

TECHNICAL REPORT

Telecontrol equipment and systems –
Part 6-505: Telecontrol protocols compatible with ISO standards and ITU-T
recommendations – TASE.2 User guide

Document Preview

[IEC TR 60870-6-505:2002](#)

<https://standards.iteh.ai/catalog/standards/iec/68ee3061-aed5-4d81-a1b2-77ab6f4dc4f0/iec-tr-60870-6-505-2002>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2006 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.
If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

[IEC TR 60870-6-505:2002](https://standards.iteh.ai/catalog/standards/iec/68ee3061-aed5-4d81-a1b2-77ab6f4dc4f0/iec-tr-60870-6-505-2002)

<https://standards.iteh.ai/catalog/standards/iec/68ee3061-aed5-4d81-a1b2-77ab6f4dc4f0/iec-tr-60870-6-505-2002>



TECHNICAL REPORT

**Telecontrol equipment and systems –
Part 6-505: Telecontrol protocols compatible with ISO standards and ITU-T
recommendations – TASE.2 User guide**

Document Preview

[IEC TR 60870-6-505:2002](https://standards.iteh.ai/catalog/standards/iec/68ee3061-aed5-4d81-a1b2-77ab6f4dc4f0/iec-tr-60870-6-505-2002)

<https://standards.iteh.ai/catalog/standards/iec/68ee3061-aed5-4d81-a1b2-77ab6f4dc4f0/iec-tr-60870-6-505-2002>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

ISBN 2-8318-8304-0

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

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
1.1 Intended users	7
1.2 Organization.....	8
1.3 TASE.2 Version.....	8
2 Reference documents.....	8
3 Definitions	8
4 Abbreviations	10
5 TASE.2 background.....	11
6 TASE.2 Overview	12
6.1 TASE.2 Concepts	12
6.2 TASE.2 Specification Organization	17
7 TASE.2 Server Objects.....	20
7.1 Association.....	20
7.2 Data Value	20
7.3 Data Set.....	21
7.4 Transfer Set.....	22
7.5 Account.....	24
7.6 Device.....	24
7.7 Program	25
7.8 Event	25
8 Conformance Blocks and Associated Objects.....	26
8.1 Block 1 (Periodic Power System Data)	26
8.2 Block 2 (Extended Data Set Condition Monitoring)	31
8.3 Block 3 (Block Data Transfer).....	31
8.4 Block 4 (Information Messages)	33
8.5 Block 5 (Device Control).....	34
8.6 Block 6 (Program Control)	35
8.7 Block 7 (Event Reporting).....	35
8.8 Block 8 (Additional User Objects)	36
8.9 Block 9 (Time Series Data).....	43
9 Mapping Utility Data to Conformance Blocks and Control Center Data Objects.....	44
10 Definition of New Data Objects	44
11 Using the PICS.....	45
12 Bilateral Table Issues	45
13 User Interface Issues	46
14 Other Local Implementation Issues.....	46
14.1 Client Server Association Management.	47
14.2 Local Implementation Setup Issues.	47
14.3 Specific Conformance Block Issues.....	47
15 Network Configuration	52
16 Security.....	54

17	Profiles.....	54
17.1	OSI	54
17.2	TCP/IP	54
18	Procurement of TASE.2.....	55
18.1	Preparing a Procurement Specification.....	55
18.2	Network Interface Control Document	56
19	Management of a TASE.2 Network	56
19.1	Configuration Management.....	56
19.2	Performance Management.....	57
19.3	Fault Management.....	57
20	Inter-Operability	57
20.1	Summary of Interoperability Tests	58
20.2	Version Compatibility.....	59
20.3	User Object Compatibility	59
Annex A (informative) Power system model exchange with TASE.2 linkage		60
Annex B (informative) TASE.2 security recommendations.....		64
Annex C (informative) TASE.2 User's guide implementation recommendations.....		72
Bibliography.....		80
Figure 1 – TASE.2 Protocol Architecture.....		12
Figure 2 – Application Program Interface (API)		13
Figure 3 – TASE.2 Client/Server Model with Multiple Associations.....		15
Figure 4 – TASE.2 Object Models		16
Figure 5 – Transfer Account Data Object Model Structure.....		38
Figure 6 – Example of Transfer Account Data Object Use.....		39
Figure 7 – Example of AGC Regulation Capacity Report using the General Data Report Object		42
Figure A.1 – Use case diagram.....		63
Figure B.1 – TASE.2 standard profile.....		70
Figure B.2 – TASE.2 secure profile		70
Figure C.1 – Validity processing		75
Figure C.2 – Current source processing.....		76
Figure C.3 – Normal value processing		77

INTERNATIONAL ELECTROTECHNICAL COMMISSION

TELECONTROL EQUIPMENT AND SYSTEMS –

Part 6-505: Telecontrol protocols compatible with ISO standards and ITU-T recommendations – TASE.2 User guide

FOREWORD

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

This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 60870-6-505 edition 1.1 contains the first edition (2002) [documents 57/548/CDV and 57/580/RVC] and its amendment 1 (2005) [documents 57/663/DTR + 57/730/DTR and 57/695/RVC + 57/737/RVC].

A vertical line in the margin shows where the base publication has been modified by amendment 1.

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

IEC 60870-6-505, which is a technical report, has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

iTeh Standards
(<https://standards.itih.ai>)
Document Preview

[IEC TR 60870-6-505:2002](https://standards.itih.ai/catalog/standards/iec/68ee3061-aed5-4d81-a1b2-77ab6f4dc4f0/iec-tr-60870-6-505-2002)

<https://standards.itih.ai/catalog/standards/iec/68ee3061-aed5-4d81-a1b2-77ab6f4dc4f0/iec-tr-60870-6-505-2002>

INTRODUCTION

A large number of utilities use the Telecontrol Application Service Element.2 (TASE.2), an international standard protocol for communication of real-time data. TASE.2 provides a common means for all utilities to exchange data between not only control centers, but power plants and substations as well. The adoption of TASE.2 has led to the availability of competitively priced data communication products based on TASE.2 from multiple vendors at a fraction of the cost of a proprietary system. This report provides guidance for utility users who are evaluating, procuring, and configuring TASE.2, as well as aid to vendors implementing TASE.2 in their products. The individual server and data objects comprising TASE.2 are described, with cross references to the specification. This provides the reader the basic understanding needed to use the TASE.2 specifications in an informed manner. The guide then addresses practical issues that arise in connection with TASE.2 use.

iTeh Standards
(<https://standards.itih.ai>)
Document Preview

[IEC TR 60870-6-505:2002](https://standards.itih.ai/catalog/standards/iec/68ee3061-aed5-4d81-a1b2-77ab6f4dc4f0/iec-tr-60870-6-505-2002)

<https://standards.itih.ai/catalog/standards/iec/68ee3061-aed5-4d81-a1b2-77ab6f4dc4f0/iec-tr-60870-6-505-2002>

TELECONTROL EQUIPMENT AND SYSTEMS –

Part 6-505: Telecontrol protocols compatible with ISO standards and ITU-T recommendations – TASE.2 User guide

1 Scope

This technical report provides a set of guidelines on the use of the following TASE.2 international standards:

IEC 60870-6-503

IEC 60870-6-702

IEC 60870-6-802

These standards specify a method of exchanging time-critical control center data through wide- and local-area networks using a full ISO compliant protocol stack. They contain provisions for supporting both centralized and distributed architectures. These standards include the exchange of real-time indications, control operations, time series data, scheduling and accounting information, unstructured ASCII or binary files, remote program control, and event notification.

However, the style of the TASE.2 standards may make them somewhat difficult to read for someone either not familiar with the precise syntax of the language used to describe the protocol or with all the background leading up to the development of these specifications. Furthermore, certain types of information that may be very useful to a user of TASE.2 but not necessary for specifying the protocol or services provided by TASE.2 have been omitted. Thus the need for this User Guide.

1.1 Intended users

This User Guide is intended for a broad audience of readers from an end user trying to decide if TASE.2 is appropriate for their data transfer needs to a vendor planning to implement TASE.2, with the goal of offering a TASE.2 product. In particular, this guide should be helpful to the following:

- An end user, such as an electric utility, with the need to transfer real-time data to another utility or utilities or to another internal control center, who is trying to evaluate which protocol is the most appropriate.
- An end user who has already decided to use TASE.2 and now needs guidance in how to procure TASE.2.
- An end user who has procured TASE.2 and is now concerned about how to map their actual data into TASE.2 data objects exactly.
- An end user who is looking for conventions and answers to practical questions regarding configuring TASE.2 software and networks.
- A vendor with a project to implement the TASE.2 specification either as a special project or to offer a standard product.

1.2 Organization

This guide first introduces the background and concepts of TASE.2 to provide a framework for understanding the TASE.2 specification. Then the individual server and data objects comprising TASE.2 are described with cross references into the specification. At this point, (i.e., Clauses 1-8) the reader should have all the necessary basic understanding to use the TASE.2 specifications intelligently. The remainder of the guide (Clauses 9-20) address practical issues that arise in connection with the use of TASE.2.

1.3 TASE.2 Version

This edition of the TASE.2 User Guide was prepared using the Second Edition of the TASE.2 standards, which at the time of the preparation of this report was the 2000 edition.

2 Reference documents

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

IEC 60870-5-101:1995, *Telecontrol equipment and systems – Part 5: Transmission protocols - Section 101: Companion standard for basic telecontrol tasks*

IEC 60870-6-503:2002, *Telecontrol equipment and systems – Part 6-503: Telecontrol protocols compatible with ISO standards and ITU-T recommendations – TASE.2 Services and protocol*

IEC 60870-6-702:1998, *Telecontrol equipment and systems – Part 6-702: Telecontrol protocols compatible with ISO standards and ITU-T recommendations – Functional profile for providing the TASE.2 application service in end systems*

IEC 60870-6-802:2002, *Telecontrol equipment and systems – Part 6-802: Telecontrol protocols compatible with ISO standards and ITU-T recommendations – TASE.2 Object models*

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 9506 (all parts), *Industrial automation systems – Manufacturing message specification*

3 Definitions

For the purposes of this technical report, the following definitions apply.

3.1 action

activity performed by the TASE.2 server triggered by some local predefined stimulus or set of circumstances

3.2 accounting information

set of information which describes an account for a utility. See IEC 60870-6-802 for more details

3.3

bilateral agreement

agreement between two control centers which identifies the data elements and objects that can be accessed and the level of access permitted

3.4

bilateral table

computer representation of the Bilateral Agreement. The representation used is a local matter

3.5

client

TASE.2 user who requests services or objects owned by another TASE.2 user acting as a server. The client is a communicating entity which makes use of the VCC for the lifetime of an association via one or more TASE.2 service requests

3.6

data set

object which provides services to group data values for singular operations by a TASE.2 client

3.7

data value

object which represents some alphanumeric quantity that is part of the Virtual Control Center (VCC) which is visible to a TASE.2 user. Data Values exist as part of the implementation of the control center and represent either real entities within the utility such as current, or derived values calculated in the control center. Data Value objects include services for accessing and managing them

3.8

instance

implementation of TASE.2 executed in either the client or the server role

3.9

interchange schedule

set of information that specifies how energy is transferred from one system to another. See IEC 60870-6-802 for more details

3.10

object

abstract entity used to implement the TASE.2 protocol and to represent data and optionally provide services for accessing that data within a VCC

3.11

object model

abstract representation that is used for real data, devices, operator stations, programs, event conditions, and event enrollments

3.12

operation

activity which is performed by the TASE.2 server at the request of the TASE.2 client

3.13

server

TASE.2 user that is the source of data and provides services for accessing that data. A TASE.2 server behaves as a VCC over the lifetime of an association

3.14

service

activity which is either a TASE.2 action or operation

3.15

tagged

the term is derived from the practice of putting a physical tag on a device as it is turned off for servicing or locked out from network access as a safety measure. The TASE.2 term tagged is used to signal such a condition to the TASE.2 user

3.16

time series

set of values of a given element that is taken at different times as specified by a single time interval. A time series is implemented through the transfer set mechanism as defined within this specification

3.17

transfer account

set of information that associates interchange scheduling information with either hourly or profile data

3.18

transfer conditions

events or circumstances under which a TASE.2 server reports the values of a data set, values in a time series, or all transfer account information

3.19

transfer set

object used to control data exchange by associating data values with transmission parameters such as time intervals, for example. There are four types of Transfer Sets: Data Set Transfer Sets, Time Series Transfer Sets, Transfer Account Transfer Sets, and information Message Transfer Sets

3.20

user

implementation of TASE.2 executed in either the client or the server role

3.21

Virtual Control Center (VCC)

abstract representation of a real control center which describes a set of behaviour with regards to communication and data management functionality and limitations. VCC is a concept taken from the underlying MMS services

4 Abbreviations

For the purpose of this standard, the following abbreviations apply.

ACSE	Association Control Service Element
API	Application Program Interface
BCD	Binary Coded Decimal
COV	Change Of Value
DIS	Draft International Standard
EPRI	Electric Power Research Institute
HLO	Hot line order
ICC	Inter-Control Center
ICCP	Inter-Control Center Communications Protocol
IDEC	Inter-utility Data Exchange Consortium

IP	Internet Protocol
KQH	Kilovar hour readings
KWH	Kilowatt hour readings
LFC	Load Following
MMS	Manufacturing Messaging Specification
MOD	Motor operated disconnect
PDU	Protocol Data Unit
QOS	Quality of Service
RBE	Report by Exception
ROSE	Remote Operations Service Element
TAL	Time Allowed to Live
TASE	Tele-control Application Service Element, (IEC's designation of an international standard protocol for utility data exchange)
TASE.1	TASE based on the ELCOM-90 protocol
TASE.2	TASE based on the ICCP protocol
TCP	Transmission Control Protocol
TLE	Time Limit for Execution
TOD	Time of Day
UCA	Utility Communications Architecture
UCS	Utility Communications Standards working group
UDP	User Datagram Protocol
VCC	Virtual Control Center
VMD	Virtual Manufacturing Device
WSCC	Western System Coordinating Council
WEICG	WSCC Energy Management Systems Inter-utility Communications Guidelines

5 TASE.2 background

Inter-utility real-time data exchange has become critical to the operation of inter-connected systems within the electric power utility industry. The ability to exchange power system data with boundary control areas and beyond provides visibility for disturbance detection and reconstruction, improved modelling capability and enhanced operation through future security control centers or independent system operators.

Historically, utilities have relied on in-house or proprietary, non-IS standard protocols such as those developed by the Western Systems Coordinating Council (WSCC), ELCOM, and the Inter-utility Data Exchange Consortium (IDEC) to exchange real-time data. TASE.2 began as an effort by power utilities, several major data exchange protocol support groups for the protocols mentioned above, EPRI, consultants and a number of SCADA/EMS and protocol vendors to develop a comprehensive, international standard for real-time data exchange within the electric power utilities industry.

By giving all interested parties an opportunity to provide requirements input and to participate in the protocol definition process, it was expected that the final product would both meet the needs of and be accepted by the electric power utility industry. To accomplish this goal, the Utility Communications Specification (UCS) Working Group was formed in September 1991 to:

- 1) develop the protocol specification;
- 2) develop a prototype implementation to test the specification;
- 3) submit the specification for standardization;
- 4) perform inter-operability tests among the developing vendors.

UCS submitted TASE.2 to the IEC Technical Committee (TC) 57 Working Group (WG) 07 as a proposed protocol standard. Another proposed standard based on ELCOM-90 over ROSE was also being considered by WG 07. TC 57 decided on a multi-standard approach to allow (1) a quick implementation to meet European Common Market requirements by 1992 and (2) also allow long term development of a more comprehensive protocol. The first protocol was designated TASE.1 (Telecontrol Application Service Element-1). The second protocol, based on TASE.2 over MMS, was designated TASE.2.

Successful first implementations of TASE.2 between SCADA/EMS control centers led to further expansion to allow communications between control centers and power plants. This expansion did not impact the basic services, but did lead to the development of specific power plant objects. These objects were incorporated into TASE.2. Similarly, protection event data objects were also added to support substation communications. The second edition of the TASE.2 standards also includes one new object for the exchange of general data reports and another new object for sending acknowledgements of complex data objects.

6 TASE.2 Overview

6.1 TASE.2 Concepts

6.1.1 Protocol Architecture

TASE.2 maximizes the use of existing standard protocols in all layers up to and including the lower layers of layer 7 in the OSI reference model. This has the benefit of requiring new protocol development for TASE.2 only in the upper sublayer of layer 7.

The protocol stack used by TASE.2 is shown in Figure 1. The upper three layers conform to the standard 7-layer OSI protocol stack with control center applications at the top. TASE.2 specifies the use of the Manufacturing Messaging Specification (MMS) for the messaging services needed by TASE.2 in layer 7. MMS specifies the mechanics of naming, listing, and addressing variables, and of message control and interpretation, while TASE.2 specifies such things as the control center object formats and methods for data requests and reporting. Applications at different control centers, possibly written by different vendors, but both conforming to these mechanics, formats, and methods, may interoperate to share data, control utility devices, output information messages, or define and execute remote programs.

Application	ICCP IEC 60870-6-503/802	
	MMS	
	ACSE	
Presentation	ISO Presentation	
Session	ISO Session	
Transport	ISO Transport Class 4	TCP
Network	ISO CLNP	IP
Data Link	ISO 8802-2 LLC, FDDI, FR, ISDN, etc.	
Physical	Ethernet LAN, WAN, Point-to-Point Circuit, ATM, SDH, etc.	

Figure 1 – TASE.2 Protocol Architecture

TASE.2 also utilizes the services of the Application Control Service Element (ACSE) in layer 7 to establish and manage logical associations or connections between sites. TASE.2 relies on the ISO Presentation Layer 6 and Session Layer 5 as well.