, IEC 61968-9 defines the precise way in which the appropriate request and response messages are formulated.

While IEC 61968-9 defines the various data items from which the request and response messages are constructed, it is less prescriptive about the corresponding message flows – that is, how a complete message exchange looks. This document provides examples of typical message exchange patterns.

In other words, IEC 61968-9 is informative rather than normative (mandatory) when it comes to describing use cases and message patterns.

IEC 61968-9 does not prescribe the means by which such messages are transmitted from component to component. However, it may be assumed that components communicate with one another either by means of web services (SOAP messages) or over a message bus such as JMS or equivalent.

IEC 61968-9 XML schema definition files

IEC 61968-9 defines many different types of XML message according to the kind of data that are to be transmitted. These message types are referred to as profiles. For example, one such profile corresponds to a meter read request message and another to the corresponding response message.

Annexes H and I of IEC 61968-9:2013 contain listings of various XML schema definition (XSD) files, one for each profile supported by the standard. These constrain the formats of the various allowable XML messages and can be used both to generate sent messages as well as to validate received messages. XSD validation is often a first step in ensuring that received messages are at least syntactically correct, although it does not guarantee that the information in the various fields is always appropriate with regard to the application.

A paper or PDF listing is not a particularly practical way of accessing these XSD documents. However, they are also available in electronic form from the UCAIUG website¹.

Such XSD files may be conveniently examined using a graphical editor such as XML Spy which is a commercial product from Altova GmbH². Open-source tools such as Eclipse³ offer similar functionality.

Conventions used in this technical report

The examples used in this technical report generally refer to MDMS and HES systems. These names are used for illustrative purposes only. Other system names such as CIS and MDMS or client and server could just as equally well have been chosen.

XML fragments and examples, the names of files and other literal text are shown in a fixed-width font.

XML schemas are depicted using screen shots taken from XML Spy. The solid lines represent mandatory elements and the dotted lines represent optional elements. Please see the XML Spy documentation⁴ for explanations of the other symbols used.



A sign like this denotes a warning. There are a few areas where special care needs to be taken with IEC 61968-9.

How this technical report is organized

- Clause 3 of this technical report describes the basics of IEC 61968-100 as they relate to IEC 61968-9.
- Clause 4 describes more details concerning IEC 61968-100, especially as to what these have to do with formulating request and response messages and how notifications of errors are communicated. This clause also describes how the standard IEC 61968-9 set of messages may be augmented by implementation-specific messages.
- Clause 5 describes how meters and other objects are named in the IEC 61968-9 world.
- Clauses 6 and 7 respectively describe how meter read operations and meter control operations are carried out.
- Clause 8 shows how a MDMS or HES may be configured with provisioning information.
- Clause 9 discusses some of the less frequently used message exchange patterns, specifically how to schedule actions for execution at some future time and how to cancel them should the need arise.

¹ <http://iectc57.ucaiug.org/WG14/Part9/Shared%20Documents/Part%209%20Ed/IEC-Part9-Profiles-2nd-Edition%20FDIS.zip>

² <http://www.altova.com> – XML Spy is the trade name of a product supplied by Altova GmbH. This information is given for the convenience of users of this document and does not constitute an endorsement by the IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

³ <http://www.eclipse.org> – Eclipse is the trade name of a product supplied by the Eclipse Foundation. This information is given for the convenience of users of this document and does not constitute an endorsement by the IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

⁴ <http://www.altova.com/documents/XMLSpyTutorial.pdf>

- Clause 10 provides some details concerning transmitting IEC 61968-9 messages over SOAP (web services) or JMS transports.
- Clause 11 is a detailed reference of the various fields that are used within IEC 61968-9 messages.

APPLICATION INTEGRATION AT ELECTRIC UTILITIES – SYSTEM INTERFACES FOR DISTRIBUTION MANAGEMENT –

Part 900: Guidance for implementation of IEC 61968-9

1 Scope

This part of IEC 61968-9, which is a technical report, is a reference document and, as such, is not always suitable for someone new to the world of meter reading and control. In particular, it assumes significant domain knowledge.

This technical report is a companion document to the official standard. It is written from the viewpoint of a software developer or systems integrator who is tasked with implementing IEC 61968-9. It is not intended as a complete description of this standard. For full details, please refer to IEC 61968-9.

To get the most from this technical report, the user should have a good understanding of XML technologies, in particular of XML schema definitions and of web services.

This technical report contains informative recommendations which may be used to guide implementations of IEC 61968-9 and IEC 61968-100. It does not attempt to be exhaustive. In particular, it focuses on the most common IEC 61968-9 interfaces and assumes the user is using web services or JMS as the underlying transport mechanism. If the user is using other systems or the transport services are something other than web services or JMS, the recommendations in this technical report may be less relevant but perhaps still useful.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61968-9:2013, *Application integration at electric utilities – System interfaces for distribution management – Part 9: Interfaces for meter reading and control*

IEC 61968-100:2013, *Application integration at electric utilities – System interfaces for distribution management – Part 100: Implementation profiles*