

INTERNATIONAL STANDARD

**Power systems management and associated information exchange - Data and communications security -
Part 7: Network and System Management (NSM) data object models**

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IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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**Power systems management and associated information exchange -
Data and communications security -
Part 7: Network and System Management (NSM) data object models**

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This edition of IEC 62351-7 cancels and replaces IEC 62351-7 published in 2017. This new edition constitutes a technical revision and includes the following significant technical changes with respect to IEC 62351-7:

- a) Reviewed and enriched the NSM object data model;
- b) UML model adopted for NSM objects description;
- c) SNMP protocol MIBs translation included as Code Components.

The text of this International Standard is based on the following documents:

Draft	Report on voting
57/2798/FDIS	57/2829/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

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A list of all parts of the IEC 62351 series, under the general title: *Power systems management and associated information exchange – Data and communications security*, can be found on the IEC website.

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- reconfirmed,
- withdrawn, or
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1 Scope

This part of IEC 62351 defines network and system management (NSM) data object models that are specific to power system operations. These NSM data objects will be used to monitor the health of networks and systems, to detect possible security intrusions, and to manage the performance and reliability of the information infrastructure. The goal is to define a set of abstract objects that will allow the remote monitoring of the health and condition of IEDs (Intelligent Electronic Devices), RTUs (Remote Terminal Units), DERs (Distributed Energy Resources) systems and other systems that are important to power system operations.

Power systems operations are increasingly reliant on information infrastructures, including communication networks, IEDs, and self-defining communication protocols. Therefore, management of the information infrastructure has become crucial to providing the necessary high levels of security and reliability in power system operations.

The telecommunication infrastructure that is in use for the transport of telecontrol and automation protocols is already subject to health and condition monitoring control, using the concepts developed in the IETF Simple Network Management Protocol (SNMP) standards for network management. However, power system specific devices (like teleprotection, telecontrol, substation automation, synchrophasors, inverters and protections) need instead a specific solution for monitoring their health.

The NSM objects provide monitoring data for IEC protocols used for power systems (IEC 61850, IEC 60870-5-104) and device specific environmental and security status. As a derivative of IEC 60870-5-104, IEEE 1815 DNP3 is also included in the list of monitored protocols. The NSM data objects use the naming conventions developed for IEC 61850, expanded to address NSM issues. For the sake of generality these data objects, and the data types of which they are comprised, are defined as abstract models of data objects.

In addition to the abstract model, in order to allow the integration of the monitoring of power system devices within the NSM environment in this part of IEC 62351, a mapping of objects to the SNMP protocol of Management Information Base (MIBs) is provided.

The objects that are already covered by existing MIBs are not defined here but are expected to be compliant with existing MIB standards. For example protocols including EST, SCEP, RADIUS, LDAP, GDOI are not in 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 TS 62351-1, *Power systems management and associated information exchange – Data and communications security – Part 1: Communication network and system security – Introduction to security issues*

IEC TS 62351-2, *Power systems management and associated information exchange – Data and communications security – Part 2: Glossary of terms*

IEC 62351-3, *Power systems management and associated information exchange – Data and communications security – Part 3: Communication network and system security – Profiles including TCP/IP*

IEC 62351-4, *Power systems management and associated information exchange – Data and communications security – Part 4: Profiles including MMS*¹

IEC 62351-5:2023, *Power systems management and associated information exchange – Data and communications security – Part 5: Security for IEC 60870-5 and derivatives*

IEC 62351-8, *Power systems management and associated information exchange – Data and communications security – Part 8: Role-based access control*

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

IEEE 754:2008, *IEEE Standard for Floating-Point Arithmetic*

IETF RFC 2578, *Structure of Management Information Version 2 (SMIv2)*, April 1999, <http://tools.ietf.org/html/rfc2578>

IETF RFC 3414, *User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)*, December 2002, <http://tools.ietf.org/rfc/rfc3414>

IETF RFC 3826, *The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model*, June 2004, <http://www.rfc-editor.org/rfc/rfc3826>

IETF RFC 4022, *Management Information Base for the Transmission Control Protocol (TCP)*, March 2005, <http://tools.ietf.org/html/rfc4022>

IETF RFC 4113, *Management Information Base for the User Datagram Protocol (UDP)*, June 2005, <http://tools.ietf.org/html/rfc4113>

IETF RFC 4292, *IP Forwarding Table MIB*, April 2006, <http://www.rfc-editor.org/rfc/rfc4292>

IETF RFC 4293, *Management Information Base for the Internet Protocol (IP)*, April 2006, <http://tools.ietf.org/rfc/rfc4293>

IETF RFC 4898, *TCP Extended Statistics MIB*, May 2007, <http://tools.ietf.org/rfc/rfc4898>

IETF RFC 5132, *IP Multicast MIB*, December 2007, <http://tools.ietf.org/rfc/rfc5132>

IETF RFC 5905, *Network Time Protocol Version 4: Protocol and Algorithms Specification*, June 2010, <http://tools.ietf.org/rfc/rfc5905>

IETF RFC 5590, *Transport Subsystem for the Simple Network Management Protocol (SNMP)*, June 2009, <http://tools.ietf.org/rfc/rfc5590>

IETF RFC 5591, *Transport Security Model for the Simple Network Management Protocol (SNMP)*, June 2009, <http://tools.ietf.org/rfc/rfc5591>

IETF RFC 5592, *Secure Shell Transport Model for the Simple Network Management Protocol (SNMP)*, June 2009, <http://www.rfc-editor.org/rfc/rfc5592>

IETF RFC 5953, *Transport Layer Security (TLS) Transport Model for the Simple Network Management Protocol (SNMP)*, August 2010, <http://www.rfc-editor.org/rfc/rfc5953>

¹ Under preparation. Stage at the time of publication: IEC CDV 62351-4:2017

IETF RFC 6347, *Datagram Transport Layer Security Version 1.2*, January 2012, <http://tools.ietf.org/rfc/rfc6347>

IETF RFC 6353, *Transport Layer Security (TLS) Transport Model for the Simple Network Management Protocol (SNMP)*, July 2011, <http://tools.ietf.org/rfc/rfc6353>

IETF RFC 7860, *HMAC-SHA-2, Authentication Protocols in User-Based Security Model (USM) for SNMPv3*, April 2016, <http://tools.ietf.org/rfc/rfc7860>

IETF RFC 8915, *Protocol Security for the Network Time Protocol*, September 2020, <http://tools.ietf.org/rfc/rfc8915>

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC TS 62351-2 and the following apply.

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

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

3.1

Unified Modelling Language

UML

general-purpose modeling language with a semantic specification, a graphical notation, an interchange format, and a repository query interface, designed for use in object-oriented software applications, including those based on technologies recommended by the Object Management Group (OMG)

[SOURCE: ISO/IEC 19501:2005, Introduction]

3.2

Structure of Management Information

SMIv2

adapted subset of OSI's Abstract Syntax Notation One, ASN.1 used to write Management Information Base (MIB) modules (RFC 2578), which defines fundamental data types, an object model, and the rules for writing and revising MIB modules

[SOURCE: Summary of IETF RFC 3410, 7.1]

3.3

Transport Security Model

Security Model for the Simple Network Management Protocol for use with secure Transport Models in the Transport Subsystem

[SOURCE: Summary of IETF RFC 5590, 3.2.1]

3.4

Datagram Transport Layer Security

protocol that provides communications privacy for datagram protocols, which allows client/server applications to communicate in a way that is designed to prevent eavesdropping, tampering, or message forgery

Note 1 to entry: The DTLS protocol is based on the Transport Layer Security (TLS) protocol and provides equivalent security guarantees.

[SOURCE: Summary of IETF RFC 6347, Abstract]

3.5

Protocol Data Unit

PDU

data object exchanged by protocol machines (entities) within a given layer, which consists of both Protocol Control Information (PCI) and user data

Note 1 to entry: This is OSI terminology for "packet".

[SOURCE: IETF RFC 1208, *A glossary of networking terms*]

3.6

Protocol Control Information

protocol information added by an OSI entity to the service data unit passed down from the layer above, all together forming a Protocol Data Unit (PDU)

[SOURCE: IETF RFC 1208, *A glossary of networking terms*]

3.7

Network Time Security

mechanism for using Transport Layer Security (TLS) and Authenticated Encryption with Associated Data (AEAD) to provide cryptographic security for the client-server mode of the Network Time Protocol (NTP)

[SOURCE: IETF RFC 8915, Abstract]

3.8

Global Navigation Satellite System

GNSS

system comprised of several networks of satellites that transmit radio signals containing time and distance data that can be picked up by a receiver, allowing the user to identify the location of its receiver anywhere around the globe

[SOURCE: ISO 15638-15:2014, 4.23]

3.9

Global Positioning System

GPS

instantiation of GNSS (4.23) controlled by the US Department of Defense

[SOURCE: ISO 15638-15:2014, 4.24]

3.10

Intermediate System

OSI system which performs network layer forwarding, analogous to an IP router

[SOURCE: RFC 1392, Internet Users' Glossary]