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Application integration at electric utilities – System interfaces for distribution management –

Part 3: Interface for network operations

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 3: Interface for network operations

FOREWORD

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International Standard IEC 61968-3 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

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

FDIS	Report on voting
57/694/FDIS	57/714/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 61968 consists of the following parts under the general title *Application integration at electric utilities – System interfaces for distribution management*:

Part 1: Interface architecture and general requirements

Part 2: Glossary

Part 3: Interface for network operations

Part 4: Interface for records and asset management[1]

The committee has decided that the contents of this publication will remain unchanged until 2006. 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- withdrawn;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.

[1] Under consideration.

INTRODUCTION

The IEC 61968 series of standards is intended to facilitate *inter-application integration* as opposed to *intra-application integration*. Intra-application integration is aimed at programs in the same application system, usually communicating with each other using middleware that is embedded in their underlying runtime environment, and tends to be optimised for close, real-time, synchronous connections and interactive request/reply or conversation communication models. IEC 61968, in contrast, is intended to support the inter-application integration of a utility enterprise that needs to connect disparate applications that are already built or new (legacy or purchased applications), each supported by dissimilar runtime environments. Therefore, these interface standards are relevant to loosely coupled applications with more heterogeneity in languages, operating systems, protocols and management tools. This series of standards is intended to support applications that need to exchange data every few seconds, minutes, or hours rather than waiting for a nightly batch run. This series of standards, which are intended to be implemented with middleware services that exchange messages among applications, will complement, but not replace utility data warehouses, database gateways, and operational stores.

As used in IEC 61968, a Distribution Management System (DMS) consists of various distributed application components for the utility to manage electrical distribution networks. These capabilities include monitoring and control of equipment for power delivery, management processes to ensure system reliability, voltage management, demand-side management, outage management, work management, automated mapping and facilities management. Standard interfaces are defined for each class of applications identified in the Interface Reference Model (IRM), which is described in IEC 61968-1.

This Part of IEC 61968 contains the Clauses shown in Table 1.

Table 1 – Document overview for IEC 61968-3

Clause	Title	Purpose
1	Scope	The scope and purpose of the document are described.
2	Normative references	Documents that contain provisions which, through reference in this text, constitute provisions of this International Standard.
3	Reference and information models	Description of the relevant parts of the interface reference model, static information model and message type naming convention.
4	Message types – general	Requirements common to all message types described in Clause 5.
5	Network operations message types	Message types related to the exchange of information for operational documents namely operation restrictions, outage, safety and switching schedule.
Annex A	Message type verbs	Description of the verbs that are used for the message types.

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

Part 3: Interface for network operations

1 Scope

The IEC 61968 series, taken as a whole, defines interfaces for the major elements of an interface architecture for Distribution Management Systems (DMS). IEC 61968-1 identifies and establishes requirements for standard interfaces based on an Interface Reference Model (IRM). Parts 3 to 10 of the IEC 61968 series define interfaces relevant to each of the major business functions described by the Interface Reference Model.

As used in the IEC 61968 series, a DMS consists of various distributed application components for the utility to manage electrical distribution networks. These capabilities include monitoring and control of equipment for power delivery, management processes to ensure system reliability, voltage management, demand-side management, outage management, work management, automated mapping and facilities management.

The IEC 61968 series is limited to the definition of interfaces and is implementation independent. It provides for interoperability among different computer systems, platforms, and languages. Methods and technologies used to implement a functionality conforming to these interfaces are considered outside of the scope of the IEC 61968 series; only the interface itself is specified in these standards.

This part specifies the information content of a set of message types that can be used to support many of the business functions related to network operations. Typical uses of the message types defined in this part include data acquisition by external systems, fault isolation, fault restoration, trouble management, maintenance of the plant, and the commissioning of the plant.

An additional part of IEC 61968 will document integration scenarios or use cases, which are informative examples showing typical ways of using the message types defined in this document as well as message types to be defined in other parts of the IEC 61968 series.

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 61850-7-4:2003, *Communication networks and systems in substations – Part 7-4: Basic communication structure for substation and feeder equipment – Compatible logical node classes and data classes*

IEC 61968-1, *System interfaces for distribution management – Part 1: Interface architecture and general requirements*

3 Reference and information models

3.1 General

The message types defined in this document are based on a logical partitioning of the DMS business functions and components called the IEC 61968 interface reference model.

The contents of the message types are based on a static information model to ensure consistency of field names and data types. Each message type is defined as a set of fields copied from Common Information Model (CIM) classes. The message types defined in this standard are intended to satisfy a majority of typical applications. In some project implementations, it may be desirable to modify the set of fields using a methodology such as that described in IEC 61968-1.

3.2 Interface reference model

It is not the intention of this standard to define the applications and systems that vendors should produce. It is expected that a concrete (physical) application will provide the functionality of one or more abstract (logical) components as listed in this standard. These abstract components are grouped by the business functions of the interface reference model.

In this standard, the term abstract component is used to refer to that portion of a software system that supports one or more of the interfaces defined in Parts 3 to 10 of the IEC 61968 series. It does not necessarily mean that compliant software is delivered as separate modules.

IEC 61968-1 describes infrastructure services common to all abstract components whilst Parts 3 to 10 of the IEC 61968 series define the details of the information exchanged for specific types of abstract component.

The IEC 61968 series defines that:

a) An inter-application infrastructure is compliant if it supplies services defined in IEC 61968-1 to support at least two applications with interfaces compliant to IEC 61968 Parts 3 to 10.

b) An application interface is compliant if it supports the interface standards defined in IEC 61968 Parts 3 to 10 for the relevant abstract components defined in the interface reference model.

c) An application is only required to support interface standards of the applicable components listed under abstract components. It is not required to support interfaces required by other abstract components of the same business sub-function or within the same business function. While this standard primarily defines information exchanged among components in different business functions, it will occasionally also define information exchanged among components within a single business function when a strong market need for this capability has been realised.

3.3 Network operations functions and components

The message types defined in IEC 61968-3, may be sent or received by any type of component within a DMS system.

Table 2 shows these functions and typical abstract components that are expected to be producers of information for these message types. Typical consumers of the information include, but are not restricted to, the other components as listed in IEC 61968-1; for example, geographic information systems, energy management systems and customer information systems.

Table 2 – Business functions for network operations

Business Functions	Business sub-functions	Abstract components
Network operation (NO)	Network operation	Substation state supervision
	Monitoring (NMON)	Network state supervision for example by topology processing and network colouring
		Switching action supervision
		Management of data acquired from SCADA and metering systems
		Management of data acquired through operation (field crews, customers, scheduled and unscheduled outages)
		Alarm management including supervision, acknowledgement, and deletion
		Operator and event logs
	Network control (CTL)	User access control
		Automatic controls: Protection (fault clearance) Sectionalising Local voltage/reactive power control
		Assisted control: Remote switch control Load shedding Voltage regulation for example broadcast of voltage reduction command Local control through field crews
		Safety document management
		Safety checking and interlocks
		Major incident co-ordination
	Fault management (FLT)	Trouble call handling and coherency analysis (LV network)
		Protective relays analysis
		Fault location by analysis of fault detectors and/or trouble call localisation
		Supply restoration assessment
		Customer incident information
	Operation feedback Analysis (OFA)	Mal-operation analysis
		Network fault analysis
		Quality index analysis
		Device operation history
		Post-disturbance review
	Operation statistics and Reporting (OST)	Maintenance information
		Information for planning
		Information for management control
	Network calculations – real-time (CLC)	Load estimation
		Energy trading analysis
		Load flow/voltage profile
		Fault current analysis
		Adaptive relay settings
	Dispatcher training (TRN)	SCADA simulation

3.4 Message type terms

The message types defined in this standard are described using the following terms.

Message type name
Each message type has a name consisting of a verb and a noun.

Message type verb
The verb describes the purpose of the message. (See Annex A for the description of the verbs).

Message type noun
The noun describes the type of data in the message body. Each noun corresponds to a class name in the static information model. For most message types, the nouns are a type of document.

Message body
The body of each message type is based on the attributes (fields) of the classes described by the nouns.

Naming
"Naming" is a class that defines common attributes used to identify instances of common information model classes. The attributes are a set of human readable alphanumeric strings. It is usual for utilities to use unique alphanumeric codes to identify their substations and the equipment in each substation. In some implementations, these codes may have to be prefixed with additional characters to guarantee uniqueness across organisation boundaries.

Naming.name
This is a human readable alphanumeric string that identifies an entity with a specific scope, for example within a particular substation.

Naming.pathname
This is a human readable alphanumeric string that identifies an entity with global scope, for example a concatenation of zone, substation and equipment names.

Naming.aliasname
This is an alternative name that is expected to be used to contain other identifiers, for example a machine allocated identification number. The aliasname may be used by a computer system as an index to name translation tables when information is exchanged between different organisations.

Naming.description
This is a human readable alphanumeric string that provides additional information but is not intended for automatic processing by computer systems.

Document
"Document" is a class that defines common attributes used in all message types.

Document.type
The document type is the name of the class that is the actual instance, for example "SwitchingSchedule", "ActivityRecord".

Document.subtype
This is additional information that may be utility specific, for example "Planned", "OnDemand" for SwitchingSchedule, "Planned", "Unplanned" for OutageRecords, "PermitToWork" for a SafetyDocument.

Document.status
The document status is a string indicating the status of the document. This is expected to be specific to the document type, for example "Draft", "In Progress", "Approved".