

DIN EN 61850-8-1

ICS 33.040.40

Ersatz für
DIN EN 61850-8-1:2012-02
Siehe Anwendungsbeginn

**Kommunikationsnetze und -systeme für die Automatisierung der elektrischen Energieversorgung –
Teil 8-1: Spezifische Abbildung von Kommunikationsdiensten (SCSM) –
Abbildungen auf MMS (nach ISO 9506-1 und ISO 9506-2) und
ISO/IEC 8802-3
(IEC 61850-8-1:2011 + A1:2020);
Englische Fassung EN 61850-8-1:2011 + A1:2020**

Communication networks and systems for power utility automation –
Part 8-1: Specific communication service mapping (SCSM) –
Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3
(IEC 61850-8-1:2011 + A1:2020);
English version EN 61850-8-1:2011 + A1:2020

Réseaux et systèmes de communication pour l'automatisation des systèmes électriques –
Partie 8-1: Mise en correspondance des services de communication spécifiques (SCSM) –
Mises en correspondance pour MMS (ISO 9506-1 et ISO 9506-2) et pour
l'ISO/IEC 8802-3
(IEC 61850-8-1:2011 + A1:2020);
Version anglaise EN 61850-8-1:2011 + A1:2020

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DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

Anwendungsbeginn

Anwendungsbeginn für die von CENELEC am 2011-07-22 angenommene Europäische Norm und die am 2020-03-27 angenommene Änderung A1 als DIN-Norm ist 2022-08-01.

Für DIN EN 61850-8-1:2012-02 besteht eine Übergangsfrist bis 2023-03-27.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 61850-8-1/A1:2017-12.

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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- geändert.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf ein Dokument ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils aktuellste Ausgabe des in Bezug genommenen Dokuments.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe des Dokuments.

Der Zusammenhang der zitierten Dokumente mit den entsprechenden deutschen Dokumenten ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Diese Norm ist die Übernahme der konsolidierten Edition 2.1 von IEC 61850-8-1:2011 + A1:2020. Durch das Amendment sind sehr umfangreiche Änderungen fast jeden Abschnittes durchgeführt worden. Deshalb wurde auf die Kennzeichnung der einzelnen Änderungen verzichtet.

Abweichend von dem üblichen Vorgehen der IEC wurden im Sinne einer besseren Nutzungsfreundlichkeit in diesem Falle alle Tabellen und Bilder (einschließlich jener, die seit Ausgabe 2 hinzugefügt wurden) in der Änderung und der konsolidierten Fassung fortlaufend nummeriert.

Diese IEC-Norm beinhaltet Code-Elemente, d. h. Elemente, die für die direkte Verarbeitung durch einen Rechner vorgesehen sind. Dies betrifft jeglichen Text, der sich zwischen den Kennzeichnungen <CODE BEGINS> und <CODE ENDS> befindet oder in dieser Norm anderweitig eindeutig als Code-Element gekennzeichnet ist.

Mit dem Kauf dieser IEC-Norm erwirbt der Käufer eine Urheberrechtslizenz für den Verkauf von Software mit Code-Elementen aus dieser Norm direkt oder über Zwischenhändler an Endanwender, wobei diese Lizenz den

Software-Lizenzierungsbedingungen der IEC unterliegt, die abgerufen werden können unter: <http://www.iec.ch/CCv1>.

Dieser Publikation sind NSD-Dateien angehängt, aus denen sich das Code-Element dieses Teils zusammensetzt. Diese Dateien sind als Ergänzung zu verstehen und bilden keinen integralen Bestandteil dieser Norm.

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 61850-8-1 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt und Abschnitt 3, der die Begriffe festlegt, sowie Abschnitt 4, der die Abkürzungen festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA der vorliegenden Norm hinzugefügt. Für die meisten 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.

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 61850-8-1:2012-02 wurden folgende Änderungen vorgenommen:

- a) Aktualisierung der normativen Verweisungen;
- b) Erweiterung der Transportschicht mittels IPv6;
- c) Erweiterung des Zeitsynchronisierungs-A-Profiles um 1588, Profil nach IEC/IEEE 61850-9-3;
- d) Erweiterung der A- und T-Profile für GOOSE und SMV zur Unterstützung von routingfähigen GOOSE und SMV, die mit IEC TR 61850-90-5 eingeführt wurden;
- e) optionale Unterstützung des neuen COMTRADE-Dateiformats;
- f) Beendigung der Unterstützung des OSI-T-Profiles für die Client/Server-Kommunikation;
- g) durch die Aktualisierung der Verweisung für PRP/HSR ändert sich die Verweisung auf PRP1 zu PRP;
- h) Zurückweisung des Unicast-Abtastwert-Modells;
- i) Zurückweisung des GSSE-Modells;
- j) Anhang bezüglich der Kompatibilität der verschiedenen Überarbeitungen der Norm;
- k) Erläuterungen und Korrekturen zu/an der zweiten Ausgabe von IEC 61850-8-1 auf Grundlage der technischen Problempunkte (TIssues) 753, 770, 784, 817, 821, 827, 834, 851, 854, 935, 942, 951, 1036, 1040, 1041, 1042, 1043, 1047, 1058, 1063, 1064, 1068, 1135, 1155, 1164, 1171, 1174, 1178, 1181, 1192, 1274, 1285, 1287, 1289, 1290, 1299, 1300, 1309, 1324, 1336, 1345, 1361, 1369, 1376, 1422, 1440, 1441, 1442, 1443, 1453, 1454, 1462, 1495, 1499, 1500, 1612, 1626, 1629, 1645, 1658.

Frühere Ausgaben

DIN EN 61850-8-1: 2005-11, 2012-02

Nationaler Anhang NA (informativ)

Auszugsweise Übersetzung

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

1 Anwendungsbereich

1.1 Allgemeines

Dieser Teil der IEC 61850 spezifiziert eine Methode zum Austausch von zeitkritischen und nicht zeitkritischen Daten über lokale Netze durch Abbildung von ACSI auf MMS und ISO/IEC 8802-3 Frames.

MMS-Dienste und -Protokolle sind so spezifiziert, dass sie über vollständige OSI- und TCP-konforme Kommunikationsprofile funktionieren. Die Verwendung von MMS ermöglicht die Unterstützung sowohl zentralisierter als auch verteilter Architekturen. Diese Norm umfasst den Austausch von Echtzeit-Datenanzeigen, Kontrollvorgängen und Berichtsmeldungen.

Sie spezifiziert die Abbildung der Objekte und Dienste der ACSI (Abstract Communication Service Interface, IEC 61850-7-2) auf MMS (Manufacturing Message Specification, ISO 9506) und ISO/IEC 8802-3 Frames.

Diese Norm legt auch die Abbildung des zeitkritischen Informationsaustauschs auf ein Nicht-MMS-Protokoll fest. Die Semantik des Protokolls ist in IEC 61850-7-2 definiert. Sie enthält die Protokollsyntax, die Definition, die Abbildung auf ISO/IEC 8802-3 Rahmenformate und alle relevanten Verfahren, die für die Verwendung von ISO/IEC 8802-3 spezifisch sind.

Diese Abbildung von ACSI auf MMS definiert, wie die Konzepte, Objekte und Dienste von ACSI unter Verwendung von MMS-Konzepten, Objekten und Diensten zu implementieren sind. Diese Abbildung ermöglicht die Interoperabilität zwischen Funktionen, die von verschiedenen Herstellern implementiert werden.

Dieser Teil der IEC 61850 definiert eine genormte Methode zur Verwendung der ISO 9506-Dienste, um den Datenaustausch zu implementieren. Für die in IEC 61850-7-2 definierten ACSI-Dienste, die nicht auf MMS abgebildet sind, definiert dieser Teil zusätzliche Protokolle. Er beschreibt reale Versorgungsgeräte in Bezug auf ihre nach außen sichtbaren Daten und ihr Verhalten mit einem objektorientierten Ansatz. Die Objekte sind abstrakter Natur und können für eine Vielzahl von Anwendungen verwendet werden. Die Verwendung dieser Abbildung geht weit über die Anwendung in der Versorgungskommunikation hinaus.

Dieser Teil der IEC 61850 bietet Zuordnungen für die in IEC 61850-7-2, IEC 61850-7-3 und IEC 61850-7-4 spezifizierten Dienste und Objekte.

1.2 Namespace name and version (Name und Version des Namensraums)

Dieser neue Abschnitt ist obligatorisch für alle Namensräume nach IEC 61850 (entsprechend der Definition in IEC 61850-7-1).

Die folgenden Parameter identifizieren diese neue Version dieses Namensraums:

- Version des Namensraums: 2003
- Überarbeitung des Namensraums: A
- Name des Namensraums: „IEC 61850-8-1:2003“

Ausgabe	Veröffentlichungsdatum	Webstore	Namensraum
Ausgabe 1.0	2004-05	IEC 61850-8-1:2004	IEC 61850-8-1:2003
Ausgabe 2.0	2011-06	IEC 61850-8-1:2011	IEC 61850-8-1:2003
Ausgabe 2.0, Änderung 1	2020-02	IEC 61850-8-1:2011/AMD1:2020	IEC 61850-8-1:2003
Ausgabe 2.1	2020-02	IEC 61850-8-1:2011+AMD1:2020 CSV	IEC 61850-8-1:2003

1.3 Code Component distribution (Verteilung der Code-Elemente)

Die Code-Elemente (en: code component) werden in einer eingeschränkten Version (en: light version) und einer Vollversion (en: full version) zur Verfügung stehen.

- Die Vollversion enthält die Definition der gesamten in dieser Norm definierten Typen und funktionalen Einschränkungen sowie die zugehörige Dokumentation; der Zugriff wird nur Personen gewährt, die diesen Teil erworben haben. Der Name des Pakets mit den Code-Elementen wird „IEC 61850-8-1.NSD.2003A2.full.zip“ lauten.
- Die eingeschränkte Version enthält ebenfalls die Definition der gesamten in dieser Norm definierten Typen und funktionalen Einschränkungen, nicht aber die zugehörige Dokumentation; diese eingeschränkte Version wird kostenfrei auf der IEC-Website zum Download bereitstehen, die Verwendung ist jedoch an entsprechende Lizenzierungsbedingungen geknüpft.

Die eingeschränkte Version dieser Code-Elemente kann unter dem folgenden Link heruntergeladen werden:

[http://www.iec.ch/tc57/supportdocuments/IEC 61850-8-1.NSD.2003A2.light.zip](http://www.iec.ch/tc57/supportdocuments/IEC%2061850-8-1.NSD.2003A2.light.zip)

Die Code-Elemente für Datenmodelle nach IEC 61850 (wie die Zuordnung der Steuerungsdienstparameter in diesem Dokument) stehen in dem Dateiformat NSD nach IEC 61850-7-7 zur Verfügung.

Bei dem in dieser IEC-Norm enthaltenen Code-Element besteht stets die Möglichkeit, dass es überarbeitet wurde, Anwender müssen deshalb stets die neueste Veröffentlichung aus dem unter dem folgenden Link erreichbaren Verzeichnis auswählen: <http://www.iec.ch/tc57/supportdocuments>

Die neueste Version/Veröffentlichung des Dokuments ist diejenige IEC 61850-8-1.NSD.{Versionsinfo}.light.zip-Datei mit dem höchsten Wert unter Versionsinfo.

Jedes Code-Element ist ein ZIP-Paket mit der elektronischen Wiedergabe des Code-Elements selbst und einer Datei, die den Inhalt des Pakets beschreibt (IECManifest.xml).

Das IECManifest umfasst mehrere Abschnitte mit Informationen zu den folgenden Aspekten:

- Urheberrechtsvermerk
- Kennung des Code-Elements
- Publikation, zu der das Code-Element gehört
- Liste der elektronischen Dateien, aus denen sich das Code-Element zusammensetzt
- optionale Liste der früheren Dateien, damit der Änderungsverlauf des Code-Elements nachvollzogen werden kann

Der Lebenszyklus eines Code-Elements ist nicht auf den Lebenszyklus der zugehörigen Publikation beschränkt. Der Lebenszyklus einer Publikation umfasst zwei Stufen, die Version (die einer Ausgabe entspricht) und die Überarbeitung (die einer Änderung entspricht). Mittels einer dritten Publikationsstufe (Veröffentlichung (en: release)) kann das Code-Element veröffentlicht werden, ohne dass eine Änderung veröffentlicht werden muss.

Dies ist nützlich, wenn InterOpTissues zu beheben sind. In diesem Falle wird eine neue Veröffentlichung des Code-Elements veröffentlicht, die die vorangehende Veröffentlichung ersetzt, und über die Website des IEC-TC57 verteilt.

3 Begriffe

Für die Anwendung dieses Dokuments gelten die Begriffe nach IEC 61850-2^{N1} und die folgenden Begriffe.

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>

3.1

(n)-Schicht

en **(n)-layer**

jede spezifische Schicht

[QUELLE: ISO/IEC 7498-1:1994, 3.1]

3.2

(n) Protokoll-Dateneinheit

en **(n)-protocol data unit**

Dateneinheit, die in einem (n)-Protokoll spezifiziert ist und aus (n)-Protokollsteuerungsinformationen und möglicherweise (n)-Nutzerdaten besteht

[QUELLE: ISO/IEC 7498-1:1994, 5.6.1.3]

3.3

(n)-Protokoll

en **(n)-protocol**

set of rules and formats (semantic and syntactic) which determines the communication behavior of (N)-entities in the performance of (n)-functions

[QUELLE: ISO/IEC 7498-1:1994, 5.2.1.9]

3.4

Klasse

en **class**

Beschreibung einer Gruppe von Objekten, die dieselben Attribute, Dienste, Beziehungen und Semantiken aufweisen

[QUELLE: IEC 61850-7-2:2010+AMD1:2019 CSV, 3.1]

3.5

Kunde

en **client**

Einheit, die einen Dienst von einem Server anfordert und die unaufgeforderte Nachrichten von einem Server empfängt

[QUELLE: IEC 61850-7-2:2010+AMD1:2019 CSV, 3.2]

3.6

Gerät

en **device**

Einheit, die Steuerungs-, Betätigungs- und/oder Erfassungsfunktionen ausführt und Schnittstellen zu anderen derartigen Einheiten innerhalb eines Automatisierungssystems bildet

Anmerkung 1 zum Begriff: Die Geräte allein erfüllen keine Energietransportfunktionen.

[QUELLE: IEC 61850-7-2:2010+AMD1:2019 CSV, 3.3]

^{N1} Nationale Fußnote: Fehler in der übernommenen IEC, korrekt ist IEC TS 61850-2.

3.7**logisches Gerät**en **logical device**

Entität, die eine Reihe typischer Unterstation darstellt

[QUELLE: IEC 61850-7-2:2010+AMD1:2019 CSV, 3.6]

3.8**Logischer Knoten**en **logical node**

Einheit, die eine typische Funktion einer Unterstation darstellt

[QUELLE: IEC 61850-7-2:2010+AMD1:2019 CSV, 3.7]

3.9**Physisches Gerät**en **physical device**

Einheit, die die physischen Teile eines Geräts darstellt (Hardware und Betriebssystem usw.)

Anmerkung 1 zum Begriff: Physische Geräte beherbergen logische Geräte.

[QUELLE: IEC 61850-7-2:2010+AMD1:2019 CSV, 3.8]

3.10**Anwendungs- und Transportprofile****A-Profil und T-Profil**en **application and transport profiles****A-Profile and T-Profile**

eine Reihe von Protokollen für einen bestimmten Zweck

3.11**Datenattribut**en **data attribute**

benanntes Element des Datenobjekts, das einen bestimmten Typ hat

3.12**Daten Objekt**en **data object**

aussagekräftige strukturierte Informationen von Anwendungen, die sich in einem Automatisierungsgerät befinden und gelesen oder geschrieben werden können

Anmerkung 1 zum Begriff: Diese Definition stimmt mit der DataObject-Definition der IEC 61850-7-2 überein. Die MMS-Verwendung von DataObject bezieht sich auf Datentypen und mögliche Instanzierungen von MMS-Variablen.

3.13**ISO/IEC 8802-3**

Kommunikationstechnik nach ISO/IEC 8802-3

3.14**Server**en **server**

Einrichtung, die Dienstleistungen für Kunden erbringt oder unaufgeforderte Nachrichten versendet

3.15**V-Put**en **V-Put**

Funktion zum Setzen eines oder mehrerer Werte innerhalb einer MMS-Variablen

Anmerkung 1 zum Begriff: Die Funktion V-Put führt die Zugriffsmethode der MMS-Variablen unter Verwendung des mit der MMS WriteRequest übertragenen Wertes aus und erzeugt ein Zugriffsergebnis, das den Erfolg oder Misserfolg anzeigt. Ein einzelner MMS WriteRequest ruft die V-Put-Funktion für jede in der Anfrage referenzierte MMS-Variable auf.

3.16**V-Get**en **V-Get**

Funktion, die verwendet wird, um einen oder mehrere Werte aus einer MMS-Variable zu erhalten

Anmerkung 1 zum Begriff: Die V-Get-Funktion führt die Zugriffsmethode der MMS-Variablen aus und erzeugt ein Zugriffsergebnis, das einen Fehler oder bei Erfolg den Wert anzeigt. Eine einzelne MMS ReadRequest ruft die V-Get-Funktion für jede MMS-Variable auf, auf die in der Anfrage verwiesen wird.

3.17**grundlegende ACSI-Konformität**en **ACSI basic conformance**

Konformität mit ACSI entsprechend der Definition in IEC 61850-7-2:2010/AMD1:2019 CSV, Anhang A

4 Abkürzungen

A	Anwendung (en: Application)
ACSE	Assoziationskontrolldienst-Element (en: Association Control Service Element)
ACSI	Abstrakte Kommunikationsdienst-Schnittstelle (en: Abstract Communication Service Interface)
APPID or AppID	Identifizierung der Anwendung (en: Application Identification)
APDU	Anwendungsprotokoll-Dateneinheit (en: Application Protocol Data Unit)
BRCB	Gepufferter Berichtssteuerungsblock (en: Buffered Report Control Block)
CBB	Konformitätsbaustein (en: Conformance Building Block)
CDC	Allgemeine Datenklasse (en: Common Data class)
CL	Verbindungslos (en: Connectionless)
Client-CR	Client-Konformitätsanforderung (en: Client Conformance Requirement)
CO	Verbindungsorientiert (en: Connection Oriented)
DNA	Dynamisches Namensraum-Attribut (en: Dynamic Namespace Attribute)
F/S	Funktionaler Standard (en: Functional Standard)
FC	Funktionale Einschränkung (en: Functional Constraint)
FCD	Funktional eingeschränkte Daten (en: Functionally Constrained Data)
GMT	Westeuropäische Zeit (en: Greenwich Mean Time)
GPS	Global Positioning System
GOOSE	Generisches objektorientiertes Unterstationsereignis (en: Generic Object Oriented Substation Event)
GSE	Generisches Unterstationsereignis (en: Generic Substation Event)
GSSE	Generisches Unterstationsstatus-Ereignis (en: Generic Substation Status Event)
HMAC	Hash-Nachrichtenauthentifizierungscode (en: Hashed Message Authentication Code)
HSR	Hochverfügbare nahtlose Redundanz (en: High-availability Seamless Redundancy)
ICD	Beschreibung der Fähigkeiten eines intelligenten elektronischen Geräts (en: IED Capability Description)
IED	intelligentes elektronisches Gerät (en: Intelligent Electronic Device)
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IID	instanzierte IED-Beschreibung (en: Instantiated IED Description)
IP	Internet Protokoll (en: Internet Protocol)
ISO	International Standardization Organization

LAN	Local Area Network
LCB	Log Steuerungs Block (en: Log Control Block)
LD	Logisches Gerät (en: Logical Device)
LI	Längenindikator (en: Length Indicator)
LLC	Logische Verbindungssteuerung (en: Logical Link Control)
LN	Logischer Knoten (en: Logical Node)
LPDU	Link-Protokoll Dateneinheit (en: Link Protocol Data Unit)
M or m	Obligatorisch. Zeigt an, dass der Dienst, der Parameter oder das Attribut innerhalb einer Implementierung unterstützt werden muss. (en: Mandatory)
M= or m=	Obligatorische Angaben, die mit den ursprünglichen Angaben im Antrag übereinstimmen müssen (en: Mandatory information that shall be equal the original information supplied in the request)
MAC	Medienzugriffskontrolle (en: Media Access Control)
MJD	Modifizierter julianischer Tag (en: Modified Julian Day)
MMPM	Fertigungsnachrichtenprotokoll Maschine (en: Manufacturing Message Protocol Machine)
MMS	Spezifikation für Fertigungsmeldungen (ISO 9506) (en: Manufacturing Message Specification (ISO 9506))
NTP	Network Time Protocol
o	Optional: Zeigt an, dass der Dienst, der Parameter oder das Attribut innerhalb einer Implementierung unterstützt werden kann. (en: Optional)
OSI	Offene Systemzusammenschaltung (en: Open Systems Interconnection)
PDU	Protokolldateneinheit (en: Protocol Data Unit)
PI	Parameterindikator (en: Parameter Indicator)
PICS	Protokoll-Implementierung Konformitätserklärung (en: Protocol Implementation Conformance Statement)
PIXIT	Protokollimplementierung Zusätzliche Informationen (en: Protocol Implementation Extra Information)
PTP	Precision Time Protocol
PV	Parameterwert (en: Parameter Value)
r	Erfordert, dass der Artikel lesbar ist. Die Fähigkeit, den Artikel zu schreiben, ist eine lokale Angelegenheit. (en: readable)
R-GOOSE	routingfähiges GOOSE (en: Routable GOOSE)
R-SV	routingfähiger Abtastwert (en: Routable Sampled Value)
RFC	Anforderung von Kommentaren (en: Request for Comments)
rw	Erfordert, dass der Artikel sowohl lesbar als auch schreibbar ist (en: readable and writeable)
S	Server-spezifischer Parameter (en: Server specified parameter)
SAP	Dienstzugangspunkt. Der Dienstzugangspunkt stellt ein logisches Konstrukt dar, über das ein Peer ein Kommunikationsprotokoll oder den Zugang zu einer Anwendung auswählt. Die Auswahl der gesamten sieben Schichten von SAPs stellt ein Kommunikationsprofil dar (en: Service Access Point)
SBO	Vor der Operation wählen (en: Select Before Operate)
SCL	substation automation System Configuration Language (IEC 61850-6)
SCD	Systemkonfigurationsbeschreibung (en: System Configuration Description)
SCSM	Spezifisches Mapping der Kommunikationsdienste (en: Specific Communication Service Mapping)
Server-CR	Server-Konformitätsanforderung (en: Server Conformance Requirement)

SG	Einstellung Gruppe (en: Setting Group)
SI	SPDU-Bezeichner (en: SPDU Identifier)
SNTP	Einfaches Netzwerkzeitprotokoll (en: Simple Network Time Protocol)
SPDU	Sitzungsprotokoll-Dateneinheit (en: Session Protocol Data Unit)
SV	Abgefragte Werte (en: Sampled Values)
Sync	Synchronisierung (en: Synchronization)
T	Transport oder Zeitstempel (en: Transport or Timestamp)
TAI	Internationale Atomzeit (en: Temps Atomique International)
TCP	Übertragungssteuerungsprotokoll (en: Transmission Control Protocol)
TIssue	technischer Problempunkt (en: Technical Issue)
TPDU	Transportprotokoll-Dateneinheit (en: Transport Protocol Data Unit)
TPID	Kennung für die Prioritätskennzeichnung (für IEEE 802.1Q-Netzwerke) = 0x8100) (en: Priority Tagging Identification (for IEEE 802.1Q networks) = 0x8100)
u or U	Benutzerspezifisch: Zeigt an, dass der Dienst, der Parameter oder das Attribut durch eine Implementierung definiert werden kann) (en: User-specific)
u= or U=	Benutzerspezifische Informationen, die mit den ursprünglich in der Anfrage angegebenen Informationen übereinstimmen müssen
UCA	Kommunikationsarchitektur für Versorgungsunternehmen (en: Utility Communication Architecture)
UD TDPU	Gerätedaten-TPDU (en: Unit Data TPDU)
URCB	Ungepufferter Report Control Block (en: Unbuffered Report Control Block)
UTC	Coordinated universal time
VARSPEC	Variable Spezifikation (en: Variable Specification)
V-GET	Virtuelle Get-Funktion, definiert ISO 9506-1 (en: Virtual Get Function)
VID	VLAN Indikator (en: VLAN Identifier)
VLAN	Virtuelles LAN (en: Virtual LAN)
VMD	Virtuelle Fertigungseinrichtung (en: Virtual Manufacturing Device)
V-PUT	Virtuelle Put-Funktion. Definiert in ISO 9506-1 (en: Virtual Put Function)
w	Setzt voraus, dass das Objekt beschreibbar ist. Die Fähigkeit, das Objekt zu lesen, ist eine lokale Angelegenheit. (en: writeable)

EUROPEAN STANDARD

EN 61850-8-1:2011-09

+ A1:2020-04

NORME EUROPÉENNE

EUROPÄISCHE NORM

ICS 33.200

Supersedes EN 61850-8-1:2004

English version

Communication networks and systems for power utility automation –
Part 8-1: Specific communication service mapping (SCSM) – Mappings
to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3
(IEC 61850-8-1:2011 + A1:2020)

Réseaux et systèmes de communication pour
l'automatisation des systèmes électriques – Partie 8-1:
Mise en correspondance des services de communication
spécifiques (SCSM) – Mises en correspondance pour
MMS (ISO 9506-1 et ISO 9506-2) et pour l'ISO/IEC 8802-3
(IEC 61850-8-1:2011 + A1:2020)

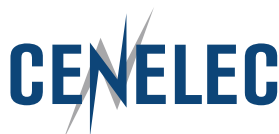
Kommunikationsnetze und -systeme für die Automatisierung
der elektrischen Energieversorgung – Teil 8-1: Spezifische
Abbildung von Kommunikationsdiensten (SCSM) – Abbildungen
auf MMS (nach ISO 9506-1 und ISO 9506-2) und ISO/IEC 8802-3
(IEC 61850-8-1:2011 + A1:2020)

This European Standard was approved by CENELEC on 2011-07-22 and A1 on 2020-03-27. 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.

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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 Brüssel

Foreword

The text of document 57/1109/FDIS, future edition 2 of IEC 61850-8-1, prepared by IEC TC 57, Power systems management and associated information exchange, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61850-8-1 on 2011-07-22.

This European Standard supersedes EN 61850-8-1:2004.

The main changes with respect to EN 61850-8-1:2004 are listed below:

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

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

The following dates were fixed:

- | | |
|--|------------------|
| – latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) 2012-04-22 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) 2014-07-22 |

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61850-8-1:2011 was approved by CENELEC as a European Standard without any modification.

European foreword A1

The text of document 57/2150/FDIS, future IEC 61850-8-1/A1, 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 61850-8-1:2011/A1:2020.

The following dates are fixed:

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by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2023-03-27
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This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

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In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 62351-4:2018 NOTE Harmonized as EN IEC 62351-4:2018 (not modified).

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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60255-24	2013	Measuring relays and protection equipment -	-	-
/ IEEE Std C37.111	2013	Part 24: Common format for transient data exchange (COMTRADE) for power systems		
IEC 61850	Series	Communication networks and systems in substations	EN 61850	Series
IEC/TS 61850-2	-	Communication networks and systems in substations - Part 2: Glossary	-	-
IEC 61850-5	-	Communication networks and systems in substations - Part 5: Communication requirements for functions and device models	EN 61850-5	-
IEC 61850-6	-	Communication networks and systems for power utility automation - Part 6: Configuration description language for communication in electrical substations related to IEDs	EN 61850-6	-
IEC 61850-7-1	-	Communication networks and systems for power utility automation - Part 7-1: Basic communication structure - Principles and models	EN 61850-7-1	-
IEC 61850-7-2	2010	Communication networks and systems for power utility automation - Part 7-2: Basic communication structure - Abstract communication service interface (ACSI)	EN 61850-7-2	2010
+A1	2019		+A1	2020
IEC 61850-7-3	-	Communication networks and systems for power utility automation - Part 7-3: Basic communication structure - Common data classes	EN 61850-7-3	-
IEC 61850-7-4	-	Communication networks and systems for power utility automation - Part 7-4: Basic communication structure - Compatible logical node classes and data object classes	EN 61850-7-4	-

IEC 61850-9-2	-	Communication networks and systems for power utility automation - Part 9-2: Specific communication service mapping (SCSM) - Sampled values over ISO/IEC 8802-3	EN 61850-9-2	-
IEC/IEEE 61850-9-3	-	Communication networks and systems for power utility automation - Part 9-3: Precision time protocol profile for power utility automation	-	-
IEC/TR 61850-90-4	-	Communication networks and systems for power utility automation - Part 90-4: Network engineering guidelines	-	-
IEC 62351-6	2019 ¹	Power systems management and associated information exchange - Data and communications security - Part 6: Security for IEC 61850	EN IEC 62351-6	— ²
IEC 62351-9	-	Power systems management and associated information exchange - Data and communications security - Part 9: Cyber security key management for power system equipment	EN 62351-9	-
IEC/TR 62357-200	2015-08	Power systems management and associated information exchange - Part 200: Guidelines for migration from Internet Protocol version 4 (IPv4) to Internet Protocol version 6 (IPv6)	-	-
IEC 62439-3	2016	Industrial communication networks - High availability automation networks - Part 3: Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR)	EN IEC 62439-3	2018
ISO/IEC 7498-1	1994	Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model	-	-
ISO/IEC 7498-3	1997	Information technology - Open Systems Interconnection - Basic Reference Model: Naming and addressing	-	-
ISO/IEC 8072	1996	Information technology - Open systems interconnection - Transport service definition	-	-
ISO/IEC 8073	1997	Information technology - Open Systems Interconnection - Protocol for providing the connection-mode transport service	-	-
ISO/IEC 8326	1996	Information technology - Open systems Interconnection - Session service definition	-	-
ISO/IEC 8327-1	1997	Information technology - Open Systems Interconnection - Connection-oriented Session protocol: Protocol specification	-	-
ISO/IEC 8348	2002	Information technology - Open Systems Interconnection - Network service definition	-	-

¹ To be published. Stage at the time of publication: IEC/PRVC 62351-6:2020.

² To be published. Stage at the time of publication: prEN IEC 62351-6:2018.

ISO/IEC 8473-1	1998	Information technology - Protocol for providing the connectionless-mode network service: Protocol specification	-	-
ISO/IEC 8473-2	1996	Information technology - Protocol for providing the connectionless mode network service - Part 2: Provision of the underlying service by an ISO/IEC 8802 subnetwork	-	-
ISO/IEC 8802-2	1998	Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 2: Logical link control	-	-
ISO/IEC/IEEE 8802-3	2014	Standard for Ethernet	-	-
ISO/IEC 8822	1994	Information technology - Open Systems Interconnection - Presentation service definition	-	-
ISO/IEC 8823-1	1994	Information technology - Open Systems Interconnection - Connection-oriented presentation protocol: Protocol specification	-	-
ISO/IEC 8824-1	2015	Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation	-	-
ISO/IEC 8825-1	2015	Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)	-	-
ISO/IEC 9542	1988	Information processing systems - Telecommunications and information exchange between systems - End system to intermediate system routing exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO 8473)	-	-
ISO/IEC 9548-1	1996	Information technology - Open Systems Interconnection - Connectionless Session protocol: Protocol specification	-	-
ISO/IEC 9576-1	1995	Information technology - Open Systems Interconnection - Connectionless Presentation protocol: Protocol specification	-	-
ISO/IEC 10035-1 + A1	1995	Information technology - Open Systems Interconnection - Connectionless protocol for the Association Control Service Element: Protocol specification	-	-
	1998		-	-
ISO/IEC ISP 11188-1	1995	Information technology - International Standardized Profile - Common upper layer requirements - Part 1: Basic connection-oriented requirements	-	-
ISO/IEC ISP 11188-3	1996	Information technology - International Standardized Profile - Common upper layer requirements - Part 3: Minimal OSI upper layer facilities	-	-
ISO 4217	2015	Codes for the representation of currencies	-	-

ISO 9506	Series	Industrial automation systems - Manufacturing Message Specification	-	-
ISO 9506-1	2003	Industrial automation systems - Manufacturing Message Specification - Part 1: Service definition	-	-
ISO 9506-2	2003	Industrial automation systems - Manufacturing Message Specification - Part 2: Protocol specification	-	-
ISO/ISP 14226-1	1996	Industrial automation systems - International Standardized Profile AMM11: MMS General Applications Base Profile - Part 1: Specification of ACSE, Presentation and Session protocols for the use by MMS	-	-
ISO/ISP 14226-2	1996	Industrial automation systems - International Standardized Profile AMM11: MMS General Applications Base Profile - Part 2: Common MMS requirements	-	-
ISO/ISP 14226-3	1996	Industrial automation systems - International Standardized Profile AMM11: MMS General Applications Base Profile - Part 3: Specific MMS requirements	-	-
IEEE C37.111	1999	IEEE Standard for Common Format for Transient Data Exchange (COMTRADE) for Power Systems	-	-
IEEE 754	1985	Binary Floating-Point Arithmetic (R1990)	-	-
IEEE 802.1Q	1998	IEEE Standard for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks	-	-
IEEE 802.1D	2004	IEEE Standard for Local and Metropolitan Area Networks - Media Access Control (MAC) Bridges	-	-
ITU-T X.217	1996	Information technology - Open Systems Interconnection - Service definition for the Associated Control Service Element	-	-
ITU-T X.227	1996	Information technology - Open Systems Interconnection - Connection-oriented protocol for the Association Control Service Element: Protocol specification	-	-
RFC 614	-	Comments on the File Transfer Protocol	-	-
RFC 640	-	Revised FTP reply codes	-	-
RFC 768	-	User Datagram Protocol	-	-
RFC 791	-	Internet Protocol - DARPA Internet Program Protocol Specification	-	-
RFC 792	-	Internet Control Message Protocol	-	-
RFC 793	-	Transmission Control Protocol - DARPA Internet Program Protocol Specification	-	-
RFC 826	-	Ethernet Address Resolution Protocol	-	-
RFC 894	-	Standard for the Transmission of IP Datagrams over Ethernet Networks	-	-

RFC 919	-	Broadcasting Internet Datagrams	-	-
RFC 922	-	Broadcasting Internet Datagrams in the presence of subnets	-	-
RFC 950	-	Internet Standard Subnetting Procedure	-	-
RFC 1006	-	ISO transport services on top of TCP: Version 3	-	-
RFC 1035	-	Domain Names - Implementation and specification	-	-
RFC 1112	-	Host Extensions for IP Multicasting	-	-
RFC 1122	-	Requirements for Internet Hosts - Communication Layers	-	-
RFC 1123	-	Requirements for Internet Hosts - Application and Support	-	-
RFC 1240	-	OSI Connectionless Transport Services on top of UDP Version:1	-	-
RFC 2460	-	Internet Protocol, Version 6 (IPv6) Specification	-	-
RFC 2474	-	Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers	-	-
RFC 2991	-	Multipath Issues in Unicast and Multicast Next-Hop Selection	-	-
RFC 3168	-	The Addition of Explicit Congestion Notification (ECN) to IP	-	-
RFC 3246	-	An Expedited Forwarding PHB (Per-Hop Behavior)	-	-
RFC 3629	-	UTF-8, a transformation format of ISO 1646	-	-
RFC 4291	-	IP Version 6 Addressing Architecture	-	-
RFC 4604	-	Internet Group Management Protocol, Version 3- (IGMPv3)	-	-
RFC 5771	-	IANA Guidelines for IPv4 Multicast Address Assignments	-	-
RFC 5905	-	Network Time Protocol Version 4: Protocol and Algorithms Specification	-	-
RFC 6864	-	Updated Specification of the IPv4 ID Field	-	-

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INTRODUCTION

This part of IEC 61850 is part of a set of specifications which details layered utility communication architecture.

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

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

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

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

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

1 Scope

1.1 General

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

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

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

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

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

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

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

1.2 Namespace name and version

This new section is mandatory for any IEC 61850 namespace (as defined by IEC 61850-7-1).

The parameters which identify this new release of this namespace are:

- Namespace Version: 2003
- Namespace Revision: A
- Namespace name: "IEC 61850-8-1:2003"

Edition	Publication date	Webstore	Namespace
Edition 1.0	2004-05	IEC 61850-8-1:2004	IEC 61850-8-1:2003
Edition 2.0	2011-06	IEC 61850-8-1:2011	IEC 61850-8-1:2003
Amendment 1 of Edition 2.0	2020-02	IEC 61850-8-1:2011/AMD1:2020	IEC 61850-8-1:2003
Edition 2.1	2020-02	IEC 61850-8-1:2011+AMD1:2020 CSV	IEC 61850-8-1:2003

1.3 Code Component distribution

The Code Component will be available in light and full version:

- Full version will contain definition of the whole types and functional constraints defined in this standard with the documentation associated and access will be restricted to purchaser of this part. The code component package name will be IEC 61850-8-1.NSD.2003A2.full.zip
- Light version will not contain the documentation but will contain the whole definition of the types functional constraints as per full version, and this light version will be freely accessible on the IEC website for download, but the usage remains under the licensing conditions.

The link for downloading the light version of this code component is:

<http://www.iec.ch/tc57/supportdocuments/IEC 61850-8-1.NSD.2003A2.light.zip>

The Code Components for IEC 61850 data models (like the mapping of the control service parameter in this document) are available as the file format NSD defined by IEC 61850-7-7.

The Code Component included in this IEC standard are potentially subject to maintenance works and user shall select the latest release in the repository located at:

<http://www.iec.ch/tc57/supportdocuments>

The latest version/release of the document will be found by selecting the file IEC 61850-8-1.NSD.{VersionStateInfo}.light.zip with the filled VersionStateInfo of the highest value.

Each Code Component is a ZIP package containing the electronic representation of the Code Component itself, with a file describing the content of the package (IECManifest.xml).

The IECManifest contains different sections giving information on:

- The copyright notice
- The identification of the code component
- The publication related to the code component
- The list of the electronic files which compose the code component
- An optional list of history files to track changes during the evolution process of the code component

The life cycle of a code component is not restricted to the life cycle of the related publication. The publication life cycle goes through two stages, Version (corresponding to an edition) and Revision (corresponding to an amendment). A third publication stage (Release) allow publication of Code Component without need to publish an amendment.

This is useful when InterOp Tissues need to be fixed. Then a new release of the Code Component will be released, which supersedes the previous release, and distributed through the IEC TC57 website.

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

IEC TS 61850-2, *Communication networks and systems for power utility automation - Part 2: Glossary*

IEC 61850-5, *Communication networks and systems for power utility automation - Part 5: Communication requirements for functions and device models*

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

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

IEC 61850-7-2:2010, *Communication networks and systems for power utility automation – Part 7-2: Basic communication structure – Abstract communication service interface (ACSI)*
IEC 61850-7-2:2010/AMD1:2020

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

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

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

IEC/IEEE 61850-9-3, *Communication networks and systems for power utility automation – Part 9-3: Precision time protocol profile for power utility automation*

IEC TR 61850-90-4, *Communication networks and systems for power utility automation - Part 90-4: Network engineering guidelines*

IEC 62351-6:—³, *Power systems management and associated information exchange data and communication security – Part 6: Security for IEC 61850*

IEC 62351-9, *Power systems management and associated information exchange - Data and communications security - Part 9: Cyber security key management for power system equipment*

IEC 62439-3:2016, *Industrial communication networks - High availability automation networks - Part 3: Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR)*

IEC TR 62357-200:2015, *Power system management and associated information exchange – Part 200: Guidelines for migration from Internet Protocol version 4 (IPv4) to Internet Protocol version 6 (IPv6)*

IEC 60255-24:2013 / IEEE Std C37.111-2013, *Measuring relays and protection equipment – Part 24: Common format for transient data exchange (COMTRADE) for power systems*

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

³ Under preparation. Stage at the time of publication: IEC/PRVC 62351-6:2020.

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

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

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

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

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

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

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

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

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

ISO/IEC/IEEE 8802-3:2014, *Standard for Ethernet*

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

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

ISO/IEC 8824-1:2015 [ITU-T X.680:2015], *Information technology – Abstract Syntax Notation One (ASN. 1): Specification of basic notation*

ISO/IEC 8825-1:2015 [ITU-T X.690:2015], *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

ISO/IEC 9542:1988, *Information processing systems – Telecommunications and information exchange between systems – End system to Intermediate system routing exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO 8473)*

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

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

ISO/IEC 10035-1:1995/AMD1:1997, *Information technology – Open Systems Interconnection – Connectionless protocol for the Association Control Service Element: Protocol specification*

ISO/IEC ISP 11188-1:1995 [ITU-T X.637:1996], *Information technology – International Standardized Profile – Common upper layer requirements – Part 1: Basic connection-oriented requirements*

ISO/IEC ISP 11188-3:1996 [ITU-T X.638:1996], *Information technology – International Standardized Profile – Common upper layer requirements – Part 3: Minimal OSI upper layer facilities*

ISO 4217:2015, *Code for the representation of currencies*

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

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

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

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

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

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

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

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

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

ITU-T X.217:1996, *Information technology – Open Systems Interconnection – Service definition for the Associated Control Service Element*

NOTE The corresponding International Standard ISO/IEC 8649:1996 has been withdrawn.

ITU-T X.227:1996, *Information technology – Open Systems Interconnection – Connection-oriented protocol for the Association Control Service Element: Protocol specification*

NOTE The corresponding International Standard ISO/IEC 8650-1:1996 has been withdrawn.

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

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

RFC 768, *User Datagram Protocol, IETF*, available at <http://www.ietf.org>

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

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

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

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

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

RFC 919, *Broadcasting Internet Datagrams, IETF*, available at <http://www.ietf.org>

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

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

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

RFC 1035, *Domain Names – Implementation and specification*, IETF, available at <http://www.ietf.org>

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

RFC 1122, *Requirement for Internet Hosts - Communication Layers*, IETF, available at <http://www.ietf.org>

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

RFC 1240, *OSI Connectionless Transport Services on top of UDP Version:1*, IETF, available at <http://www.ietf.org>

RFC 2460, *Internet Protocol, Version 6 (IPv6) Specification*, IETF, available at <http://www.ietf.org>

RFC 2474, *Definition of Differentiated Services Field (DS Field) in IPv4 and IPv6 Headers*, available at <http://www.ietf.org>

RFC 2991, *Multipath Issues in Unicast and Multicast Next-Hop Selection*, available at <http://www.ietf.org>

RFC 3168, *The Addition of Explicit Congestion Notification (ECN) to IP*, available at <http://www.ietf.org>

RFC 3246, *An Expedited Forwarding PHB (Per-Hop Behavior)*, available at <http://www.ietf.org>

RFC 3629, *UTF-8, a transformation format of ISO 1646 – IETF*, available at <http://www.ietf.org>

RFC 4291, *IP Version 6 Addressing Architecture*, available at <http://www.ietf.org>

RFC 4604, *Internet Group Management Protocol, Version 3 (IGMPv3)*, available at <http://www.ietf.org>

RFC 5771, *IANA Guidelines for IPv4 Multicast Address Assignments*, available at <http://www.ietf.org>

RFC 5905, *Network Time Protocol (NTP) Version 4: Protocol and Algorithms Specification*, IETF, available at <http://www.ietf.org>

RFC 6864, *Updated Specification of the IPv4 ID Field*, IETF, available at <http://www.ietf.org>

3 Terms and definitions

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

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>

3.1

(n)-layer

any specific layer

[SOURCE: ISO/IEC 7498-1:1994, 3.1]

3.2

(n)-protocol data unit

unit of data specified in an (n)-protocol and consisting of (n)-protocol-control-information and possibly (n)-user-data

[SOURCE: ISO/IEC 7498-1:1994, 5.6.1.3]

3.3

(n)-protocol

set of rules and formats (semantic and syntactic) which determines the communication behavior of (N)-entities in the performance of (n)-functions

[SOURCE: ISO/IEC 7498-1:1994, 5.2.1.9]

3.4

class

description of a set of objects that share the same attributes, services, relationships, and semantics

[SOURCE: IEC 61850-7-2:2010+AMD1:2019 CSV, 3.1]

3.5

client

entity that requests a service from a server and that receives unsolicited messages from a server

[SOURCE: IEC 61850-7-2:2010+AMD1:2019 CSV, 3.2]

3.6

device

entity that performs control, actuating and/or sensing functions and interfaces to other such entities within an automation system

Note 1 to entry: Devices alone do not perform energy transport functions.

[SOURCE: IEC 61850-7-2:2010+AMD1:2019 CSV, 3.3]

3.7

logical device

entity that represents a set of typical substation functions

[SOURCE: IEC 61850-7-2:2010+AMD1:2019 CSV, 3.6]

3.8

logical node

entity that represents a typical substation function

[SOURCE: IEC 61850-7-2:2010+AMD1:2019 CSV, 3.7]

3.8

physical device

entity that represents the physical parts of a device (hardware and operating system, etc.)

Note 1 to entry: Physical devices host logical devices.

[SOURCE: IEC 61850-7-2:2010+AMD1:2019 CSV, 3.8]

3.9

application and transport profiles

A-Profile and T-Profile

set of protocols for a specific purpose

3.10

data attribute

named element of data object which has a specific type

3.11

data object

meaningful structured information of applications located in an automation device which can be read or written

Note 1 to entry: This definition is in accordance with the DataObject definition of IEC 61850-7-2. The MMS use of DataObject refers to data types and potential instantiations of MMS variables.

3.12

ISO/IEC 8802-3

communication technology according to ISO/IEC 8802-3

3.13

server

entity that provides services to clients or issues unsolicited messages

3.14

V-Put

function used to set one or more values within an MMS Variable

Note 1 to entry: The V-Put function executes the MMS variable's access method using the value transferred with the MMS WriteRequest and generates an access-result indicating success or failure. A single MMS WriteRequest invokes the V-Put Function for each MMS Variable referenced in the request.

3.15

V-Get

function used to obtain one or more values from an MMS Variable

Note 1 to entry: The V-Get function executes the MMS variable's access method and generates an access-result indicating failure or upon success the value. A single MMS ReadRequest invokes the V-Get Function for each MMS Variable referenced in the request.

3.16

ACSI basic conformance

conformance with ACSI, as defined in IEC 61850-7-2:2010+AMD1:2019 CSV, Annex A

3.17

ACSI basic conformance

conformance with ACSI, as defined in IEC 61850-7-2:2010+AMD1:2019 CSV, Annex A

4 Abbreviations

A	Application
ACSE	Association Control Service Element
ACSI	Abstract Communication Service Interface
APPID or ApplID	Application Identification
APDU	Application Protocol Data Unit
BRCB	Buffered Report Control Block
CBB	Conformance Building Block
CDC	Common Data class
CL	Connectionless
Client-CR	Client Conformance Requirement
CO	Connection Oriented
DNA	Dynamic Namespace Attribute
F/S	Functional Standard.
FC	Functional Constraint
FCD	Functionally Constrained Data

GMT	Greenwich Mean Time
GPS	Global Positioning System
GOOSE	Generic Object Oriented Substation Event
GSE	Generic Substation Event
GSSE	Generic Substation Status Event
HMAC	Hashed Message Authentication Code
HSR	High-availability Seamless Redundancy
ICD	IED Capability Description
IED	Intelligent Electronic Device
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IID	Instantiated IED Description
IP	Internet Protocol
ISO	International Standardization Organization
LAN	Local Area Network
LCB	Log Control Block
LD	Logical Device
LI	Length Indicator
LLC	Logical Link Control
LN	Logical Node
LPDU	Link Protocol Data Unit
M or m	Mandatory. Indicates that the service, parameter, or attribute shall be supported within an implementation
M= or m=	Mandatory information that shall be equal the original information supplied in the request
MAC	Media Access Control
MJD	Modified Julian Day
MMPM	Manufacturing Message Protocol Machine
MMS	Manufacturing Message Specification (ISO 9506)
NTP	Network Time Protocol
o	Optional: Indicates that the service, parameter, or attribute may be supported within an implementation
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
PI	Parameter Indicator
PICS	Protocol Implementation Conformance Statement
PIXIT	Protocol Implementation Extra Information
PTP	Precision Time Protocol
PV	Parameter Value
r	Mandates that the item is readable. The ability to write the item is a local issue.
R-GOOSE	Routable GOOSE

R-SV	Routeable Sampled Value
RFC	Request for Comments
rw	Mandates that the item is both readable and writeable.
S	Server specified parameter
SAP	Service Access Point. The Service Access Point represents a logical construct through which a peer selects a communication protocol or access to an application. The selection of the entire seven layers of SAPs represents a communication profile
SBO	Select Before Operate
SCL	substation automation System Configuration Language (IEC 61850-6)
SCD	System Configuration Description
SCSM	Specific Communication Service Mapping
Server-CR	Server Conformance Requirement
SG	Setting Group
SI	SPDU Identifier
SNTP	Simple Network Time Protocol
SPDU	Session Protocol Data Unit
SV	Sampled Values
Sync	Synchronization
T	Transport or Timestamp
TAI	Temps Atomique International
TCP	Transmission Control Protocol
Tissue	Technical Issue
TPDU	Transport Protocol Data Unit
TPID	Priority Tagging Identification (for IEEE 802.1Q networks) = 0x8100
u or U	User-specific: Indicates that the service, parameter, or attribute can be defined by an implementation
u= or U=	User-specific information that shall be equal the original information supplied in the request
UCA	Utility Communication Architecture
UD TDPDU	Unit Data TPDU
URCB	Unbuffered Report Control Block
UTC	Coordinated universal time
VARSPEC	Variable Specification
V-GET	Virtual Get Function. Defined in ISO 9506-1
VID	VLAN Identifier
VLAN	Virtual LAN
VMD	Virtual Manufacturing Device
V-PUT	Virtual Put Function. Defined in ISO 9506-1.
w	Mandates that the item is writeable. The ability to read the item is a local issue.

5 Overview

5.1 General

The purpose of IEC 61850-8-1 is to provide detailed instructions/specifications as to the mechanisms and rules required to implement the services, objects, and algorithms specified in IEC 61850-7-2, IEC 61850-7-3, and IEC 61850-7-4 while making use of ISO 9506 (all parts) (Manufacturing Message Specification), SNTP, and other application protocols (see Figure 1). This clause is intended to provide an overview of the methodology to provide the mapping from IEC 61850-7-2, IEC 61850-7-3, and IEC 61850-7-4 into MMS.

The communication requirements for utilities (listed in IEC 61850-5) are met by the profiles shown in Figure 1.

The message types and performance classes specified in IEC 61850-5 are mapped as shown in Figure 1:

- Type 1 (Fast messages)

- Type 1A (Trip)

- Type 2 (Medium speed messages)

- Type 3 (Low speed messages)

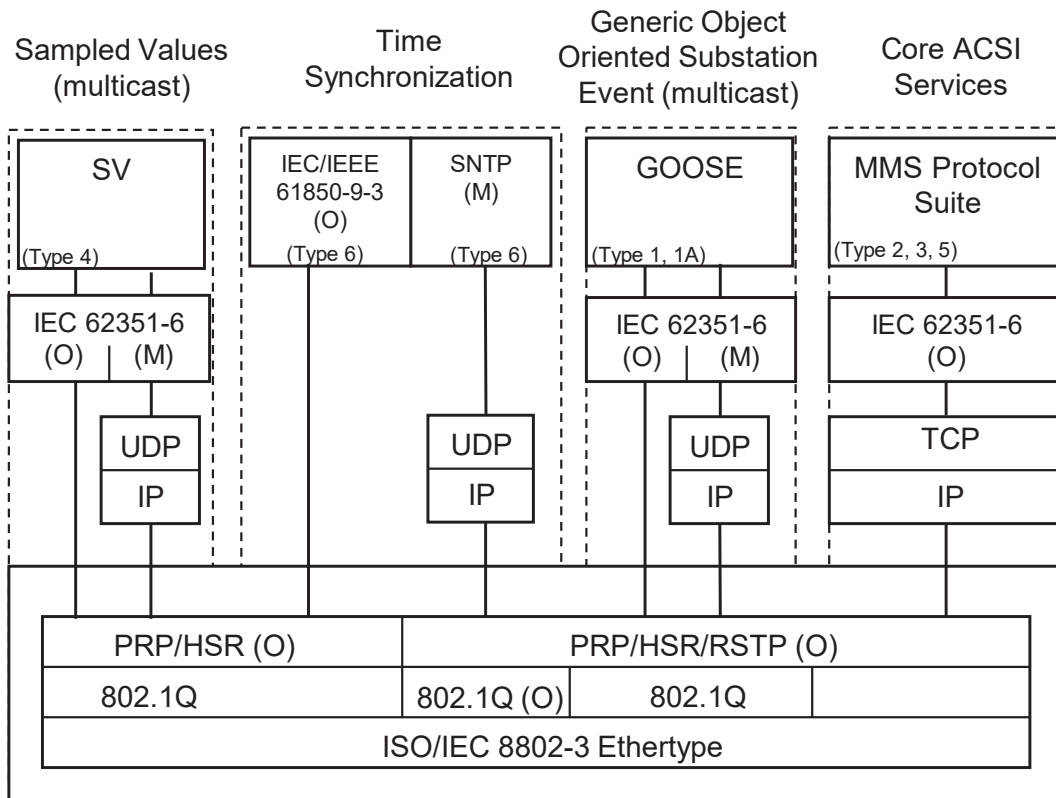
- Type 4 (Raw data messages)

- Type 5 (File transfer functions)

- Type 6 (Time synchronisation messages)

Messages of Type 1 and Type 1A are mapped to the same Ethertype. However, to optimise decoding of received messages they will use different ranges of the APPID (see Annex C).

Messages of Type 2, 3, and 5 require message oriented services. The MMS standard provides exactly the information modelling methods and services required by the ACSI.



(Type x) is the Message type and performance class defined in IEC 61850-5

Figure 1 – Overview of functionality and profiles

Further details pertaining to the use and actual specification of each profile may be found in Clause 6.

5.2 MMS communication profiles

The VMD's service address format is determined through the communication profile being used. However, ISO has recognized the existence of Application Profiles (A-Profiles) and Transport Profiles (T-Profiles). A-Profiles represent the protocols and agreements regarding the upper 3 layers of the OSI Reference Model (ISO/IEC 7498-1). The T-Profiles represent the protocols and agreements regarding the lower 4 layers of the OSI reference model.

For the purpose of this document, there are 2 A-Profiles: Connection Oriented OSI and Connectionless OSI. Additionally, there are 3 T-Profiles: Connection Oriented TCP, Connection Oriented OSI, and Connectionless OSI. The ConnectionOriented A-Profile shall only be used over the connection-oriented T-Profiles.

5.3 Non-MMS communication profiles

There are several services, specified in IEC 61850-7-2, that have been intentionally mapped to application protocols and communication profiles that do not make use of ISO 9506 as the application layer protocol. Other communication profiles are used to accomplish time synchronization, via IETF Simple Network Time Protocol (SNTP), sampled values, and GOOSE messages.

5.4 MMS objects being used

ISO 9506 (MMS) specifies several MMS objects that could be used as part of this SCSM. However, all objects are not required in order to perform the mapping of IEC 61850-7-2, IEC 61850-7-3, and IEC 61850-7-4. Table 1 shows the MMS objects and services that shall be used within this SCSM.

Table 1 – MMS objects and services in use within this SCSM

MMS OBJECT	IEC 61850 OBJECT	MMS SERVICES IN USE
Application Process VMD	Server	Initiate Conclude Abort Reject Cancel Identify ^a Status ^b GetCapabilityList ^b
Named Variable Objects	Logical Nodes and Data	Read Write InformationReport GetVariableAccessAttribute GetNameList
Named Variable List Objects	Data Sets	GetNamedVariableListAttributes GetNameList DefineNamedVariableList DeleteNamedVariableList Read Write InformationReport
Journal Objects	Logs	ReadJournal GetNameList
Domain Objects	Logical Devices	GetNameList GetDomainAttributes ^b
Files	Files	FileOpen FileRead ObtainFile FileClose FileDirectory FileDelete
a Required by ISO 9506 for conformance. b Suggested to be implemented for compatibility with MMS systems.		

6 Communication stack

6.1 Overview of the protocol usage

The OSI Reference Model (ISO/IEC 7498-1) details a model based upon the concept of layering of communication functionality. The model details 7 layers and details the functional requirements, for each layer, in order to achieve a robust communication system. The model does not specify the protocols to be used to achieve the functionality, nor does it restrict the solution to be a single set of protocols.

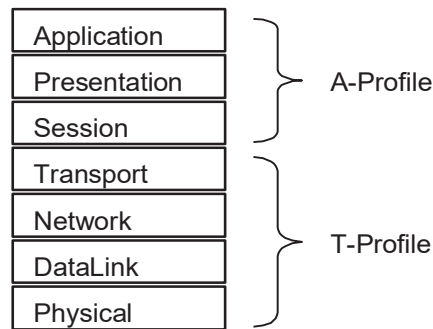


Figure 2 – OSI reference model and profiles

The use of ISO Application (A-Profile) and Transport (T-Profile) Profiles (see Figure 2) describes the various stack profiles. An ISO A-Profile is the set of specifications and agreements relating to the upper 3 layers of the ISO OSI reference model (e.g. the layers of application, presentation, and session). An ISO T-Profile is the set of specifications and agreements relating to the lower 4 layers of the ISO OSI reference model (e.g. the layers of transport, network, DataLink and physical).

Various combinations of A-Profiles and T-Profiles can be combined in order to allow certain types of information/services to be exchanged. The services, as specified in IEC 61850-7-2, are mapped into 4 different combinations of A- and T- profiles. The three different combinations are used for:

- Client/server services (see Figure 1 Core ACSI Services). See 6.2 for further details;
- GOOSE/GSE Management Services. See 6.3 for further details;
- Time Sync. See 6.4 for further details.

6.2 Client/server services and communication profiles

6.2.1 Client/server services

The client/server communication profile shall be used for any implementation claiming conformance to this standard and declaring support for one of the IEC 61850-7-2 services shown in Table 2.

Table 2 – Services requiring client/server Communication Profile

IEC 61850-7-2 model	IEC 61850-7-2 service
Server	GetServerDirectory
Association	Associate
	Abort
	Release
Logical Device	GetLogicalDeviceDirectory
Logical Node	GetLogicalNodeDirectory
	GetAllDataValues
Data	GetDataValues
	SetDataValues
	GetDataDirectory
	GetDataDefinition
Data Set	GetDataSetValues
	SetDataSetValues

IEC 61850-7-2 model	IEC 61850-7-2 service
	CreateDataSet
	DeleteDataSet
	GetDataSetDirectory
Setting Group Control Block	SelectActiveSG
	SelectEditSG
	SetEditSGValue
	ConfirmEditSGValues
	GetEditSGValue
	GetSGCBValues
Report Control Block	Report
	GetBRCBValues
	SetBRCBValues
	GetURCBValues
	SetURCBValues
LOG Control Block	GetLCBValues
	SetLCBValues
	GetLogStatusValues
	QueryLogByTime
	QueryLogAfter
GOOSE	GetGoCBValues
	SetGoCBValues
GSSE (deprecated)	GetGsCBValues (deprecated)
	SetGsCBValues (deprecated)
Sampled Value	GetMSVCBValues
	SetMSVCBValues
Control	Select
	SelectWithValue
	Cancel
	Operate
	CommandTermination
	TimeActivatedOperate
FILE transfer	GetFile
	SetFile
	DeleteFile
	GetFileAttributeValues

6.2.2 A-Profile

6.2.2.1 General

Services and protocols of the A-Profile client/server shall be as shown in Table 3.

Table 3 – Service and protocols for client/server communication A-Profile

OSI model layer	Specification			m/o
	Name	Service specification	Protocol specification	
Application	Manufacturing Message Specification	ISO 9506-1:2003	ISO 9506-2:2003	m
	Application level security	IEC 62351-6	IEC 62351-6	c
	Association Control Service Element	ITU-T X.217:1996	ITU-T X.227:1996	m
Presentation	Connection Oriented Presentation	ISO/IEC 8822:1994	ISO/IEC 8823-1:1994	m
	Abstract Syntax	ISO/IEC 8824-1:2015	ISO/IEC 8825-1:2015	m
Session	Connection Oriented Session	ISO/IEC 8326:1996	ISO/IEC 8327-1:1997	m
c Shall be 'm' if the implementation declares support for secured A-Profile				

There is 1 T-Profile that may be used by the client/server A-Profile: TCP/IP. The previously defined T-Profile over OSI has been deprecated in this revision of the standard. An implementation that claims conformance to this standard shall implement the TCP/IP profile as a minimum.

6.2.2.2 Implementation agreements

This A-Profile shall conform to the agreements specified in ISO/ISP 14226-1, ISO/ISP 14226-2, ISO/ISP 14226-3, ISO/IEC ISP 11188-1 and ISO/IEC ISP 11188-3.

There are further agreements required for compatibility with existing implementations. These impact parameters used in ACSE and Presentation.

The following information shall be proposed, at a minimum, on a P-Connect.req:

- For ACSE, the Object Identifiers that need to be proposed, as a minimum are:
Abstract Syntax = 2.2.1.0.1 (ACSE)
Transfer Syntax = 2.1.1 (ASN.1 basic encoding)
- For ISO-9506, the Object identifiers that need to be proposed, as a minimum are:
Abstract Syntax = 1.0.9506.2.1 (MMS)
Transfer Syntax = 2.1.1 (ASN.1 basic encoding)
- The proposed ASO Context name shall be:
ASO Context Name = 1.0.9506.2.3 (this is called "Application Context" in ISO 9506-2).
- The MMS version number shall be as specified in Table 124 and Table 125.
- The max_mms_pdu_size is defined as the maximum number of octets in an MMSpdu encoded using the negotiated transfer syntax. This size shall apply to all MMSpdus with the exception of the initiate-Request PDU, initiate-Response PDU, and initiate-Error PDU. The max_mms_pdu_size shall be negotiated during connection initiation using the Local Detail Calling and Local Detail Called parameters of the MMS initiate service.
- The local detail called parameter in the initiate response shall specify the negotiated max_mms_pdu_size for the application association.

- The local detail called parameter in the response shall be less than or equal to the value of the local detail calling parameter of the request.
- The local detail called parameter shall not be less than 64; however, it is recommended that at least 8 192 octets be supported.
- The negotiated max_mms_pdu_size shall be applied as follows:
 - a) Any received MMSpdu whose length is less than or equal to the negotiated max_mms_pdu_size shall be properly parsed and processed.
 - b) An MMS implementation should not send an MMSpdu whose size exceeds the negotiated max_mms_pdu_size. If an MMS implementation sends an MMSpdu that exceeds the negotiated max_mms_pdu_size, then it shall be prepared to receive a reject pdu. Should an MMS implementation receive an MMSpdu that exceeds the negotiated max_mms_pdu_size, it shall either reject the MMSpdu or accept the MMSpdu as if no size violation had occurred and perform the expected processing.
 - c) If an MMS implementation is unable to send a service response because the response would exceed the max_mms_pdu_size, then it shall return a Service response (-) with an errorClass="service" and an errorCode="pdu-size".
 - d) When rejecting an MMSpdu because it exceeds the negotiated max_mms_pdu_size, an MMS implementation shall return a Reject with a rejectPDUType="confirmed-requestPDU" and a rejectCode="value-out-of-range".

Further agreements required for compatibility with existing implementations are defined in the context of IEC 62351-6.

6.2.3 TCP/IP T-Profile

6.2.3.1 Service and protocols

Table 4 shows services and protocols of the TCP/IP T-Profile client/server. The use of IEEE 802.1Q is outside of the scope of this document.

Table 4 – Service and protocols for client/server TCP/IP T-Profile

OSI Model Layer	Specification			m/o
	Name	Service specification	Protocol specification	
Communication	Requirement for internet host	RFC 1122		m
Transport	ISO Transport on top of TCP	RFC 1006		m
	TLS	IEC 62351-6		c1
	Internet Control Message Protocol (ICMP)	RFC 792		m
	Transmission Control Protocol (TCP)	RFC 793		m
Network	Internet Protocol	RFC 791 – IPv4		m
		RFC 2460 – IPv6		o
	An Ethernet Address Resolution Protocol (ARP)	RFC 826		m
Link Redundancy	Parallel Redundancy Protocol and High Availability Seamless Redundancy	IEC 62439-3 – PRP or HSR		o

OSI Model Layer	Specification			m/o
	Name	Service specification	Protocol specification	
Communication	Requirement for internet host	RFC 1122		m
	Rapid Spanning Tree Protocol (RSTP)	IEEE 802.1D		o
DataLink	Standard for the transmission of IP datagrams over Ethernet networks	RFC 894		m
	Standard for Ethernet	ISO/IEC/IEEE 8802-3:2014		m
Physical	Electrical	IEC TR 61850-90-4		c2
	Optical	IEC TR 61850-90-4		c2
c1 Shall be 'm' if the implementation declares support for secured T-Profile.				
c2 AtLeastOne if the Product Standard (per IEC 61850-7-1) profiling this standard is not specifying another physical interface.				

6.2.3.2 Implementation agreements

6.2.3.2.1 TCP_KEEPALIVE

The TCP_KEEPALIVE function according to RFC 1122 shall be implemented. The value of the maximum time before a lost connection is detected shall be documented in seconds in the PIXIT.

NOTE A loss of connection should be detected in less than 20 s. This time is not intended to be changed via SCL since the impact of the parameter can be IED wide.

6.2.3.2.2 Transport selector

The Transport Selector size shall be limited to a maximum of 4 octets.

6.2.3.2.3 TCP Port usage

The TCP port used on a TCP-SYN shall be per IANA for iso-tsap (port 102 decimal) or iso-tp0s (port 3782 decimal). iso-tp0s shall only be used for secure profiles (see IEC 62351-6).

6.3 GSE management and GOOSE services communication profiles

6.3.1 GSE mapping overview

The GSE communication profile shall be used for any implementation claiming conformance to this standard and declaring support for one of the IEC 61850-7-2 services shown in Table 5.

Table 5 – Services requiring GSE Management and GOOSE communication profile

Model	IEC 61850-7-2 service
Generic Substation Event	GetGoReference
	GetGOOSEElementNumber
	SendGOOSEMessage

6.3.2 A-Profile

6.3.2.1 General

Table 6 shows services and protocols of the A-Profile GSE Management and GOOSE services.

Table 6 – Service and protocols for GSE Management and GOOSE communication A-Profile

OSI model layer	Specification			m/o
	Name	Service specification	Protocol specification	
Application	GSE/GOOSE protocol	See Annex A		m
	Security	IEC 62351-6		c1, c2
Presentation	Abstract Syntax	NULL		m
Session	Secure Session	See Annex J		c1
	OSI Connectionless Transport Services on top of UDP	RFC 1240		c1
c1 shall be 'm' if using UDP/IP in the T-Profile				
c2 shall be 'm' if the implementation declares support for layer 2 GOOSE security				

The presentation layer encoding shall be Basic Encoding Rules as defined in ISO/IEC 8824-1 and ISO/IEC 8825-1 to encode the grammar referenced.

6.3.2.2 Implementation agreement

RFC 1240 defines several transport parameters. Table 7 specifies the parameters that shall be supported and lengths for those parameters.

Table 7 – RFC 1240 A-Profile Options

Transport Parameter Description	Parameter Value (decimal)	Mandatory/Optional/ eXcluded	Comment
Source TSAP	193	X	Used to identify the application emitter within a node.
Destination TSAP	194	X	
Checksum	195	X	
User Data		M	

The variable parts of RFC 1240 shall not be used within this standard. Therefore, only the LI and UD fields shall be present (e.g. 2 octets). The value of the LI octet shall be one (1).