

Telecontrol equipment and systems —

Part 6-802: Telecontrol protocols compatible with ISO standards and ITU-T recommendations — TASE.2 Object models

The European Standard EN 60870-6-802:2002, with the incorporation of amendment A1:2005, has the status of a British Standard

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National foreword

This British Standard is the official English language version of EN 60870-6-802:2002, including amendment A1:2005. It is identical with IEC 60870-6-802:2002, including amendment 1:2005. It supersedes BS EN 60870-6-802:1998 which is withdrawn.

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TASE.2 Object models
(includes amendment A1:2005)
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Matériels et systèmes de téléconduite
Partie 6-802: Protocoles de téléconduite
compatibles avec les normes ISO
et les recommandations de l'UIT-T -
Modèles d'objets TASE.2
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Foreword

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Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annex ZA is normative and annex A is informative.

Annex ZA has been added by CENELEC.

Endorsement notice

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INTRODUCTION

The primary purpose of Telecontrol Application Service Element (TASE.2) is to transfer data between control systems and to initiate control actions. Data is represented by object instances. This part of IEC 60870 proposes object models from which to define object instances. The object models represent objects for transfer. The local system may not maintain a copy of every attribute of an object instance.

The object models presented herein are specific to "control centre" or "utility" operations and applications; objects required to implement the TASE.2 protocol and services are found in IEC 60870-6-503. Since needs will vary, the object models presented here provide only a base; extensions or additional models may be necessary for two systems to exchange data not defined within this standard.

It is by definition that the attribute values (i.e. data) are managed by the owner (i.e. source) of an object instance. The method of acquiring the values are implementation dependent; therefore accuracy is a local matter.

The notation of the object modelling used for the objects specified in clause 5 is defined in IEC 60870-6-503. It should be noted that this part of IEC 60870 is based on the TASE.2 services and protocol. To understand the modelling and semantics of this standard, some basic knowledge of IEC 60870-6-503 is recommended.

Clause 5 describes the control centre-specific object models and their application. They are intended to provide information to explain the function of the data.

Clause 6 defines a set of MMS type descriptions for use in exchanging the values of instances of the defined object models. It is important to note that not all attributes of the object models are mapped to types. Some attributes are described simply to define the processing required by the owner of the data and are never exchanged between control centres. Other attributes are used to determine the specific types of MMS variables used for the mapping, and therefore do not appear as exchanged values themselves. A single object model may also be mapped onto several distinct MMS variables, based on the type of access and the TASE.2 services required.

Clause 7 describes the mapping of instances of each object type MMS variables and named variable lists for implementing the exchange.

Clause 8 describes device-specific codes and semantics to be used with the general objects.

An informative annex is included which describes some typical interchange scheduling scenarios, along with the use of TASE.2 objects to implement the schedule exchange.

TELECONTROL EQUIPMENT AND SYSTEMS –

Part 6-802: Telecontrol protocols compatible with ISO standards and ITU-T recommendations – TASE.2 Object models

1 Scope

This part of IEC 60870 specifies a method of exchanging time-critical control centre data through wide-area and local-area networks using a full ISO compliant protocol stack. It contains provisions for supporting both centralized and distributed architectures. The standard includes the exchange of real-time data indications, control operations, time series data, scheduling and accounting information, remote program control and event notification.

2 Normative references

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

IEC 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: Telecontrol protocols compatible with ISO standards and ITU-T recommendations – Section 503: TASE.2 Services and protocol*

ISO 9506-1:2000, *Industrial automation systems – Manufacturing message specification – Part 1: Service definition*

ISO 9506-2:2000, *Industrial automation systems – Manufacturing message specification – Part 2: Protocol specification*

3 Definitions

For the purposes of this part of IEC 60870, the definitions in the above referenced standards apply.

4 Abbreviations

For the purposes of this part of IEC 60870, all the abbreviations defined in the above referenced standards apply.

5 Object models

Object models are required for various functions within a system. This clause delineates abstract object models based on functionality. Object models within one functional area may be used in another functional area.

5.1 Supervisory Control and Data Acquisition

The object models in this clause are derived from the historical perspective of Supervisory Control and Data Acquisition (SCADA) systems. The following text presents the context within which the object models are defined.

Fundamental to SCADA systems are two key functions: control and indication. The control function is associated with the output of data whereas the indication function is associated with the input of data. A more recent concept that is finding usage is the control and indication function where data output may also be input (i.e. bi-directional).

The previous identified functions within SCADA systems are mapped to point equipment (point). The primary attribute of a point is the data value. SCADA systems define three types of data for points: analog, digital and state.

The association of one or more points together is used to represent devices. For example, a breaker device may be represented by a control point and an indication point. The control point represents the new state that one desires for the breaker device. The indication point represents the current state of the breaker device. For SCADA to SCADA data exchange (e.g. control centre to control centre, control centre to SCADA master, etc.), additional data is often associated with point data. Quality of point data is often exchanged to defined whether the data is valid or not. In addition, for data that may be updated from alternate sources, quality often identifies the alternate source. Select-Before-Operate control is associated with Control Points for momentary inhibiting access except from one source. Two other informative data values are: time stamp and change of value counter. The time stamp, when available, details when a data value last changed. The change of value counter, when available, details the number of changes to the value.

From the context presented, the primary object models required are: Indication Point, and Control Point. The attributes Point Value, Quality, Select-Before-Operate, Time Stamp, and Change of Value Counter are required to meet the desired functionality for data exchange. The Indication Point and Control Point models may be logically combined to a single model to represent a device which implements a control function with a status indication as to its success/failure. The combined logical model will result in the same logical attributes, and map onto the same MMS types as the independent models.

5.1.1 IndicationPoint Object

An IndicationPoint object represents an actual input point.

Object: **IndicationPoint** (Read Only)

Key Attribute: PointName

Attribute: PointType (REAL, STATE, DISCRETE)

Constraint PointType=REAL

Attribute: PointRealValue

Constraint PointType=STATE

Attribute: PointStateValue

Constraint PointType=DISCRETE

Attribute: PointDiscreteValue

Attribute: QualityClass: (QUALITY, NOQUALITY)

Constraint: QualityClass = QUALITY
 Attribute: Validity (VALID, HELD, SUSPECT, NOTVALID)
 Attribute: CurrentSource (TELEMETERED, CALCULATED, ENTERED, ESTIMATED)
 Attribute: NormalSource (TELEMETERED, CALCULATED, ENTERED, ESTIMATED)
 Attribute: NormalValue (NORMAL,ABNORMAL)
 Attribute: TimeStampClass: (TIMESTAMP, TIMESTAMPEXTENDED, NOTIMESTAMP)
 Constraint: TimeStampClass = TIMESTAMP
 Attribute: TimeStamp
 Attribute: TimeStampQuality: (VALID, INVALID)
 Constraint: TimeStampClass = TIMESTAMPEXTENDED
 Attribute: TimeStampExtended
 Attribute: TimeStampQuality: (VALID, INVALID)
 Attribute: COVClass: (COV, NOCOV)
 Constraint: COVClass = COV
 Attribute: COVCounter

PointName
 The PointName attribute uniquely identifies the object.

PointType
 The PointType attribute identifies the type of input point, and must be one of the following:
 REAL, STATE, DISCRETE.

PointRealValue
 The current value of the IndicationPoint, if the PointType attribute is REAL.

PointStateValue
 The current value of the IndicationPoint, if the PointType attribute is STATE.

PointDiscreteValue
 The current value of the IndicationPoint, if the PointType attribute is DISCRETE.

QualityClass
 The QualityClass has the value QUALITY if the object instance has any of the quality attributes (Validity, CurrentSource, or NormalValue), and takes the value NOQUALITY if none of the attributes are present.

Validity
 The Validity attribute specifies the validity or quality of the PointValue data it is associated with. These are based on the source system's interpretation as follows:

Validity	Description
VALID	Data value is valid
HELD	Previous data value has been held over. Interpretation is local
SUSPECT	Data value is questionable. Interpretation is local
NOTVALID	Data value is not valid

CurrentSource

The CurrentSource attribute specifies the current source of the PointValue data it is associated with as follows:

CurrentSource	Description
TELEMETERED	The data value was received from a telemetered site
CALCULATED	The data value was calculated based on other data values
ENTERED	The data value was entered manually
ESTIMATED	The data value was estimated (State Estimator, etc.)

NormalSource

The NormalSource attribute specifies the normal source of the PointValue data it is associated with as follows:

NormalSource	Description
TELEMETERED	The data value is normally received from a telemetered site
CALCULATED	The data value is normally calculated based on other data values
ENTERED	The data value is normally entered manually
ESTIMATED	The data value is normally estimated (State Estimator, etc.)

NormalValue

The NormalValue attribute reports whether value of the PointValue attribute is normal. Only one bit is set, it is defined as follows:

NormalValue	Description
NORMAL	The point value is that which has been configured as normal for the point
ABNORMAL	The point value is not that which has been configured as normal for the point

TimeStampClass

The TimeStampClass attribute has the value TIMESTAMP or TIMESTAMPEXTENDED if the IndicationPoint is time stamped, and has the value NOTTIMESTAMP if the IndicationPoint contains no TimeStamp attribute.

TimeStamp

The TimeStamp attribute provides a time stamp (with a minimum resolution of one second) of when the value (attribute PointRealValue, PointStateValue or PointDiscreteValue) of the IndicationPoint was last changed. It is set at the earliest possible time after collection of the IndicationPoint value from the end device.

TimeStampExtended

The TimeStampExtended attribute provides a time stamp (with a resolution of one millisecond) of when the value (attribute PointRealValue, PointStateValue or PointDiscreteValue) of the IndicationPoint was last changed. It is set at the earliest possible time after collection of the IndicationPoint value from the end device.

TimeStampQuality

The TimeStampQuality attribute has the value VALID if the current value of the TimeStamp attribute contains the time stamp of when the value was last changed, and has the value INVALID at all other times.

COVClass

The COVClass (Change Of Value Counter) attribute has the value COV if the IndicationPoint contains a COVCounter attribute, otherwise it has the value NOCOV.

COVCounter

The COVCounter attribute specifies the number of times the value (attribute PointRealValue, PointStateValue, or PointDiscreteValue) of the IndicationPoint has changed. It is incremented each time the owner sets a new value for the IndicationPoint.

5.1.2 ControlPoint Object

A ControlPoint Object is an integral part of the services provided by TASE.2. It is used to represent values of various types of data typical of SCADA and energy management systems. Typically, a ControlPoint object will be associated with some real world object.

Object: **ControlPoint** (Write Only, except for attributes CheckBackName, Tag, State and Reason)

Key Attribute: ControlPointName

Attribute: ControlPointType: (COMMAND, SETPOINT)

Constraint: ControlPointType = COMMAND

Attribute: CommandValue

Constraint: ControlPointType = SETPOINT

Attribute: SetPointType: (REAL, DISCRETE)

Constraint SetpointType=REAL

Attribute: SetpointRealValue

Constraint SetpointType=DISCRETE

Attribute: SetpointDiscreteValue

Attribute: DeviceClass: (SBO, NONSBO)

Constraint: DeviceClass = SBO

Attribute: CheckBackName

Attribute: State: (SELECTED, NOTSELECTED)

Attribute: Timeout

Attribute: TagClass: (TAGGABLE, NONTAGGABLE)

Constraint: TagClass = TAGGABLE

Attribute: Tag: (NO-TAG, OPEN-AND-CLOSE-INHIBIT, CLOSE-ONLY-INHIBIT)

Attribute: State: (IDLE, ARMED)

Attribute: Reason

ControlPointName

The ControlPointName attribute uniquely identifies the object.

ControlPointType

The value of the ControlPointType attribute for an instance of a ControlPoint will be COMMAND or SETPOINT, indicating the type of controlled device.

CommandValue

The CommandValue attribute indicates the command for a device.

SetPointType

The value of the SetPointType attribute for an instance of a ControlPoint of ControlPointType SETPOINT will be REAL or DISCRETE, indicating the type of setpoint.

SetPointRealValue

The SetPointRealValue attribute may be set with the floating point value requested for the setpoint control.

SetPointDiscreteValue

The SetPointDiscreteValue attribute may be set with the integer value requested for the setpoint control.

DeviceClass

The DeviceClass attribute of an instance of a ControlPoint has the value SBO if the device requires a Select operation before being operated, and the value NONSBO otherwise.

CheckBackName

The CheckBackName attribute contains a symbolic description of the physical object being controlled. This data is returned by the system operating the physical object to the system requesting the operation so that the person or system requesting the operation can be assured the proper object has been selected.

State

The State attribute indicates whether the ControlPoint is SELECTED or NOTSELECTED.

Timeout

The Timeout attribute of an instance of a ControlPoint has the value of the maximum allowed time for which the ControlPoint of DeviceClass SBO may remain SELECTED before operation.

TagClass

The TagClass attribute of an instance of a ControlPoint has the value TAGGABLE if the instance contains a Tag attribute, and otherwise has the value NONTAGGABLE.

Tag

The Tag attribute indicates whether or not the ControlPoint is tagged, and if it is, what the level of tagging is. The Tag attribute can take on the values NO-TAG, OPEN-AND-CLOSE-INHIBIT, CLOSE-ONLY-INHIBIT.

Reason

The Reason attribute contains a message that indicates the reason for tagging.

5.1.3 Protection Equipment Event Object Model

The following object model represents the events generated in the operation of protection equipment. Start events are generated by the protection equipment when it detects faults. Trip events report commands to output circuits which are generated by the protection equipment when it decides to trip the circuit-breaker. Both events are transient information. The protection event models are based on IEC 60870-5-101.

Object: ProtectionEvent

KeyAttribute: Name

Attribute: ElapsedTimeValidity (VALID, INVALID)

Attribute: Blocked (NOTBLOCKED, BLOCKED)

Attribute: Substituted (NOTSUBSTITUTED, SUBSTITUTED)

Attribute: Topical (TOPICAL, NOTTOPICAL)

Attribute: EventValidity (VALID, INVALID)

Attribute: ProtectionClass (SINGLE, PACKED)

Constraint: ProtectionClass = SINGLE

Attribute: EventState (INDETERMINATE, OFF, ON)

Attribute: EventDuration

Attribute: EventTime

Constraint: ProtectionClass = PACKED

Attribute: EventClass (START, TRIP)

Constraint: EventClass = START

Attribute: StartGeneral (NOSTART, START)

Attribute: StartPhase1 (NOSTART, START)

Attribute: StartPhase2 (NOSTART, START)

Attribute: StartPhase3 (NOSTART, START)

Attribute: StartEarth (NOSTART, START)

Attribute: StartReverse (NOSTART, START)

Attribute: DurationTime

Attribute: StartTime

Constraint: EventClass = TRIP

Attribute: TripGeneral (NOTRIP, TRIP)

Attribute: TripPhase1 (NOTRIP, TRIP)

Attribute: TripPhase2 (NOTRIP, TRIP)

Attribute: TripPhase3 (NOTRIP, TRIP)

Attribute: OperatingTime

Attribute: TripTime

Name

The Name attribute uniquely identifies the protection event.

ElapsedTimeValidity

The elapsed time (attribute EventDuration, DurationTime, or OperatingTime depending on the event type) is valid if it was correctly acquired. If the acquisition function detects invalid conditions, the ElapsedTimeValidity attribute is INVALID, otherwise it is VALID.

Blocked

The Blocked attribute is BLOCKED if the value of protection event is blocked for transmission, and is NOTBLOCKED otherwise. The value remains in the state that was acquired before it was blocked. Blocking and deblocking may be initiated by a local lock or by a local automatic cause.

Substituted

The Substituted attribute takes the value SUBSTITUTED if the event was provided by input of an operator (dispatcher) or by an automated source.

Topical

The Topical attribute is TOPICAL if the most recent update was successful, and is NOTTOPICAL if it was not updated successfully during a specified time interval or is unavailable.

EventValidity

The EventValidity attribute takes the value INVALID if the acquisition function recognizes abnormal conditions of the information source, otherwise it is VALID.

ProtectionClass

The ProtectionClass attribute identifies the type of protection event, and must be one of the following: SINGLE or PACKED.

EventState

The EventState attribute of a SINGLE protection event takes the value of the protection event: OFF, ON or INDETERMINATE.

EventDuration

The EventDuration attribute takes the value of the event duration (total time the fault was detected) or operation time (time between start of operation and trip command execution).

EventTime

The EventTime attribute signifies the time of the start of the operation.

EventClass

The type of protection event being reported. The value START signifies a start event, and TRIP signifies a trip event.

StartGeneral

The value NOSTART signifies no general start of operation, and START signifies that the event includes a general start of operation.

StartPhase1

The value NOSTART for StartPhase1 implies that Phase L1 was not involved in the event, START implies that it was involved.

StartPhase2

The value NOSTART for StartPhase2 implies that Phase L2 was not involved in the event, START implies that it was involved.

StartPhase3

The value NOSTART for StartPhase3 implies that Phase L3 was not involved in the event, START implies that it was involved.

StartEarth

The value NOSTART for StartEarth implies that earth current was not involved in the event, START implies that it was involved.

StartReverse

The value NOSTART for StartReverse implies that reverse direction was not involved in the event, START implies that it was involved.

DurationTime

Time in milliseconds from the start of operation until the end of operation.

StartTime

Time of the start of operation of the protection equipment.

TripGeneral

The TripGeneral attribute takes on the value of TRIP if a general command to the output circuit was issued during the operation, NOTRIP otherwise.

TripPhase1

The TripPhase1 attribute takes on the value of TRIP if a command to output circuit Phase L1 command was issued during the operation, NOTRIP otherwise.

TripPhase2

The TripPhase2 attribute takes on the value of TRIP if a command to output circuit Phase L2 command was issued during the operation, NOTRIP otherwise.

TripPhase3

The TripPhase3 attribute takes on the value of TRIP if a command to output circuit Phase L3 command was issued during the operation, NOTRIP otherwise.

OperatingTime

The time in milliseconds from the start of operation until the first command to an output circuit was issued.

TripTime

Time of the start of the operation.

5.2 Transfer Accounts

One of the key control centre application requirements is the ability to exchange "scheduling" and "accounting" information. In the utility world, "schedules" is a term that generally means an amount of electrical energy transferred from one system to another on a periodic basis for a certain interval of time under the restrictions of a formal agreement. From a data exchange standpoint, exchanging "schedules" has been expanded to include the exchange of any periodic or profile data for control centre energy scheduling, accounting or monitoring applications. Thus exchanging schedules may also mean exchanging generation, actual interchange, loads, price information, memo accounts, etc. Again, any information may be exchanged if it can be modelled as periodic or profile data.

Schedule accounts and accounting information accounts specify a list of quantities (energy, capacity or some other user-defined quantity) to be exchanged during sequential time periods. These transactions may be specified either as flat periodic values or as ramped profiles. In addition, schedule accounts may contain a list of transmission segments defining the paths used to implement the transaction.

The subclauses below discuss the object models for transfer accounts.

5.2.1 TransferAccount Object

A Transfer Account object represents what, where, when, and how much is transferred between two utilities in a particular account. It may also represent generation schedules and other energy delivery schedules within a utility. It is a container for a number of different attributes and objects which together define the entire transfer account definition, i.e. which account, when is the effective time frame, and what are the periodic or profile values of the data. Refer to annex A for more information concerning how these object definitions relate to each other.

Object: **TransferAccount**

- Key Attribute: TransferAccountReference
- Attribute: SendUtility
- Attribute: ReceiveUtility
- Attribute: SellingAgent
- Attribute: BuyingAgent
- Attribute: TimeStamp
- Attribute: TransactionCode
- Attribute: NumberOfLocalReference
- Attribute: ListOfLocalReference
- Attribute: Name
- Attribute: TransmissionSegmentOption (INCLUDED, NOTINCLUDED)
- Constraint: TransmissionSegmentOption=INCLUDED
 - Attribute: NumberOfTransSegments
 - Attribute: ListOfTransmissionSegment
- Attribute: DataType (PERIODIC, PROFILE)
- Constraint: DataType = PERIODIC
 - Attribute: StartTime
 - Attribute: PeriodResolution
 - Attribute: NumberOfPeriods
 - Attribute: ListOfPeriodicValues
- Constraint: DataType = PROFILE
 - Attribute: NumberOfProfiles
 - Attribute: ListOfProfileValues

TransferAccountReference

The TransferAccountReference attribute specifies a unique reference value between the sender and the receiver to identify this particular transfer account.

SendUtility

The SendUtility attribute specifies the utility initially delivering the energy or service.

ReceiveUtility

The ReceiveUtility attribute specifies the utility ultimately receiving the energy or service.

SellingAgent

Currently, the seller is almost always the same as SendUtility. However, as a result of deregulation and open access, it is likely in the future that the seller may be an independent power producer within the area serviced by the SendUtility. Obviously, in such cases it is necessary to distinguish between the seller and the sending utility; this attribute allows such a distinction.

BuyingAgent

Currently, the buyer is almost always the same as ReceiveUtility. However, as a result of deregulation and open access, it is likely in the future that the buyer may be a municipality or cooperative within the area serviced by the ReceiveUtility. Obviously, in such cases it is necessary to distinguish between the buyer and the receiving utility; this attribute allows such a distinction.

TimeStamp

The TimeStamp attribute provides a means for the receiver to know when the sender sent this message. The time stamp indicates when the application created the Transfer Account data for the purpose of transmitting the data. It is not related to the time to which the Transfer Account data itself applies. If the applications providing data to TASE.2 include a transmission (or object creation) time stamp, that time stamp is used. Otherwise, TASE.2 provides the time stamp prior to passing the Transfer Account object to MMS.

TransactionCode

The TransactionCode attribute provides status on the TransferAccount transaction. The values are shown below:

TransactionCode	Description
NEW	Original submittal of a newly proposed schedule or of a report
REQUESTED	Report or schedule is requested via the Account Request operation
REVISED	Revised version of previously sent schedule or report
CONFIRMED	Schedule or report has now been scheduled for actual implementation and is not subject to further approval cycles. A <i>curtailment, halt, revision, or deletion</i> after this stage requires a new schedule or report to be sent
DELETED	Any time the originator of the schedule or report cancels the transaction (for example, due to equipment failure)

NumberOfLocalReference

This attribute contains the count of entries in the ListOfLocalReference.

ListOfLocalReference

The ListOfLocalReference contains locally defined parameters that specify how the Transfer Account Object is to be treated as a whole. For example, it might specify that the schedule or transaction applies to all Mondays during Summer. The meaning of the parameter list is a local matter and is agreed upon among the participating parties for each type of Transfer Account object, for all Transfer Account objects, or for a combination of the two as needed.

Name

The Name attribute provides an option for the user application to include string related information associated with the Transfer Account object. For example, a schedule may need to identify a generating unit by name. Whether or not this attribute is used and its semantics are a local implementation matter.

TransmissionSegmentOption

The TransmissionSegmentOption indicates whether or not a ListOfTransmissionSegments is included in the Transfer Account object. Transmission segments may be included in a Transfer Account object independently of the kind of data the Transfer Account object represents, i.e. it does not have to be included only for energy buy-sell transactions between utilities where wheeling is involved. Transmission segments can be used in any Transfer Account object to convey any information between multiple parties when some of the information is unique to each party and it is desired to provide all of the information in the account to all parties.

NumberOfTransSegments

This attribute defines the number of transmission segments to be included in the report.

ListOfTransmissionSegments

The ListOfTransmissionSegments attribute describes the various transmission paths (or segments) that an interchange schedule may take to get from the SendUtility to the ReceiveUtility, or to describe other information that is significant to intermediate parties of any transaction. Each TransmissionSegment object provided describes one component of the path, or data for one intermediate party. As many or as few TransmissionSegment Objects as required may be added to the list.

DataType

The data contained in a Transfer Account object can be periodic as is the case of most of the data for generation schedules, energy transactions, and billing. The data can also define a series of ramping requirements which together result in an energy (or price) profile. The DataType attribute indicates which of these two types of data the Transfer Account object contains. Note that a Transfer Account object cannot contain both periodic and profile data. However, there is no restriction on the use of the TransferAccountReference attribute with respect to the object's data type. Therefore, two Transfer Account objects could be transmitted with the same TransferAccountReference; the first would convey periodic type information while the other would convey profile type data.

StartTime

For a Transfer Account object containing periodic data, StartTime specifies the UTC time to which the first time period in the sequence applies.

PeriodResolution

For a Transfer Account object containing periodic data, PeriodResolution specifies the quantity of time to which each entry in the sequence applies.

NumberOfPeriods

This attribute defines the number of time periods being specified in the sequence defined by the Transfer Account object. Together with StartTime and PeriodResolution, it also defines the maximum time frame covered by the Transfer Account.

ListOfPeriodicValues

This attribute contains the bulk of the data associated with the account. For energy transactions, this is the data related to the end-use of the transaction that is, the transaction between the buyer and seller. Information specific to the wheeling partners of each transmission segment is specified in the ListOfTransmissionSegment attribute (if included).

NumberOfProfiles

This attribute defines the number of time periods specified in the ListOfProfileValues.

ListOfProfileValues

The ListOfProfileValues attribute describes profile, or ramping information. The number of ProfileValue objects passed in the message implies the number of inflection point changes in the profile – one for each change.

5.2.2 TransmissionSegment Object

A TransmissionSegment object is used to represent the specifics of a wheeling arrangement where a utility allows another utility the use of its high-voltage transmission grid to transfer energy to a third utility. This object may also be used to convey any information to a utility involved in a multi-utility transaction. The TransmissionSegment may describe either where the energy is to be received and which utility it is coming from (INONLY) or where the energy is to be delivered and which utility is to receive it (OUTONLY). Also a TransmissionSegment object may describe both the in and out utilities and their associated receipt and delivery points (INOUT). Or if the energy is being scheduled directly between two utilities (DIRECT), it may only specify the point of interchange. In addition, the utility providing the service and the utility paying for the transmission service (wheeling) may be specified.

Object: TransmissionSegment

Attribute: TransmissionReference

Attribute: UtilWheeling

Attribute: TransmissionSegType (INONLY, OUTONLY, INOUT, DIRECT)

Constraint: TransmissionSegType = INONLY

Attribute: UtilIn

Attribute: InterchangePtIn

Constraint: TransmissionSegType = OUTONLY

Attribute: UtilOut

Attribute: InterchangePtOut

Constraint: TransmissionSegType = INOUT

Attribute: UtilIn

Attribute: InterchangePtIn

Attribute: UtilOut

Attribute: InterchangePtOut

Constraint: TransmissionSegType = DIRECT

Attribute: InterchangePt

Attribute: UtilPaying

Attribute: ListOfSegmentData

TransmissionReference

The TransmissionReference attribute specifies a value agreed upon between the sender and receiver of the message that further describes the transmission segment (transmission agreement reference number, etc.).

UtilWheeling

The UtilWheeling attribute specifies the utility providing the transmission services (if any).

TransmissionSegType

The TransmissionSegType attribute specifies the type of data in the TransmissionSegment object as follows:

TransmissionSegType	Description
INONLY	The object <u>only</u> specifies which utility the energy is coming from and where it is being received. This object type shall be used when the outbound side of the segment is either not known or not important
OUTONLY	The object <u>only</u> specifies which utility the energy is delivered to and where it is delivered. This object type shall be used when the inbound side of the segment is either not known or not important
INOUT	The object specifies both the in and out utilities and the associated receiving and delivering interchange points
DIRECT	The object specifies only the interchange point between the initial sending utility and the ultimate receiving utility. This object type shall be used when no intermediate utilities are providing transmission services

UtilIn

The UtilIn attribute specifies which utility the inbound energy is coming from.

InterchangePtIn

The InterchangePtIn attribute specifies which interchange point or interface the inbound energy is to be received from UtilIn.

UtilOut

The UtilOut attribute specifies which utility the outbound energy is delivered to.

InterchangePtOut

The InterchangePtOut attribute specifies which interchange point or interface the outbound energy is to be delivered to UtilOut.

InterchangePt

The InterchangePt attribute specifies which interchange point or interface the direct transfer of energy is to take place between SendUtility and RecvUtility.

UtilPaying

The UtilPaying attribute specifies which utility should be billed for any transmission service charges (wheeling, losses, etc.)

ListOfSegmentData

The ListOfSegmentData contains the information specific to the wheeling partners of each transmission segment. This may include data such as the energy transferred through the segment and/or the cost.

5.2.3 ProfileValue Object

A ProfileValue object represents a profile of a quantity or value being exchanged over time. The value may be energy, capacity, price and/or other information. It is represented by specifying a target value, ramp start time and a ramp rate. When a ProfileValue object is received which effects the magnitude of the exchange, the profile moves in the direction of the new target, starting at the time specified by the RampStartTime and at a rate specified by the RampDuration. If a zero is specified for the RampDuration (or it is not passed), the value does not begin to ramp but is implemented instantly at RampStartTime. Upon reaching the target value, it proceeds at a constant level through time. This constant level may be altered or terminated with another ProfileValue object.

Object: **ProfileValue**

Attribute: RampStartTime
Attribute: RampDuration
Attribute: ProfilePrice
Attribute: TargetClass (ENERGY, CAPACITY, OTHER)
Constraint: TargetClass = ENERGY
Attribute: ProfileEnergy
Constraint: TargetClass = CAPACITY
Attribute: ProfileCapacity
Constraint: TargetClass = OTHER
Attribute: ProfileOther

RampStartTime

The time when the change is to occur.

RampDuration

The length of time that the ramp transition may occur. The units are as specified in the bilateral agreements.

ProfilePrice

The price value is generally expressed in currency units per unit of measure (such as \$/MWH) as defined in bilateral agreements.

TargetClass

The TargetClass attribute determines the type of profile. It takes on the values ENERGY, CAPACITY or OTHER.

ProfileEnergy

The energy value is generally expressed in energy/hours (such as MWH) as defined in bilateral agreements. This attribute exists if the TargetClass attribute is ENERGY.

ProfileCapacity

The capacity value, is generally expressed as a quantity of capacity (such as MW) as defined in bilateral agreements. This attribute exists if the TargetClass attribute is CAPACITY.

ProfileOther

Some other unspecified value as defined in bilateral agreements. Use local interpretation. This attribute exists if the TargetClass attribute is OTHER.

5.2.4 AccountRequest Object

An AccountRequest object is used to request account information. This request may be used for interchange schedule accounts and/or accounting information accounts. This object, when written, will cause the TASE.2 server to generate a TASE.2 Transfer Account Transfer Report (see IEC 60870-6-503) of the requested data. The Transfer Report will contain the identifier AccountRequested as the MMS variable being reported.

Object: **AccountRequest**

Key Attribute: AccountRequestName
Attribute: Transfer Account Reference
Attribute: StartTime
Attribute: Duration
Attribute: RequestId
Attribute: TaConditionRequested

AccountRequestName

The AccountRequestName uniquely identifies the AccountRequest object.

TransferAccountReference

The TransferAccountReference attribute specifies a unique reference value between the sender and the receiver to identify this particular transfer account.

StartTime

The StartTime attribute specifies the starting time that is being requested. This time is specified in seconds.

Duration

The duration attribute specifies the ending time that is being requested. It designates the number of seconds from StartTime.

RequestId

Used to match the response with the request. The value is returned in the Transfer Account report.

TaConditionsRequested

Identifies the type of data being requested.

5.3 Device Outage Object

A DeviceOutage object is used to communicate schedule information regarding device outages. It is composed of a number of objects which define the device which will be (was) affected and describe the time period for which the outage will occur.

Object: DeviceOutage

Key Attribute: OutageReferenceId

Attribute: OwningUtilityID

Attribute: Timestamp

Attribute: StationName

Attribute: DeviceType (GENERATOR, TRANSFORMER, CAPACITOR,
TRANSMISSION_CIRCUIT, BREAKER_SWITCH, INDUCTOR, OTHER)

Attribute: DeviceName

Attribute: DeviceNumber

Attribute: DeviceRating

Attribute: ActivityDateAndTime

Attribute: Activity (NEWPLAN, REVISE, CANCEL, ACTUAL)

Constraint: Activity = NEWPLAN, REVISE

Attribute: PlanType (SCHEDULED, ESTIMATED)

Attribute: PlannedOpenOrOutOfServiceDateAndTime

Attribute: PlannedCloseOrInServiceDateAndTime

Attribute: OutagePeriod (CONTINUOUS, DAILY, WEEKDAYS, OTHER)

Attribute: OutageType (FORCED, MAINTENANCE, PARTIAL, ECONOMY,
UNPLANNED, OTHER)

Attribute: OutageAmountType (PARTIAL, FULL)

Constraint: OutageAmountType = PARTIAL

Attribute: Amount

Attribute: UpperOperatingLimit

Attribute: LowerOperatingLimit

Attribute: Class (INSERVICE, OUTSERVICE)

Constraint: Activity = ACTUAL

Attribute: Action (TRIPPED, OFFLINE, ONLINE, OPEN, CLOSE)

Constraint: Action = TRIPPED, OFFLINE, OPEN

Attribute: Affected Amount

Attribute: Comments

Attribute: OutageEffect

OutageReferenceId

The OutageReferenceId attribute is a unique reference value assigned by the originator for identifying this particular outage.

OwningUtilityID

ID of the utility or control area owning the equipment.

TimeStamp

The TimeStamp attribute provides the time at which a DeviceOutage object was generated.

StationName

Name of station at which the affected equipment, circuit, etc. resides.

DeviceType

Type of the device which is affected.

DeviceName

Name of the device which is affected.

DeviceNumber

The DeviceNumber attribute provides further qualification of DeviceName in cases where DeviceName may not provide sufficient specificity. As an example, multiple transmission lines may connect the same two substations and be assigned a single DeviceName. To uniquely identify one of these multiple lines, each line is assigned a DeviceNumber.

DeviceRating

The Device rating in KV, MW, MVAR.

ActivityDateAndTime

This is the time that the activity occurred or, for a planned activity or cancellation, this the time the activity is planned to occur.

Activity

This describes the type of activity reported. A NEWPLAN or REVISE requires dates for starting and ending the outage. A CANCEL only requires a cancellation date, which is recorded in the ActivityDateAndTime. An ACTUAL activity requires a date the event occurred, which is recorded in the ActivityDateAndTime, and a description of the actual event that occurred.

PlanType

A plan can be either a scheduled activity (with firm committed dates) or an activity with only estimated dates.

PlannedOpenOrOutOfServiceDateAndTime

Date and time the device is going to be taken out of service (or switch/breaker is to be opened).

PlannedCloseOrInServiceDateAndTime

Date and time the device is going to be returned to service (or switch/breaker is to be closed).

OutagePeriod

This describes the periodicity of the outage for plans which are to be executed periodically, such as daily or weekly.

OutageType

This describes the reason the equipment is being taken out of service. FORCED is a controlled but unscheduled outage MAINTENANCE is a scheduled outage for maintenance purposes PARTIAL is an outage where only a portion of the capacity is removed from service. ECONOMY is an outage planned for economic reasons. UNPLANNED is an unscheduled outage.

OutageAmountType

This describes whether the equipment outage is PARTIAL, in that some capacity is still available, or FULL, in which case no capacity is available.

Amount

For partial outages, this is the amount of normal capacity which will be unavailable during outage.

UpperOperatingLimit

Upper limit of operating range during outage.

LowerOperatingLimit

Lower limit of operating range during outage.

Class

Specifies whether device is in service or out of service when outage occurs.

Action

Describes the event which caused the outage or return to service.

AffectedAmount

This describes the load being carried at the time the outage starts.

Comments

This field contains 128 characters of ASCII text which may be used for operator comments.

OutageEffect

Effect of outage on transfer capacity. The field contains up to 128 characters of ASCII text which may be used to describe the effect of the outage on transfer capacity.

5.4 InformationBuffer Object

An InformationBuffer object is used to send multiple line ASCII text messages or binary data. It may be used to transfer messages limited in size to the maximum message size of the underlying communications structure (i.e. the maximum MMS PDU size). The application and coding of the content of this object is outside the scope of TASE.2, and is left as a local issue for agreement between the sending and receiving implementations. Note that this object is referred to as the Information Message object in IEC 60870-6-503.

Object: InformationBuffer

Key Attribute: InfoReference

Attribute: LocalReference

Attribute: MessageId

Attribute: Size

Attribute: InfoStream

InfoReference

The InfoReference attribute uniquely identifies the object. It is used to identify and/or trigger some special handling required by the receiving system.

LocalReference

The LocalReference attribute specifies a value agreed upon between the sender and receiver of the message that further identifies the message (file name, application identification, etc.).

MessageId

Identifies the particular instance of a message.

Size

The length of the valid data in the InfoStream.

InfoStream

The InfoStream attribute contains the byte stream of information being passed. It is limited only by the maximum size of a single message.

5.5 Power Plant Objects

These objects are intended for use with TASE.2 services, as defined in IEC 60870-6-503. The first two objects shall be reported using the same mechanism as TASE.2 schedule and accounting object model, possibly with redefined **Condition** codes. The third object may require a slightly different mechanism to be added to TASE.2 to allow for simple negotiation.

5.5.1 Availability Report Object

The following object represents a report from the plant to either a GCS or a control centre EMS declaring the overall availability of a unit for a given future time period. This report is based on the overall predicted availability of the plant resources. The unit may be available to operate in a variety of operating modes, each of which may involve a different price structure.

This report can also be used for scheduling an outage for various reasons, such as maintenance or testing. The outage is proposed by the DCS system, along with a range of time during which the operation may be initiated. Copies of this object can be repeatedly exchanged between the control centre and power plant until an actual start time is established.

Once a fixed schedule has been established and accepted for a maintenance or testing operation, no further exchanges are required unless either party wishes to cancel the operation or re-open the negotiation. In this case, the party requests the existing schedule be cancelled. If the operation must be re-negotiated, it may be re-proposed with a new start range.

Object: Availability

Key attribute: AvailabilityReferenceID

Attribute: Timestamp

Attribute: PlantReferenceID

Attribute: UnitID

Attribute: ReportStatus (PROPOSED, CONFIRMED, CANCELLED)

Attribute: StartDateAndTime

Attribute: StopDateAndTime

Attribute: Duration

Attribute: Availability Status (AVAILABLE, UNAVAILABLE)

Constraint: AVAILABLE

Attribute: EconomicImpact (YES,NO)

Constraint: YES

Attribute: PriceImpact

Attribute: RampRateImpact (YES,NO)

Constraint: YES

Attribute: MaxRampRateUp

Attribute: MaxRampRateDown

Attribute: CapacityImpact (YES,NO)

Constraint: YES

Attribute: UnitCapacity (GROSS,NET,BOTH)

Constraint: GROSS

Attribute: GrossMaxCapacity

Attribute: GrossMinCapacity

Constraint: NET

Attribute: NetMaxCapacity

Attribute: NetMinCapacity

Constraint: BOTH

Attribute: GrossMaxCapacity

Attribute: GrossMinCapacity

Attribute: NetMaxCapacity

Attribute: NetMinCapacity

Attribute: TypeOfAvailability (STANDBY, ONLINE)

Constraint: STANDBY

Attribute: TimeToOnline

Constraint: ONLINE:

Attribute: LFC (YES,NO)

Constraint: YES

Attribute: Dispatchable

Attribute: Regulating

Attribute: Manually_Loaded

Constraint: NO

Attribute: ReasonForNoLFC (STARTUP,UNSTABLE)

Constraint: (UNAVAILABLE)

Attribute: ReasonForUnavailable (FORCED,SCHEDULED,TESTING)

Attribute: ProvidingReserve (YES,NO)

Attribute: Comment

AvailabilityReferenceID

A unique identifier to be used in subsequent references to the schedule when revising.

TimeStamp

The time the report is sent.

PlantReferenceID

Unique identifier for plant.

UnitID

Unique identifier for unit reported on.

ReportStatus

Status of availability report. PROPOSED indicates either the first or a revised schedule. If proposed, the start and stop date and time refer to the earliest start and stop times, with a duration stating the actual time estimated. CONFIRMED indicates a schedule accepted by the control centre, in which case the start and stop times refer to scheduled times. Duration may then be blank. CANCELLED is self explanatory.

StartDateAndTime

Either the earliest start date and time (for PROPOSED) or scheduled start date and time (for CONFIRMED).

StopDateAndTime

Either the earliest stop date and time (for PROPOSED) or scheduled stop date and time (for CONFIRMED).

Duration

The period of time covered by the report.

AvailabilityStatus

AVAILABLE indicates that the unit is able to generate power. UNAVAILABLE indicates the unit is offline and not available for scheduling.

EconomicImpact

If TRUE, indicates there is a price impact associated with this report.

PriceImpact

The absolute price associated with power generated by the unit for the period covered by the report.

RampRateImpact

If TRUE, indicates there is a ramp rate impact associated with the report.

MaxRampRateUp

The maximum predicted ramp rate up (MW) which will be attainable by the unit during the time period.

MaxRampRateDown

The maximum predicted ramp rate down (MW) which will be attainable by the unit during the time period.

CapacityImpact

If TRUE, indicates if there is an impact on capacity associated with this report.

UnitCapacity

Indicates if unit capacity reported is GROSS (direct output from unit), NET (net output onto line), or BOTH.

GrossMaxCapacity

The predicted gross maximum operating capacity (MW) of the unit for throughout the time period.

GrossMinCapacity

The predicted gross minimum operating capacity (MW) of the unit for throughout the time period.

NetMaxCapacity

The predicted net maximum operating capacity (MW) of the unit for throughout the time period.

NetMinCapacity

The predicted net minimum operating capacity (MW) of the unit for throughout the time period.

TypeOfAvailability

STANDBY indicates the unit is available to generate power but is not online. ONLINE indicates the unit is synchronized and generating power.

TimeToOnline

The time until the unit can be brought online.

LFC

If TRUE, indicates unit is available for control and which type of control. The LFC components below describe the availability of the unit for various types of control. Each type of use requires a distinct price (i.e., use as a regulating unit would require a different price than use as a base loaded unit). The components may be used in various combinations.

Dispatchable

Available to be operated to an externally generated setpoint.

Regulating

Available to be operated for the purpose of reducing Area Control Error (ACE) via LFC from a GCS or EMS.

Manually_Loaded

Available to be controlled locally.

ReasonForNoLFC

Reason why unit cannot be load frequency controlled. STARTUP indicates the unit is not yet up to desired operating point. UNSTABLE indicates the unit is at an operating point unsuitable for LFC.

ReasonForUnavailable

If the unit is out of service, the reason can be FORCED (controlled but unscheduled outage), SCHEDULED (for maintenance or other reasons), or TESTING.

ProvidingReserve

If YES, the unit is currently providing reserve.

Comment

Text string up to 256 characters to add any user defined description to the report.

5.5.2 Real Time Status Object

The following object represents a report from the plant to either a GCS or a control centre EMS declaring the overall operating mode of a unit at the time of the report. The real time report differs from the availability report in that:

- it defines the actual status of a unit, not a prediction;
- it includes the attributes which report external blocks, if any.

These real time reports may be issued at any time by the plant DCS system to report changes in the current status of a unit.

Object: RealTimeStatus

Key Attribute: RealTimeStatusReferenceID

Attribute: Timestamp

Attribute: PlantReferenceID

Attribute: UnitID

Attribute: Availability Status (AVAILABLE,UNAVAILABLE)

Constraint: AVAILABLE

Attribute: MaxRampRateUp

Attribute: MaxRampRateDown

Attribute: UnitCapacity (GROSS,NET,BOTH)

Constraint: GROSS

Attribute: GrossMaxCapacity

Attribute: GrossMinCapacity

Constraint: NET

Attribute: NetMaxCapacity

Attribute: NetMinCapacity

Constraint: BOTH

Attribute: GrossMaxCapacity

Attribute: GrossMinCapacity

Attribute: NetMaxCapacity

Attribute: NetMinCapacity

Attribute: TypeOfAvailability (STANDBY, ONLINE)

Constraint: STANDBY

Attribute: TimeToOnline

Constraint: ONLINE:

Attribute: LFC (YES,NO)

Constraint: YES

Attribute: Dispatched

Attribute: Regulating

Attribute: Manually_Loaded

Constraint: NO

Attribute: ReasonForNoLFC (STARTUP,UNSTABLE)

Attribute: ExternallyBlockedHigh (YES,NO)

Attribute: ExternallyBlockedLow (YES,NO)

Constraint: UNAVAILABLE

Attribute: ReasonForUnavailable (FORCED,SCHEDULED,TESTING,EQUIPMENT)

Attribute: ProvidingReserve (YES,NO)

RealTimeStatusReferenceID

A unique identifier to be used in subsequent references to the report.

TimeStamp

The time the report is sent.

PlantReferenceID

Unique identifier for plant.

UnitID

Unique identifier for unit reported on.

AvailabilityStatus

AVAILABLE indicates that the unit is able to generate power. UNAVAILABLE indicates the unit is offline and not available for scheduling.

MaxRampRateUp

The maximum predicted ramp rate up (MW) which will be attainable by the unit during the time period.

MaxRampRateDown

The maximum predicted ramp rate down (MW) which will be attainable by the unit during the time period.

UnitCapacity

Indicates if unit capacity reported is GROSS (direct output from unit), NET (net output onto line), or BOTH.

GrossMaxCapacity

The predicted gross maximum operating capacity (MW) of the unit for throughout the time period.

GrossMinCapacity

The predicted gross minimum operating capacity (MW) of the unit for throughout the time period.

NetMaxCapacity

The predicted net maximum operating capacity (MW) of the unit for throughout the time period.

NetMinCapacity

The predicted net minimum operating capacity (MW) of the unit for throughout the time period.

TypeOfAvailability

STANDBY indicates the unit is available to generate power but is not online. ONLINE indicates the unit is synchronized and generating power.

TimeToOnline

The time until the unit can be brought online.

LFC

If TRUE, indicates unit is under load frequency control and if so, which type of control. The LFC components below describe the various types of control. The components may be used in various combinations.

Dispatched

Operated to an externally generated setpoint.

Regulating

Operated for the purpose of reducing Area Control Error (ACE) via LFC from a GCS or EMS.

Manually_Loaded

Controlled locally.

ReasonForNoLFC

Reason why unit cannot be load frequency controlled. STARTUP indicates the unit is not yet up to desired operating point. UNSTABLE indicates the unit is at an operating point unsuitable for LFC.

ExternallyBlockedHigh

If TRUE, unit is temporarily unable to increase output.

ExternallyBlockedLow

If TRUE, unit is temporarily unable to decrease output.