DEUTSCHE NORM

Mai 2023

DIN EN IEC 61968-3

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Ersatz für
DIN EN IEC 61968-3:2019-08
Siehe Anwendungsbeginn

Integration von Anwendungen in Anlagen der Elektrizitätsversorgung – Systemschnittstellen für Netzführung – Teil 3: Schnittstelle für Netzbetriebsarten (IEC 61968-3:2021); Englische Fassung EN IEC 61968-3:2021

Application integration at electric utilities –
System interfaces for distribution management –
Part 3: Interface for network operations
(IEC 61968-3:2021);
English version EN IEC 61968-3:2021

Intégration d'applications pour les services électriques –
Interfaces système pour la gestion de la distribution –
Partie 3: Interface pour l'exploitation du réseau
(IEC 61968-3:2021);
Version anglaise EN IEC 61968-3:2021

Gesamtumfang 378 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

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Anwendungsbeginn

Anwendungsbeginn für die von CENELEC am 2021-06-01 angenommene Europäische Norm als DIN-Norm ist 2023-05-01.

Für DIN EN IEC 61968-3:2019-08 besteht eine Übergangsfrist bis 2024-06-01.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN IEC 61968-3:2021-04.

Für dieses Dokument ist das nationale Arbeitsgremium DKE/K 952 „Netzleittechnik“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE (www.dke.de) zuständig.

Aktuelle Informationen zu diesem Dokument können über die Internetseiten von DKE (www.dke.de) und DIN (www.din.de) durch eine Suche nach der Dokumentennummer aufgerufen werden.

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Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für die vorliegende Norm erfüllt.

Da sich die Benutzer der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der EN IEC 61968-3:2021 veröffentlicht. Zu deren Einleitung, Abschnitt 1, der den Anwendungsbereich festlegt, und Abschnitt 3, der die Begriffe und Abkürzungen festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA der vorliegenden Norm hinzugefügt. Für einige der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Diese Norm steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

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Das Original-Dokument enthält Bilder in Farbe, die in der Papierversion in einer Graustufen-Darstellung wiedergegeben werden. Elektronische Versionen dieses Dokuments enthalten die Bilder in der originalen Farbdarstellung.

Änderungen

Gegenüber DIN EN IEC 61968-3:2019-08 wurden folgende Änderungen vorgenommen:

a) umfassende Überarbeitung von „Switch Order“- und „Outage“-bezogenen Profilen;

b) detailliertere Dokumentation der Profile auf Grundlage der Analyse von Ende-zu-Ende-Anwendungsfällen;

c) Aufteilung des Profils „Measurement and Control“ (Messung und Steuerung) auf zwei Profile: „PSRMeasurements“ und „PSRControls“;

d) Ersetzung des Profils „Temporary Network Change“ (vorübergehender Netzwechsel) durch das Profil „SwitchingEvents“;

e) Hinzufügung von „MeasurementAction“, „ControlAction“, „GenericAction“ und „VerificationAction“ zu dem Profil „SwitchingPlans“. Hinzufügung von Beispielen;

f) Hinzufügung des Profils „SwitchingActions“ zwecks Unterstützung bei der Koordination der Ausführung von „SwitchingPlan“ zwischen Leitstelle und Außendienstteams;

g) Hinzufügung von „ClampAction“ zu den Profilen „SwitchingPlan“, „SwitchingAction“ und „SwitchingEvent“, so dass Klemmen unabhängig von Verbindungsleitungen platziert und entfernt werden können;

h) Aufteilung des Profils „OutagesAndFaults“ auf „UnplannedOutages“, „PlannedOutages“, „EquipmentFaults“ und „LineFaults“;

i) Hinzufügung einer Liste spannungsführender und spannungsfreier „UsagePoints“ zu dem Profil „UnplannedOutages“;

j) Hinzufügung des Profils „PlannedOutages“;

k) Hinzufügung des Profils „PlannedOutageNotifications“;

l) Ersetzung des Profils „OutageSchedules“ durch das Profil „SwitchingPlanRequest“;

m) Ergänzung des Profils „TroubleOrders“ um „UnplannedOutages“ und „TroubleTickets“ sowie um die Möglichkeit, Teams für einzelne Aufgaben innerhalb des „TroubleOrder“ einzuplanen;

n) Erweiterung der Anwendungsfälle und Sequenzdiagramme;

o) Aktualisierung der Sequenzdiagramme im Hinblick auf die Nachrichtenmuster von IEC 61968-100;

p) Anwendungsfälle in Anwendungsfallvorlage aus IEC 62559-2;

q) Hinzufügung von Beispiel-XML für Profile;

r) Ersetzung der XSD im Anhang durch Tabellen zur Dokumentation der Profile in einem serialisierungsunabhängigen Format;

s) Ergänzung der Erläuterung des FLISR-Anwendungsfalls im Hinblick auf die Interaktion zwischen VNB und ÜNB entsprechend den Kommentaren zur Überarbeitung von Ausgabe 2;

t) Streichung von „OperationalTags“, da dies nun Bestandteil von „TagAction“ in der Nutzlast von „SwitchingEvents“ ist.

Frühere Ausgaben

DIN EN 61968-3: 2005-03
DIN EN IEC 61968-3: 2019-08

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Nationaler Anhang NA
(informativ)

Auszugsweise Übersetzung

Reihenfolge und Inhalt der folgenden Abschnitte sind identisch mit denen in den jeweiligen Abschnitten der Englischen Fassung.

Einleitung

Der Zweck dieses Teils von IEC 61968 ist es, einen Standard für die Integration von Netzbetriebssystemen untereinander sowie mit anderen Systemen und Geschäftsfunktionen zu definieren, die im Anwendungsbereich der Norm IEC 61968 liegen. Die spezifischen Details zu den Kommunikationsprotokollen der jeweiligen Systeme liegen außerhalb des Anwendungsbereichs dieses Teils von IEC 61968. Stattdessen beschreibt und modelliert dieser Teil von IEC 61968 die allgemeinen Funktionen, die potenziell von Netzbetriebssystemen bereitgestellt werden können. Auf diese Weise ist dieser Teil von IEC 61968 nicht von der Festlegung, Entwicklung und/oder Bereitstellung zukünftiger Generationen von Netzbetriebssystemen betroffen, weder durch die Anwendung von Normen noch durch proprietäre Mittel.

Die Normenreihe IEC 61968 soll die Integration zwischen Anwendungen im Gegensatz zur Integration innerhalb von Anwendungen erleichtern. Die anwendungsinterne Integration zielt auf Programme in demselben Anwendungssystem ab, die in der Regel über die in der zugrunde liegenden Laufzeitumgebung eingebettete Middleware miteinander kommunizieren, und sie ist üblicherweise für ähnliche synchrone Echtzeitverbindungen sowie interaktive Kommunikationsmodelle basierend auf Anforderungen/Antworten oder auf Konversationen optimiert. Daher gelten diese anwendungsübergreifenden Schnittstellennormen für lose verknüpfte Anwendungen mit einem hohen Maß an Heterogenität bezüglich der Sprachen, Betriebssysteme, Protokolle und Verwaltungstools. Diese Normenreihe dient der Unterstützung von Anwendungen, die Daten im Sekunden-, Minuten- oder Stundentakt austauschen müssen, anstatt dies in Form von nächtlichen Massenvorgängen durchzuführen. Diese Normenreihe, die für eine Implementierung basierend auf Middleware-Diensten vorgesehen ist, die Meldungen zwischen den Anwendungen austauschen, stellt eine Ergänzung zu den Data Warehouses, Datenbank-Gateways und Betriebsspeichern von Energieversorgungsunternehmen dar und ersetzt diese nicht.

Nach IEC 61968 besteht ein Verteilnetzmanagementsystem (DMS, en: distribution management system) aus diversen dezentralen Anwendungskomponenten, mit denen Energieversorgungsunternehmen Stromverteilnetze verwalten können. Diese Komponenten umfassen Funktionen wie die Überwachung und Steuerung von Betriebsmitteln zur Strombereitstellung, Verwaltungsprozesse zur Sicherstellung der Zuverlässigkeit des Systems, die Spannungsregelung, die Verwaltung auf Verbraucherseite, die Verwaltung von Ausfällen, die Arbeitsplanung, die automatische Zuordnung und die Verwaltung von Anlagen. Für jede in dem in IEC 61968-1 beschriebenen Schnittstellen-Referenzmodell (IRM, en: interface reference model) bestimmte Anwendungsklasse werden Standard-Schnittstellen definiert.

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1 Anwendungsbereich

Entsprechend dem Schnittstellen-Referenzmodell aus IEC 61968 stattet die in diesem Teil von IEC 61968 definierte Funktion für den Netzbetrieb Energieversorgungsunternehmen mit den Mitteln zur Überwachung der Hauptstationstopologie (Leistungsschalter- und Schaltzustand), der Abzweigungstopologie und der Steuerung des Status von Betriebsmitteln mittels SCADA, AMI und anderer Datenquellen aus. Darüber hinaus ermöglicht sie die Verwaltung der Netzkonnektivität und der Lastbedingungen. Schließlich bietet sie Energieversorgungsunternehmen die Möglichkeit, telefonisch eingegangene Beschwerden von Kunden zu orten und die Einsätze von Außendienstteams bei geplanten und ungeplanten Ausfällen zu koordinieren.

IEC 61968-3 legt den Informationsinhalt einer Reihe von Meldungsnutzlasten fest, die für die Unterstützung zahlreicher mit dem Netzbetrieb zusammenhängender Geschäftsfunktionen verwendet werden können. Zu den typischen Anwendungen der in IEC 61968-3 definierten Meldungsnutzlasten gehören z. B. die Datenerfassung durch externe Systeme, die Fehlereingrenzung, die Fehlerbehebung, das Problemmanagement und die Koordination des Echtzeit-Netzzustands.

Das in Bild 1 dargestellte Diagramm des Anwendungsbereichs illustriert die Möglichkeit, die Funktion nach IEC 61968-3 entweder als ein einzelnes, integriertes erweitertes Verteilnetzmanagementsystem oder als Menge einzelner Funktionen – OMS, DMS und SCADA – zu implementieren. Den Energieversorgungsunternehmen steht es frei, diese Systeme bei unterschiedlichen Anbietern zu erwerben und sie anschließend mithilfe der Meldungen aus IEC 61968-3 zu integrieren. Alternativ könnte ein Anbieter zwei oder alle Komponenten als ein einzelnes, integriertes System anbieten. Wenn mehrere Systeme von ein und demselben Anbieter bereitgestellt werden, darf der Anbieter entscheiden, ob er Erweiterungen der Meldungen nach IEC 61968 oder einen proprietären Integrationsmechanismus verwendet, um die Funktionen über die Anforderungen/Unterstützung der Spezifikation aus IEC 61968-3 hinaus auszubauen. Wenngleich es sich hierbei um eine mögliche Implementierung handelt, wird der Anwendungsbereich in 4.3 in Form von Geschäftsfunktionen definiert, die in dem Angebot von Anbietern üblicherweise enthalten sind.

In den Anhängen dieses Dokuments werden Integrationsszenarien oder Anwendungsfälle beschrieben; dabei handelt es sich um informative Beispiele für die Verwendung von in diesem Dokument definierten Meldungsnutzlasten sowie von in anderen Teilen der Normenreihe IEC 61968 zu definierenden Meldungsnutzlasten.

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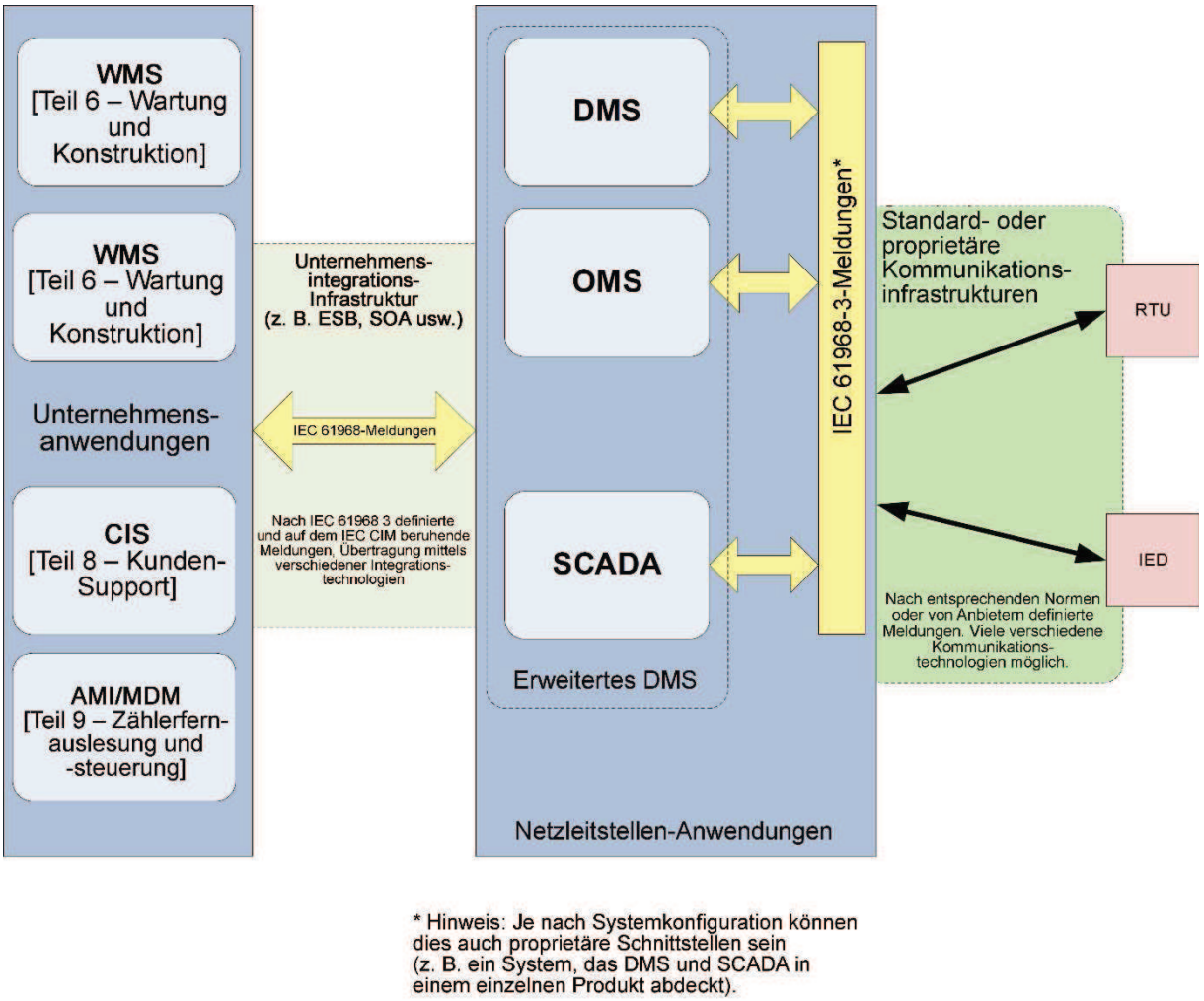

Bild 1 – Anwendungsbereich von IEC 61968-3

3 Begriffe und Abkürzungen

3.1 Begriffe

In diesem Dokument werden keine Begriffe aufgeführt.

ISO und IEC stellen terminologische Datenbanken für die Verwendung in der Normung unter den folgenden Adressen bereit:

- IEC Electropedia: verfügbar unter http://www.electropedia.org/
- ISO Online Browsing Platform: verfügbar unter http://www.iso.org/obp

3.2 Abkürzungen

Für die Anwendung dieses Dokuments gelten die Abkürzungen nach IEC 61968-2 und die folgenden Abkürzungen.

ANMERKUNG Für allgemeine Glossardefinitionen kann IEC 60050, *International Electrotechnical Vocabulary*, herangezogen werden.

FLISR Fehlerortung und -eingrenzung und Dienstwiederherstellung (en: fault location, isolation and service restoration)

WMS Arbeitsplanungssystem (en: work management system)

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EUROPEAN STANDARD

NORME EUROPÉENE

EUROPÄISCHE NORM

EN IEC 61968-3

June 2021

ICS 33.200

Supersedes EN IEC 61968-3:2018 and all of its amendments and corrigenda (if any)

English version

Application integration at electric utilities – System interfaces for distribution management – Part 3: Interface for network operations (IEC 61968-3:2021)

Intégration d'applications pour les services électriques – Interfaces système pour la gestion de la distribution – Partie 3: Interface pour l'exploitation du réseau (IEC 61968-3:2021)

Integration von Anwendungen in Anlagen der Elektrizitätsversorgung – Systemschnittstellen für Netzführung – Teil 3: Schnittstelle für Netzbetriebsarten (IEC 61968-3:2021)

This European Standard was approved by CENELEC on 2021-06-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

The text of document 57/2343/FDIS, future edition 3 of IEC 61968-3, prepared by IEC/TC 57 "Power systems management and associated information exchange" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61968-3:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022-03-01
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-06-01

This document supersedes EN IEC 61968-3:2018 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Endorsement notice

The text of the International Standard IEC 61968-3:2021 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61968-4	NOTE	Harmonized as EN IEC 61968-4.
IEC 61968-5	NOTE	Harmonized as EN IEC 61968-5.
IEC 61968-6	NOTE	Harmonized as EN 61968-6.
IEC 61968-8	NOTE	Harmonized as EN 61968-8.
IEC 61968-9	NOTE	Harmonized as EN 61968-9.
IEC 61968-11	NOTE	Harmonized as EN 61968-11.
IEC 61968-13	NOTE	Harmonized as EN IEC 61968-13.
IEC 62361-100	NOTE	Harmonized as EN 62361-100.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 61968-1	-	Application integration at electric utilities - System interfaces for distribution management - Part 1: Interface architecture and general recommendations	EN IEC 61968-1	-
IEC/TS 61968-2	-	Application integration at electric utilities - System interfaces for distribution management - Part 2: Glossary	-	-
IEC 61968-100	-	Application integration at electric utilities - System interfaces for distribution management - Part 100: Implementation profiles	EN 61968-100	-
IEC 61970-301	-	Energy management system application program interface (EMS-API) - Part 301: Common information model (CIM) base	EN IEC 61970-301	-

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INTRODUCTION

The purpose of this part of IEC 61968 is to define a standard for the integration of network operations systems with each other and other systems and business functions within the scope of IEC 61968. The specific details of the communication protocols those systems employ are outside the scope of this part of IEC 61968. Instead, this part of IEC 61968 will recognize and model the general capabilities that can be potentially provided by network operations systems. In this way, this part of IEC 61968 will not be impacted by the specification, development and/or deployment of next generation network operations systems, either through the use of standards or proprietary means.

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. Therefore, these inter-application 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, 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.

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

Part 3: Interface for network operations

1 Scope

Per the IEC 61968 Interface Reference Model, the Network Operations function defined in this part of IEC 61968 provides utilities with the means to supervise main substation topology (breaker and switch state), feeder topology and control equipment status through SCADA, AMI and other data sources. It also provides the means for handling network connectivity and loading conditions. Finally, it makes it possible for utilities to locate customer telephone complaints and coordinate activities of field crews with respect to planned and unplanned outages.

IEC 61968-3 specifies the information content of a set of message payloads that can be used to support many of the business functions related to network operations. Typical uses of the message payloads defined in IEC 61968-3 include data acquisition by external systems, fault isolation, fault restoration, trouble management and coordination of the real-time state of the network.

The scope diagram shown in Figure 1 illustrates the possibility of implementing IEC 61968-3 functionality as either a single integrated advanced distribution management system or as a set of separate functions – OMS, DMS and SCADA. Utilities may choose to buy these systems from different vendors and integrate them using the IEC 61968-3 messages. Alternatively, a single vendor could provide two or all of these components as a single integrated system. In the case of more than one system being provided by the same vendor, the vendor may choose to use either extensions of the IEC 61968 messages or a proprietary integration mechanism to provide enhanced functionality over and above what is required/supported by the IEC 61968-3 specification. While this is a possible implementation, Subclause 4.3 defines the scope in terms of business functions that are implemented in common vendor offerings.

Annexes in this document detail integration scenarios or use cases, which are informative examples showing typical ways of using the message payloads defined in this document as well as message payloads to be defined in other parts of the IEC 61968 series.

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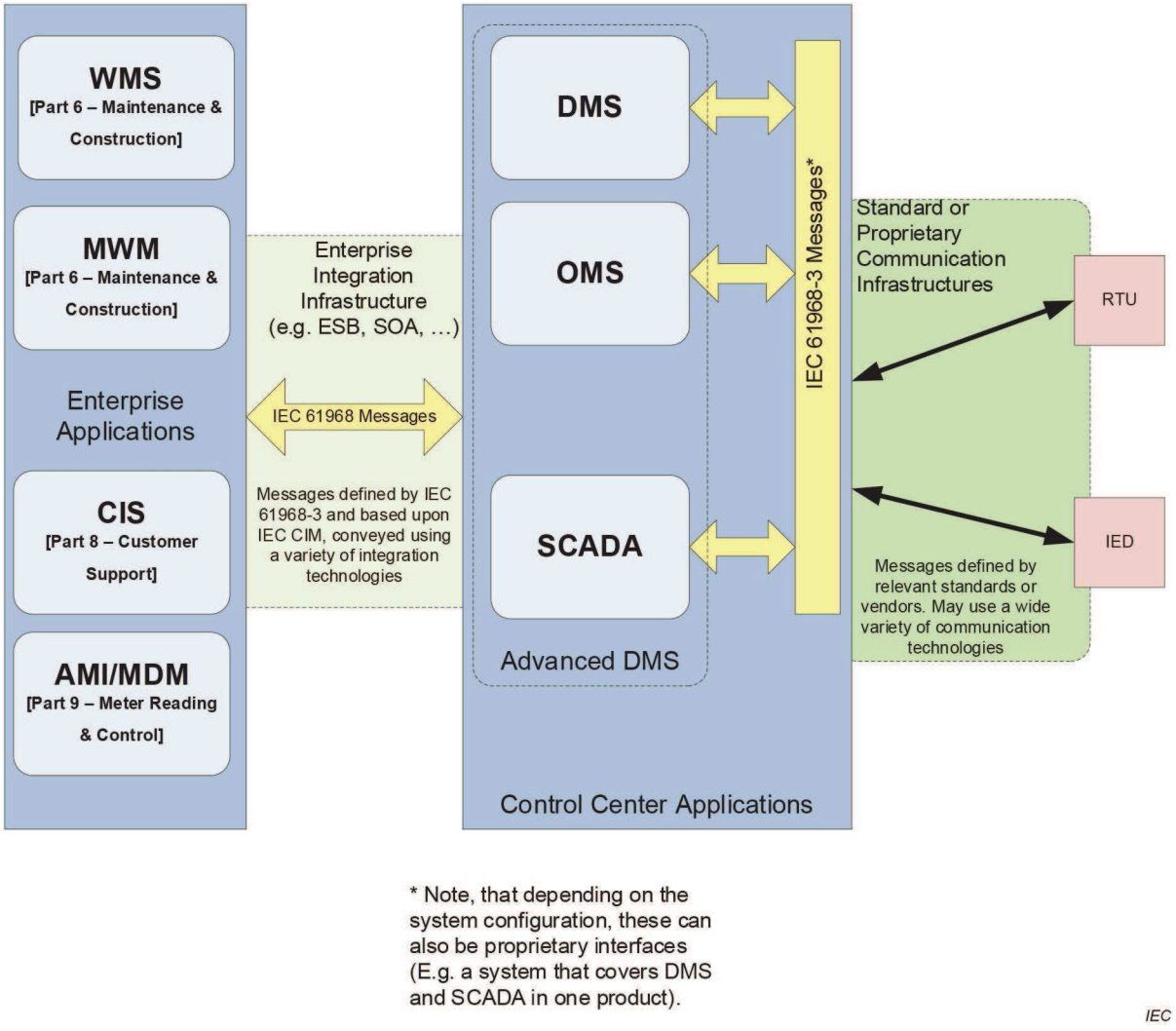

Figure 1 – IEC 61968-3 Scope

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 61968-1, Application integration at electric utilities – System interfaces for distribution management – Part 1: Interface architecture and general recommendations

IEC TS 61968-2, Application integration at electric utilities – System interfaces for distribution management – Part 2: Glossary

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

IEC 61970-301, Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base

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3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.2 Abbreviated terms

For the purposes of this document, the abbreviations given in IEC 61968-2 as well as the following apply.

NOTE Refer to IEC 60050, *International Electrotechnical Vocabulary*, for general glossary definitions.

FLISR Fault Location, Isolation and Service Restoration

WMS Work Management System

4 Reference and information models

4.1 General approach to network operations

Traditionally there have been two types of systems to manage distribution operations: Distribution Management Systems (DMS) and Outage Management Systems (OMS). Often a DMS has been delivered as an extension to a SCADA system, but some DMS can be delivered as a standalone set of distribution applications with no SCADA.

Outage Management Systems are used extensively in many parts of the world (typically with large service territories and a large amount of primary overhead conductor) to manage their distribution systems. Such distribution systems are typically configured radially and cover large distances. For this reason it has been historically expensive to monitor the status of the distribution system, particularly outside of the substation. In more dense populations the cost of telemetry and automation is lower, and can be justified on a cost per customer basis.

Thus often the only way that a distribution utility knows that there is a problem with the system is when a customer calls to report an outage. The utility then collects a set of outage calls, and from the pattern of calls received, determines the likely location and cause of the outage. A crew is then sent to the location of the outage to investigate further and affect repairs.

Distribution management systems have their roots in transmission SCADA systems. As automation has moved downwards and into distribution substations, there has been an increasing need to provide functionality for distribution applications. Distribution management systems originated as either extensions to the existing transmission SCADA, by adding additional points to cover the feeder breakers, or by adding a standalone distribution SCADA system. Both types of system usually have RTUs, communication front-ends, alarm systems and displays.

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What characterizes these systems as distribution management systems is the addition of functions such as the ability to add temporary devices, such as line cuts and jumper lines. Such temporary devices are uncommon in transmission systems, but are very common in distribution systems. Since many distribution systems are operated in a radial configuration, it is often necessary to operate feeder tie switches to reconfigure feeders, either to restore outages or to adjust to different loading situations. This dictates a need for the ability to dynamically color lines according to which direction they are being energized from and also for the ability to color lines according to whether they are energized or not. In addition, in certain parts of the world, such systems can be unbalanced, meaning that each electrical phase is operated independently. Another characteristic of a distribution system is that change is the norm. New residential construction and routine maintenance means that the distribution network model changes frequently. It is not uncommon for 10 000 or even 100 000 changes to occur to a distribution system in a single week.

The thing that both the DMS and OMS have in common is the need for an as operated near real-time network model. Thus this part of IEC 61968 includes the ability to exchange distribution network models between two such systems and to keep them synchronized. Increasingly, vendors are beginning to realize that this integration is non-trivial to implement and maintain, are therefore offering integrated DMS/OMS, and even integrated DMS/OMS/SCADA systems in order to provide reduced total cost of ownership and consistent views of the real-time distribution network. The term ADMS (Advanced Distribution Management System) has been coined to describe such systems.

4.2 Reference model

Figure 2 serves as a reference model and provides examples of the logical components and data flows related to this document. Clause 3 provides references to terms that are defined by the CIM.

The diagram in Figure 2 describes the flows between the components in the reference model. The label for each flow is the name of an IEC 61968 message profile.

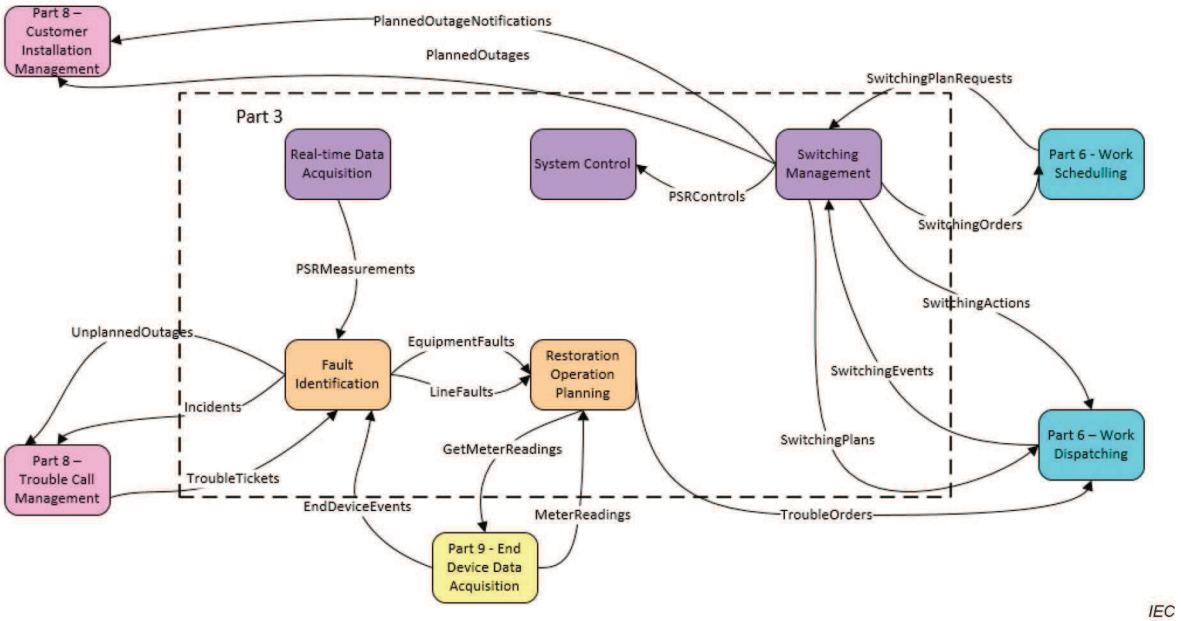

Figure 2 – IEC 61968-3 Reference model

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The reference architecture reflects four main logical components (potentially realized as systems or subsystems) related to network operations:

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

IEC 61968-8, Application integration at electric utilities – System interfaces for distribution management – Part 8: Interfaces for customer operations

IEC 61968-6, Application integration at electric utilities – System interfaces for distribution management – Part 6: Interfaces for maintenance and construction

IEC 61968-5, Application integration at electric utilities – System interfaces for distribution management – Part 5: Distributed energy optimization

4.3 Interface reference model

It is not the intention of this document 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 document. These abstract components are grouped by the business functions of the Interface reference model.

In this document, 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 this part of IEC 61968 and IEC 61968-6, IEC 61968-8 and IEC 61968-9. It does not necessarily mean that compliant software is delivered either as separate modules or as a single system.

IEC 61968-1 describes the interface reference model, while IEC 61968-3 through IEC 61968-9 define the details of the information exchanged for specific types of abstract component.

4.4 Network operations business functions and sub-business functions

It should be noted that the message payloads defined in this document, IEC 61968-3, *Application integration at electric utilities – System interfaces for distribution management – Part 3: Interfaces for Network Operations*, may be sent or received by any type of component within a distribution management system (DMS) or outage management system (OMS).

Table 1 shows these business functions and typical sub-business functions that are expected to be producers of information for these message payloads. This is not intended to be an exhaustive list of business functions and sub-business functions, rather they are examples. Typical consumers of the information include, but are not restricted to, the other business functions as listed in IEC 61968-1.

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Table 1 – Business functions and sub-business functions

Business functions	Sub-business functions
Real-time Operation (RTO) The Real-Time Operation (RTO) business function includes the execution of the planned action in regard to changing the network operational state. In addition, it monitors the current state of the network to ensure that the power grid is operating in a secure and balanced state. Predefined and activated remedial action will be executed when the pre-condition is met. That a system is secure and balanced state means that there is balance between supply and demand and that the system can handle pre-defined unanticipated loss of system equipment without violating operational requirements in regard to voltage, frequency, and operational stability limits. Real-Time Data Acquistion (RTDA)	The Real-Time Data Acquisition business function includes the collection and validation of measurements and observations that are used to determent the present state of the system that is under the entities' control. This could include acquisition of measurements and observations that are outside the entity's responsibility, but where the equipment that is defined as relevant to determine the state of the responsible system. The measurements and observations could include: • traditional SCADA points and analogues; • manually collected and entered data; • phasor data; • data generated by other systems, such as: – generating plants; – IEC 61850 systems; – lower or higher-level operations' activities. The common denominator for this data is that it is sampled data treated as raw input, as opposed to a setting or instruction or request received from some other system. In other words, the source of the data is completely ignorant of the acquisition and use of the data. It is not a coordinated integration of peer intelligence.
	Switching Management (SM) The Switching Management business function includes all activity involved in supervising execution of switching orders and outage restoration. • Execution of switching steps can involve remote operations of devices via SCADA and/or modifying settings on system controls. • Execution incorporates critical safety procedures. • Wherever there is concern about the impact of switching on the grid, analytical evaluation of the security of the state that switching will establish is usual. The types of analysis are similar to real-time state evaluation except that power flow or optimal power flow replaces state estimation.
	System Control (SC) The System Control business function includes any activity (other than Switching Management) which issues instructions to field controls in order to change the state of the grid. These controls may be closed loop or man-in-the-loop. Controls can be divided into active and reactive domains and generally use either raw measurements or the evaluated state as the input to control logic, which then develops a proposed change. Such control logic can be quite complex, even involving analyses based on algorithms such as optimal power flow. Control functions also may include follow-up logic to confirm that an issued control was in fact executed in the field and/or to assess whether the impact of the control was as predicted. Controls are important to model in analytical simulations, and a key distinguishing characteristic is whether the control can be represented by standard block diagram components or whether one has to incorporate the control software in order to simulate. Active controls include: • AGC, LFC;

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Business functions	Sub-business functions
	• active reserve management; • controllable load management; • remedial action scheme settings; • security constrained dispatch. Reactive controls include: • reactive reserve management; • Volt-VAr optimization; • DER settings; • FLISR.
Fault Management (FM) The Fault Management (FM) business function receives notifications regarding faults in the electrical network and analyses those notifications in order to estimate the location of the fault. Fault Management tracks the fault through the stages of actual location, minimizing the area impacted by the fault, restoring service to all impacted parts of the network and coordinating permanent repairs. Fault Management ensures that fault durations and restoration times are correctly captured for regulatory reporting purposes.	Fault Identification (FI) The Fault Identification (FI) business function uses a variety of inputs in order to identify where the real fault has occurred. It will also identify the cause of the fault, where known.
	Restoration Operation Planning (ROP) The Restoration Operation Planning (ROP) business function create a plan for handling unplanned or forced outage to recover to an acceptable operation state. It also includes a plan to restore the network to its pre-fault condition after repairs have been made

The use case sequence diagrams presented in this document assume a simplified interpretation of the business functions listed in Table 1. This allows for easier mapping of business functions to systems familiar to the parties implementing the standard.

4.5 Static information model

4.5.1 General

The information model relevant to network operations consists of classes that provide a template for the attributes for each message payload.

The classes are defined in detail in IEC 61968-11, Common Information Model (CIM) Extensions for Distribution or in IEC 61970-301, Energy Management System Application Program Interfaces – Common Information Model Core.

4.5.2 Classes for network operations

Table 2 lists classes used within message types. Usually all the attributes of these classes are defined within a message type. The descriptions provided describe usage within IEC 61968-3.

Classes that are used to specify the network model are defined in IEC 61970.

Classes described as type "Asset" are defined in the IEC 61968/Assets package of the CIM.

Classes described as type "Work" are defined in the IEC 61968/Work package of the CIM.

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Classes described as type "Customer" are defined in the IEC 61968/Customers package of the CIM.

Classes described as type "Metering" are defined in the IEC 61968/Metering package of the CIM.

Classes described as type "Profile" are contextual profiles defined for IEC 61968-3 that describe message definitions defined using CIM objects.

Table 2 – Classes for network operations

Class	Type	Description
AreaKind	Class	Enumeration for the type of area defined; e.g., county, state, parish, zipcode, etc.
ClearanceAction	Class	Action on clearance document as a switching step.
ClearanceActionKind	Class	Type of clearance action.
ClearanceDocument	Class	Safety document used to authorise work on conducting equipment in the field. Tagged equipment is not allowed to be operated.
ControlAction	Class	Control executed as a switching step.
CutAction	Class	Action on cut as a switching step.
EnergySourceAction	Class	Action on energy source as a switching step.
ERTConfidenceKind	Class	The estimated time of restoration can have a confidence factor applied such as high or low confidence that the ERT will be accomplished. This confidence factor may be updated as needed during the outage period – just as the actual ERT can be updated.
EstimatedRestorationTime	Class	The Estimated Restoration Time for a single outage
FieldSafetySupervisor	Class	Crew member on work site responsible for all local safety measures for the work crew doing maintenance, construction and repair in a substation or on a power line/cable.
GenericAction	Class	An arbitrary switching step.
GroundAction	Class	Action on ground as a switching step.
Incident	Class	Description of a problem in the field that may be reported in a trouble ticket or come from another source. It may have to do with an outage.
JumperAction	Class	Action on jumper as a switching step.
MeasurementAction	Class	Measurement taken as a switching step.
OperationalTag	Class	Operational tag placed on a power system resource or asset in the context of switching plan execution or other work in the field.
OperationsSafetySupervisor	Class	Operator with responsibility that the work in high voltage installation is executed in a safe manner and according to safety regulation.

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Class	Type	Description
Outage	Class	Document describing details of an active or planned outage in a part of the electrical network. A non-planned outage may be created upon: – a breaker trip, – a fault indicator status change, – a meter event indicating customer outage, – a reception of one or more customer trouble calls, or – an operator command, reflecting information obtained from the field crew. Outage restoration may be performed using a switching plan which complements the outage information with detailed switching activities, including the relationship to the crew and work. A planned outage may be created upon: – a request for service, maintenance or construction work in the field, or – an operator-defined outage for what-if/contingency network analysis.
OutageArea	Class	This defines the area covered by the Outage.
OutageCauseKind	Class	This enumeration describes the primary cause of the outage – planned, unplanned, etc.
OutageOrder	Class	Transmits an outage plan to a crew in order for the planned outage to be executed.
OutagePlan	Class	Document containing the definition of planned outages of equipment and/or usage points. It will reference switching plans that are used to execute the planned outage.
OutageStatusKind	Class	This defines if the outage have been predicted or confirmed
PlannedOutage	Class	An outage that is created by the utility that will impact a customer. These may be created to implement a switching plan or energize a new line or device. The customer may or may not be notified in advance.
PlannedOutageNotification	Class	Notifies customers about a planned outage that they will be impacted by.
PSREvent	Class	Event recording the change in operational status of a power system resource; may be for an event that has already occurred or for a planned activity.
PSREventKind	Class	Kind of power system resource event.
SafetyDocument	Class	Document restricting or authorising works on electrical equipment (for example a permit to work, sanction for test, limitation of access, or certificate of isolation), defined based upon organisational practices.
ServicePointOutageSummary	Class	Summary counts of service points affected by an outage. These counts are sometimes referred to as total and critical customer count.
SwitchAction	Class	Action on switch as a switching step.
SwitchActionKind	Class	Kind of action on switch.
SwitchingAction	Class	Atomic switching action.
SwitchingEvent	Class	Event indicating the completion (success or fail) of any switching action (jumper action, cut action, tag action, etc). The switching action may or may not be a consequential event in response to a request to complete the action.
SwitchingOrder	Class	Transmits a switching plan to a crew in order for the plan to be executed.

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Class	Type	Description
SwitchingPlan	Class	A sequence of grouped or atomic steps intended to: – de-energise equipment or part of the network for safe work, and/or – bring back in service previously de-energised equipment or part of the network.
SwitchingPlanRequest	Class	A document used to request that a switching plan be created for a particular purpose.
SwitchingStep	Class	Atomic switching step; can be part of a switching step group, or part of a switching plan.
SwitchingStepGroup	Class	A logical step, grouping atomic switching steps that are important to distinguish when they may change topology (e.g. placing a jumper between two cuts).
TagAction	Class	Action on operation tag as a switching step.
TagActionKind	Class	Kind of action on tag.
TempEquipActionKind	Class	Kind of action on temporary equipment (such as cut, jumper, ground, energy source).
TroubleOrder	Class	Trouble order sends an incident to a crew to initiate a response to an unplanned outage.
UnplannedOutage	Class	Document describing the consequence of an unplanned outage in a part of the electrical network. For the purposes of this model, an unplanned outage refers to a state where energy is not delivered; such as, customers out of service, a street light is not served, etc. A unplanned outage may be created upon: – impacts the SAIDI calculation – a breaker trip, – a fault indicator status change, – a meter event indicating customer outage, – a reception of one or more customer trouble calls, or – an operator command, reflecting information obtained from the field crew. Outage restoration may be performed using a switching plan which complements the outage information with detailed switching activities, including the relationship to the crew and work.
VerificationAction	Class	Verification of a switch position or other condition as a switching step

4.5.3 Classes related to network operations

Table 3 lists classes that are commonly associated with network operations classes. Their attributes, or a subset of their attributes, are used in the messages defined in this document. The detailed attributes of those classes are defined in IEC 61968-11.

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Table 3 – Classes related to network operations

Related Class	Reference	Description
AccountNotification	Customer	Notifications for move-in, move-out, delinquencies, etc.
Agreement	Common	Formal agreement between two parties defining the terms and conditions for a set of services. The specifics of the services are, in turn, defined via one or more service agreements.
Approver	Common	Person who accepted/signed or rejected the document.
Asset	Asset	Tangible resource of the utility, including power system equipment, various end devices, cabinets, buildings, etc. For electrical network equipment, the role of the asset is defined through PowerSystemResource and its subAssetes, defined mainly in the Wires model (refer to IEC 61970-301 and model package IEC61970::Wires). Asset description places emphasis on the physical characteristics of the equipment fulfilling that role.
AssetContainer	Asset	Asset that is aggregation of other assets such as conductors, transformers, switchgear, land, fences, buildings, equipment, vehicles, etc.
AssetFunction	Asset	Function performed by an asset.
AssetInfo	Asset	Set of attributes of an asset, representing typical datasheet information of a physical device that can be instantiated and shared in different data exchange contexts: – as attributes of an asset instance (installed or in stock) – as attributes of an asset model (product by a manufacturer) – as attributes of a type asset (generic type of an asset as used in designs/extension planning).
AssetKind	Asset	Kinds of assets or asset components.
Author	Common	Person who created document or activity record.
BaseWork	Class	Common representation for work and work tasks.
ConfigurationEvent	Common	Used to report details on creation, change or deletion of an entity or its configuration.
CoordinateSystem	Common	Coordinate reference system.
Crew	Common	Group of people with specific skills, tools, and vehicles.
CrewMember	Common	Member of a crew.
CrewStatusKind	Common	Defines the current status of the Crew – assigned, arrived, etc.
CrewType	Common	Custom description of the type of crew. This may be used to determine the type of work the crew can be assigned to. Examples include repair, tree trimming, switching, etc.
Customer	Customer	Organisation receiving services from service supplier.
CustomerAccount	Customer	Assignment of a group of products and services purchased by the customer through a customer agreement, used as a mechanism for customer billing and payment. It contains common information from the various types of customer agreements to create billings (invoices) for a customer and receive payment.
CustomerAgreement	Customer	Agreement between the customer and the service supplier to pay for service at a specific service location. It records certain billing information about the type of service provided at the service location and is used during charge creation to determine the type of service.
CustomerKind	Customer	Kind of customer.

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Related Class	Reference	Description
CustomerNotification	Customer	Conditions for notifying the customer about the changes in the status of their service (e.g., outage restore, estimated restoration time, tariff or service level change, etc.)
Document	Common	Parent class for different groupings of information collected and managed as a part of a business process. It will frequently contain references to other objects, such as assets, people and power system resources.
DocumentPersonRole	Common	Person role with respect to documents.
Editor	Common	Person who modified the document.
ElectronicAddress	Common	Electronic address information.
FieldDispatchHistory	Common	The history of field dispatch statuses for this work.
FieldDispatchStep	Common	Details of the step in the field dispatch history.
Hazard	Common	An object or a condition that is a danger for causing loss or perils to an asset and/or people.
Issuer	Common	Person who issued the document and is responsible for its content.
Location	Common	The place, scene, or point of something where someone or something has been, is, and/or will be at a given moment in time. It can be defined with one or more postition points (coordinates) in a given coordinate system.
NotificationTriggerKind	Customer	Kind of trigger to notify customer.
OperationPersonRole	Common	Person role in the context of utility operations.
Operator	Common	Control room operator.
Organisation	Common	Organisation that might have roles as utility, contractor, supplier, manufacturer, customer, etc.
Ownership	Common	Ownership of e.g. asset.
Person	Common	General purpose information for name and other information to contact people.
PositionPoint	Common	Set of spatial coordinates that determine a point, defined in the coordinate system specified in 'Location.CoordinateSystem'. Use a single position point instance to desribe a point-oriented location. Use a sequence of position points to describe a line-oriented object (physical location of non-point oriented objects like cables or lines), or area of an object (like a substation or a geographical zone – in this case, have first and last position point with the same values).
Priority	Common	Priority definition.
ServiceCategory	Customer	Category of service provided to the customer.
ServiceKind	Customer	Kind of service.
ServiceLocation	Customer	A real estate location, commonly referred to as premises.
Status	Common	Current status information relevant to an entity.
StreetAddress	Common	General purpose street and postal address information.
StreetDetail	Common	Street details, in the context of address.
TelephoneNumber	Common	Telephone number.
TownDetail	Common	Town details, in the context of address.
TroubleCallKind	Customer	Describes the type of Trouble, based on customer input.
TroubleReportingKind	Customer	Kind of trouble reporting.
TroubleTicket	Customer	Customer call to report a problem with their service.

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Related Class	Reference	Description
Work	Work	Document used to request, initiate, track and record work.
WorkActivityRecord	Work	Records information about the status of work or work task at a point in time.
WorkAsset	Work	Asset used to perform work.
WorkKind	Work	Kinds of work.
WorkLocation	Work	Information about a particular location for various forms of work.
WorkStatusKind	Work	Kind of status, specific to work.
WorkTask	Work	A task within a set of work.
WorkTaskKind	Work	Kinds of work tasks.

5 Network operations message payloads

5.1 General

The purpose of Clause 5 is to describe the message payloads related to IEC 61968-3. It is important to note that some of these message payloads may also be used by other parts of IEC 61968. The general approach to the realization of message structures and XML schemas for IEC 61968 message payloads is described in IEC 61968-100.

Although they may be represented in sequence diagrams for context and completeness, this document does not describe message formats that are defined by other parts of IEC 61968. The message payload structures defined by this part of IEC 61968 are described in Clause 5.

Message structures are diagrammed within Clause 5. Note that these diagrams are examples and not intended to be exhaustive. The notation convention shows required elements with a solid outline, and optional elements with dashed outlines.

It is also important to note that the use cases and sequence diagrams provided in Anhang A are informative in nature, and are intended to provide examples of usage for the normative message payload definitions. There is no intent by this document to standardize specific business processes.

The following are some general conventions in the message definitions provided in this document:

– Objects are identified by one of the following:
  - **mRID** inherited from **IdentifiedObject**
  - one or more **Name.name** instances. Transacting systems may use one or both of the attributes to uniquely identify the objects being exchanged.
  - a combination of **mRID** and one or more **Name.name** instances
– Several CIM classes have an attribute called **type** to provide a string description of an instance of the class. Some CIM classes (such as **Asset**) also have an enumerated attribute called "**kind**". This provides for better interoperability. Messages in this document that incorporate such classes include both the "**type**" and "**kind**" attributes. Where an appropriate value is not available for "**kind**", the transacting systems may use the value "**other**" for "**kind**" in order to indicate that the string description in the "**type**" attribute should be used.
– The majority of attributes in the message payloads are optional. It is up to the transacting system to implement the logic for any required fields.

5.2 Summary of IEC 61968-3 message profiles

Table 4 shows a summary of all of the messages defined in this document and their purpose.

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Table 4 – Summary of IEC 61968-3 message profiles

Profile Name	Purpose
PSRMeasurements	Contains accumulator, analog, discrete and string values from SCADA. Time stamps and quality codes are also included. If applicable, includes a reference to the **PowerSystemResource** that the measurement is associated with.
PSRControls	Request to SCADA to change a value in the field. The change can be an accumulator reset, analog control, command, raise/lower command or a setpoint. If applicable, includes a reference to the **PowerSystemResource** that is associated with the control request.
SwitchingPlanRequests	A **SwitchingPlanRequest** is used to convey a request from work management (or other business function) to network operations that switching needs to be performed (e.g. part of the network needs to be isolated) in order for maintenance or construction work to be performed. The payload includes the type of work to be performed and when it should start. The typical outcome of a **SwitchingPlanRequest** is the creation of a **SwitchingPlan**.
SwitchingPlans	**SwitchingPlans** message payloads are designed to communicate a set of **SwitchingActions** that form a sequence of operations to manage a complete operational task. **SwitchingPlans** may also be created in order to perform emergency switching.
SwitchingOrders	**SwitchingOrders** message payloads are designed to communicate requests for scheduling the execution of a **SwitchingPlan** for emergency or planned switching.
SwitchingActions	**SwitchingActions** are used to coordinate the manual execution of steps within **SwitchingPlans** between the control room and field crews. Automated step execution is coordinated with **PSRControls** messages.
SwitchingEvents	**SwitchingEvents** are used to communicate temporary network changes as a result of the execution of a step in a **SwitchingPlan** that was initiated via a **SwitchingAction. SwitchingEvents** are also used to communicate temporary network changes between enterprise systems. Results of **PSRControls** are coordinated with **PSRMeasurements** messages.
PlannedOutageNotifications	**PlannedOutageNotifications** are used to notify customers that they will be impacted by a **PlannedOutage**, prior to the execution of a **SwitchingPlan**. The payload includes scheduled start and end date/time and a list of customers who will be impacted.
PlannedOutages	**PlannedOutages** message payloads are designed to communicate the creation and status changes of **PlannedOutages** once one or more customers become de-energized as a result of planned switching actions. The payload includes: a list of customers affected and the actual start/end time.
UnplannedOutages	**UnplannedOutages** message payloads are designed to communicate the creation and status changes of **UnplannedOutages** once one or more customers become de-energized. This could be as a result of faults, such as short circuit faults and downed lines, switching errors or other causes.
TroubleOrders	**TroubleOrders** message payloads are designed to communicate work requests to field crews to perform work in response to an **Incident**, or an **UnplannedOutage**, and to track the status of the work.
Incidents	**Incidents** message payloads are designed to communicate a problem in the field. Typically, but not always, an **Incident** is associated with an **UnplannedOutage**.
EquipmentFaults	**EquipmentFaults** message payloads, are designed to communicate the detailed fault information as part of **UnplannedOutages** messages. An **EquipmentFault** is a fault applied at the terminal, external to the equipment. This class is not used to specify faults internal to the equipment.
LineFaults	**LineFaults** messages are designed to communicate the detailed fault information as part of **UnplannedOutages** messages. **LineFaults** define all types of faults that occur on AC or DC line segments.

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5.3 Config Profiles

5.3.1 General

Config profiles are used to share a subset of the model so as to avoid sharing the entire model and to avoid sending configuration data at run-time. It is envisioned that config messages are exchanged between systems only when required.

For example, a Customer Information System may send **CustomerConfig**, **UsagePointConfig**, and **OperationsDataLinkageConfig** messages to an Outage Management System. By receiving these messages and instantiating the customer information, the usage point information, the association between customers and usage points, and information in its database, the OMS can produce customer contact lists for an outage.

All messages rely on unique identifiers (**mRIDs**) for all objects that are part of the common network model, in this case the common distribution network model which is defined as part of CIM. In order to publish those unique identifiers, the respective system needs either to import that network model or load the necessary identifiers as part of the system's configuration step.

Two mechanisms are supported for message transfer between systems, one is a 'push' model and the other is a 'pull' model. The mechanism selected depends upon the capabilities of the systems involved in the message exchange and the timeliness of the data exchanged. An example of a push message exchange is shown in Figure 3. In this example, a new customer is created in the CIS and the information is sent to OMS.

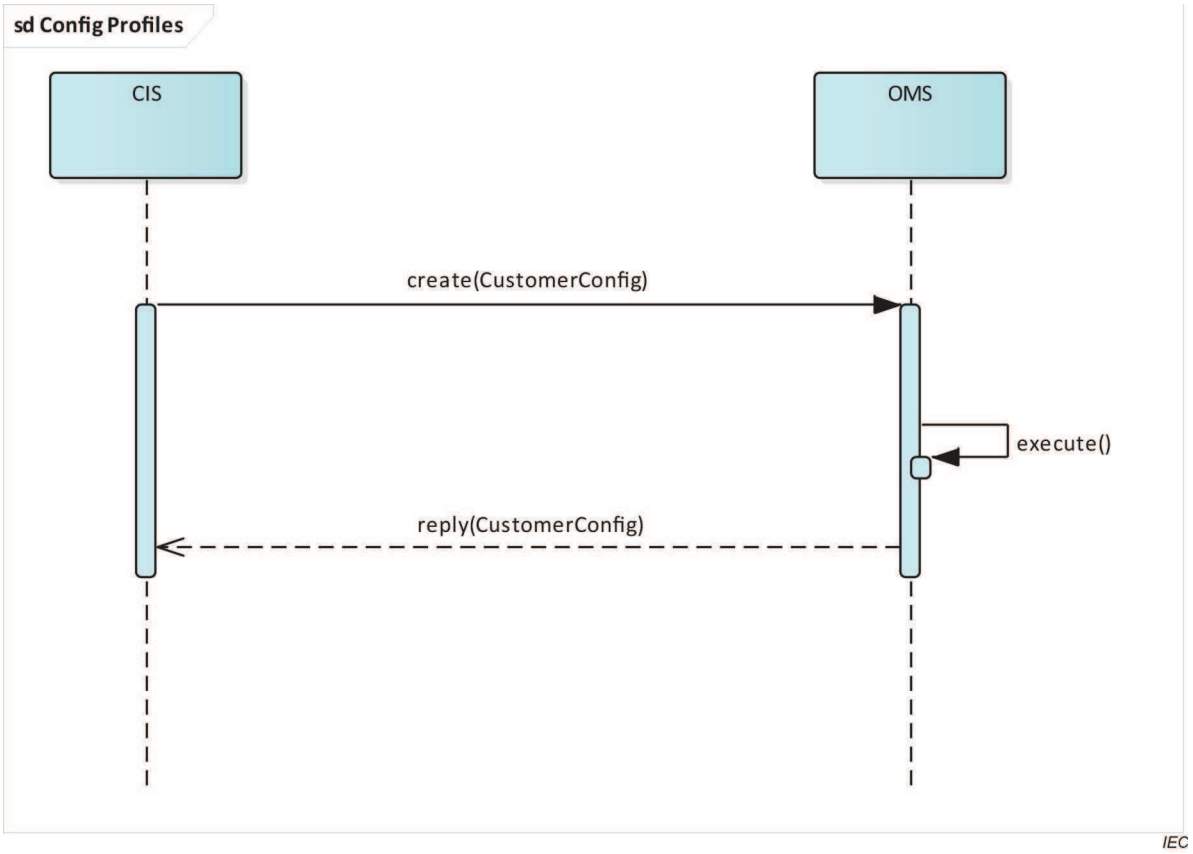

Figure 3 – Example of a Push Message Exchange

An example of a pull message exchange is shown in Figure 4.

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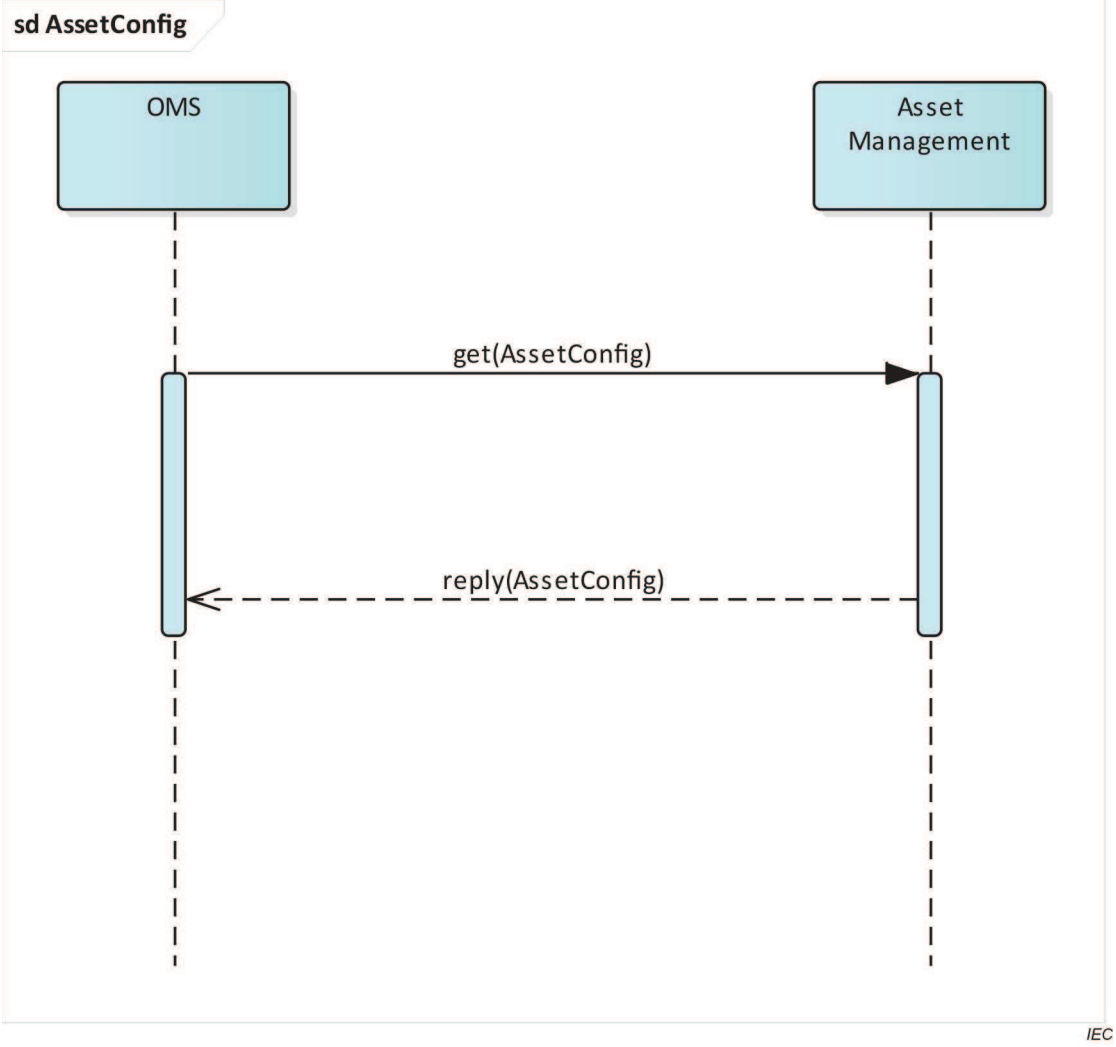

Figure 4 – Example of a Pull Message Exchange

5.3.2 Message payloads

There are multiple Config messages, including:

- **AssetConfig** – see 5.3.3
- **CustomerAgreementConfig** – see D.1
- **CustomerConfig** – see D.2
- **FaultCauseTypeConfig** – see 5.3.4
- **LocationConfig** – see 5.3.5
- **MeterConfig** – see D.3
- **PowerSystemResourceConfig** – see 5.3.6
- **UsagePointConfig** – see D.4
- **UsagePointLocationConfig** – see D.5

The above config messages are associated using the **OperationsDataLinkageConfig** message, to allow relationships between the various config messages to be defined.

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5.3.3 **AssetConfig** payload

The **AssetConfig** payload shown in Figure 5 and Figure 6 defines zero, one or many **Asset**s. Important attributes for the purposes of this document are the **mRID** and **Names** since this allows the mapping between the **mRID**, **Names** and the objects themselves in the messages so that the the entire object instance does not need to be sent in the message.

The attributes of the **AssetConfig** profile are described in Table 5.

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Table 5 – AssetConfig Profile

AssetConfig				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
AssetConfig	Asset	[1..*]		
Profile Attributes for Asset				
mRID	String	[0..1]	GUID	mRID of the Asset
description	String	[0..1]		Free-form text field that describes the **Asset**
Names	Name	[0..*]	See B.56	Human-readable names for the Asset.
baselineCondition	String	[0..1]		Condition of asset at last baseline. Examples include new, rebuilt, overhaul required, other. Refer to inspection data for information on the most current condition of the asset.
baselineLossOfLife	PerCent	[0..1]		Percentage of initial life expectancy that has been lost as of the last life expectancy baseline. Represents (initial life expectancy – current life expectancy) / initial life expectancy.
critical	Boolean	[0..1]		True if asset is considered critical for some reason (for example, a pole with critical attachments).
inUseState	inUseStateKind	[0..1]	See C.9	Indication of whether asset is currently deployed (in use), ready to be put into use or not available for use.
kind	AssetKind	[0..1]	See C.1	Kind of asset. Used in description of asset components in asset instance templates.
lifecycleState	AssetLifecycleStateKind	[0..1]	See C.2	Current lifecycle state of asset.
lotNumber	String	[0..1]		Lot number for this asset. Even for the same model and version number, many assets are manufactured in lots.
position	String	[0..1]		Position of asset or asset component. May often be in relation to other assets or components.
purchasePrice	Money	[0..1]		Purchase price of asset.

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AssetConfig				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
retiredReason	RetiredReasonKind	[0..1]	See C.16	Reason asset retired.
serialNumber	String	[0..1]		Serial number of this asset.
type	String	[0..1]		Utility-specific classification of Asset and its subtypes, according to their corporate standards, practices, and existing IT systems (e.g., for management of assets, maintenance, work, outage, customers, etc.).
utcNumber	String	[0..1]		Uniquely tracked commodity (UTC) number.
ActivityRecords	ActivityRecord	[0..*]	See B.5	
AssetContainer	Choice of: Cabinet DuctBank Pole Structure Tower UndergroundStructure	[0..1]	For Cabinet, see B.14 For DuctBank, see B.30 For Pole, see B.66 For Structure, see B.84 For Tower, see B.91 For UndergroundStructure, see B.96	
AssetFunction	AssetFunction	[0..*]	Reference to AssetFunction in this payload	Contains the mRID or Names.name of the referenced AssetFunction
ConfigurationEvents	ConfigurationEvent	[0..*]	See B.19	All configuration events created for this asset.
electronicAddress	ElectronicAddress	[0..1]	See B.32	Electronic address of this asset, such as a MAC address.
lifecycleDate	LifeCycleDate	[0..1]	See B.50	Lifecycle dates for this asset.
Location	Location	[0..1]	See B.52	Location of this asset
Ownerships	Ownership	[0..1]	See B.64	All ownerships of this asset.
ProductAssetModel	ProductAssetModel	[0..1]	See B.70	The model of this asset.
status	Status	[0..1]	See B.79	Status of this asset.

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AssetConfig				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
Profile attributes for AssetFunction				
mRID	String	[0..1]	GUID	mRID of the AssetFunction
description	String	[0..1]		Free-form text field that describes the **AssetFunction**
Names	Name	[0..*]	See B.56	Human-readable names for the AssetFunction.
configID	String	[0..1]		Configuration specified for this function.
firmwareID	String	[0..1]		Firmware version.
hardwareID	String	[0..1]		Hardware version.
password	String	[0..1]		Password needed to access this function.
programID	String	[0..1]		Name of program.

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