INTERNATIONAL STANDARD

ISO 17214

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Space data and information transfer systems — Spacecraft onboard interface services — Time access service

Systèmes de transfert des informations et données spatiales — Services d'interfaces à bord des véhicules spatiaux — Service d'accès au temps

Reference number
ISO 17214:2011(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 17214 was prepared by the Consultative Committee for Space Data Systems (CCSDS) (as CCSDS 872.0-M-1, January 2011) and was adopted (without modifications except those stated in Clause 2 of this International Standard) by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 13, *Space data and information transfer systems*.

Space data and information transfer systems — Spacecraft onboard interface services — Time access service

1 Scope

This International Standard defines services and service interfaces provided by the Spacecraft Onboard Interface Services (SOIS) time access service. It specifies only the service and not the methods of providing the service, although use of the SOIS subnetwork services is assumed.

This International Standard conforms to the principles set out in the SOIS Green Book (CCSDS 850.0-G-1; see Reference A6) and it is intended to be applied together with it.

The scope and field of application are furthermore detailed in subclauses 1.1 and 1.2 of the enclosed CCSDS publication.

2 Requirements

Requirements are the technical recommendations made in the following publication (reproduced on the following pages), which is adopted as an International Standard:

CCSDS 872.0-M-1, January 2011, *Spacecraft onboard interface services — Time access service.*

For the purposes of international standardization, the modifications outlined below shall apply to the specific clauses and paragraphs of publication CCSDS 872.0-M-1.

Pages i to v

This part is information which is relevant to the CCSDS publication only.

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Add the following information to the reference indicated:

[A3] Document CCSDS 301.0-B-3, January 2002, is equivalent to ISO 11104:2003.

3 Revision of publication CCSDS 872.0-M-1

It has been agreed with the Consultative Committee for Space Data Systems that Subcommittee ISO/TC 20/SC 13 will be consulted in the event of any revision or amendment of publication CCSDS 872.0-M-1. To this end, NASA will act as a liaison body between CCSDS and ISO.

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The Consultative Committee for Space Data Systems

Recommendation for Space Data System Practices

SPACECRAFT ONBOARD INTERFACE SERVICES— TIME ACCESS SERVICE

RECOMMENDED PRACTICE

CCSDS 872.0-M-1

MAGENTA BOOK
January 2011

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AUTHORITY

Issue:	Recommended Practice, Issue 1
Date:	January 2011
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This document has been approved for publication by the Management Council of the Consultative Committee for Space Data Systems (CCSDS) and represents the consensus technical agreement of the participating CCSDS Member Agencies. The procedure for review and authorization of CCSDS documents is detailed in the *Procedures Manual for the Consultative Committee for Space Data Systems*, and the record of Agency participation in the authorization of this document can be obtained from the CCSDS Secretariat at the address below.

This document is published and maintained by:

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STATEMENT OF INTENT

The Consultative Committee for Space Data Systems (CCSDS) is an organization officially established by the management of its members. The Committee meets periodically to address data systems problems that are common to all participants, and to formulate sound technical solutions to these problems. Inasmuch as participation in the CCSDS is completely voluntary, the results of Committee actions are termed **Recommendations** and are not in themselves considered binding on any Agency.

CCSDS Recommendations take two forms: **Recommended Standards** that are prescriptive and are the formal vehicles by which CCSDS Agencies create the standards that specify how elements of their space mission support infrastructure shall operate and interoperate with others; and **Recommended Practices** that are more descriptive in nature and are intended to provide general guidance about how to approach a particular problem associated with space mission support. This **Recommended Practice** is issued by, and represents the consensus of, the CCSDS members. Endorsement of this **Recommended Practice** is entirely voluntary and does not imply a commitment by any Agency or organization to implement its recommendations in a prescriptive sense.

No later than five years from its date of issuance, this **Recommended Practice** will be reviewed by the CCSDS to determine whether it should: (1) remain in effect without change; (2) be changed to reflect the impact of new technologies, new requirements, or new directions; or (3) be retired or canceled.

In those instances when a new version of a **Recommended Practice** is issued, existing CCSDS-related member Practices and implementations are not negated or deemed to be non-CCSDS compatible. It is the responsibility of each member to determine when such Practices or implementations are to be modified. Each member is, however, strongly encouraged to direct planning for its new Practices and implementations towards the later version of the Recommended Practice.

FOREWORD

This document is a technical Recommended Practice for use in developing flight and ground systems for space missions and has been prepared by the Consultative Committee for Space Data Systems (CCSDS). The Time Access Service described herein is intended for missions that are cross-supported between Agencies of the CCSDS, in the framework of the Spacecraft Onboard Interface Services (SOIS) CCSDS area.

This Recommended Practice specifies a set of related services to be used by space missions to obtain onboard time. The SOIS Time Access Service provides provides a common service interface and quality of service regardless of the particular type of data link or protocol being used for communication.

Through the process of normal evolution, it is expected that expansion, deletion, or modification of this document may occur. This Recommended Practice is therefore subject to CCSDS document management and change control procedures, which are defined in the *Procedures Manual for the Consultative Committee for Space Data Systems*. Current versions of CCSDS documents are maintained at the CCSDS Web site:

http://www.ccsds.org/

Questions relating to the contents or status of this document should be addressed to the CCSDS Secretariat at the address indicated on page i.

At time of publication, the active Member and Observer Agencies of the CCSDS were:

Member Agencies

– Agenzia Spaziale Italiana (ASI)/Italy.
– Canadian Space Agency (CSA)/Canada.
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– China Satellite Launch and Tracking Control General, Beijing Institute of Tracking and Telecommunications Technology (CLTC/BITTT)/China.
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– CSIR Satellite Applications Centre (CSIR)/Republic of South Africa.
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– European Organization for the Exploitation of Meteorological Satellites (EUMETSAT)/Europe.
– European Telecommunications Satellite Organization (EUTELSAT)/Europe.
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– Hellenic National Space Committee (HNSC)/Greece.
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– KFKI Research Institute for Particle & Nuclear Physics (KFKI)/Hungary.
– Korea Aerospace Research Institute (KARI)/Korea.
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– Space and Upper Atmosphere Research Commission (SUPARCO)/Pakistan.
– Swedish Space Corporation (SSC)/Sweden.
– United States Geological Survey (USGS)/USA.

DOCUMENT CONTROL

Document	Title	Date	Status
CCSDS 872.0-M-1	Spacecraft Onboard Interface Services—Time Access Service, Recommended Practice, Issue 1	January 2011	Original issue
EC1	Editorial Correction	September 2011	Corrects typographical elements

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

This document is one of a family of documents specifying the Spacecraft Onboard Interface Services (SOIS)-compliant services to be provided in support of onboard applications.

The purpose of this document is to define services and service interfaces provided by the SOIS Time Access Service. Its scope is to specify the service only and not to specify methods of providing the service, although use of the SOIS subnetwork services is assumed.

This document conforms to the principles set out in the SOIS Green Book (reference [A6]) and it is intended to be applied together with it.

1.2 APPLICABILITY

This document applies to any mission or equipment claiming to provide a SOIS-compatible Time Access Service.

1.3 RATIONALE

SOIS provides service interface specifications in order to promote interoperability and development reuse via peer-to-peer and vertical standardisation.

1.4 DOCUMENT STRUCTURE

This document has five major sections:

– this section, containing administrative information, definitions, and references;

– section 2, describing general concepts and assumptions, including security issues;

– section 3, containing the Time Access Service specification;

– section 4, containing the Management Information Base (MIB) for this service;

– section 5, comprising a Service Conformance Statement Proforma.

In addition, four informative annexes are provided:

– annex A, containing a list of informative references;

– annex B, describing how local time registers may be implemented and how the master onboard time value is usually distributed in current spacecraft;

– annex C, describing aspects of the POSIX API time functions which might be useful to implementers of the Time Access Service;

– annex D, describing how an implementation of the service may be characterised.

1.5 CONVENTIONS AND DEFINITIONS

1.5.1 BIT NUMBERING CONVENTION AND NOMENCLATURE

In this document, the following convention is used to identify each bit in an *N*-bit field. The first bit in the field to be transmitted (i.e., the most left justified when drawing a figure) is defined to be 'Bit 0'; the following bit is defined to be 'Bit 1' and so on up to 'Bit *N*–1'. When the field is used to express a binary value (such as a counter), the Most Significant Bit (MSB) shall be the first transmitted bit of the field, i.e., 'Bit 0' (see figure 1-1).

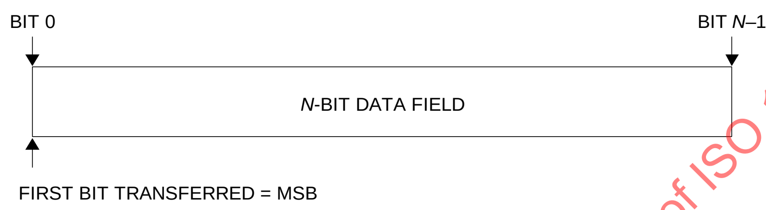

Figure 1-1: Bit Numbering Convention

In accordance with modern data communications practice, spacecraft data fields are often grouped into eight-bit 'words' widely known as bytes. Throughout this Recommended Practice, such an eight-bit word is called an 'octet'.

The numbering for octets within a data structure starts with zero. By CCSDS convention, any 'spare' bits shall be permanently set to '0'.

1.5.2 DEFINITIONS

1.5.2.1 General

For the purpose of this document the following definitions apply.

1.5.2.2 Definitions from the Open Systems Interconnection (OSI) Basic Reference Model

This document is defined using the style established by the Open Systems Interconnection (OSI) Basic Reference Model (reference [A4]). This model provides a common framework for the development of standards in the field of systems interconnection.

The following terms used in this Recommended Practice are adapted from definitions given in reference [A4]:

layer: subdivision of the architecture, constituted by subsystems of the same rank.

protocol data unit (PDU): unit of data specified in a protocol and consisting of Protocol Control Information (PCI) and possibly user data.

service: capability of a layer (service provider) together with the layers beneath it, which is provided to the service users.

Time Access Service Access Point (TASAP): the point at which Time Access Service is provided by a Time Access Service entity to a Time Access Service user entity.

TASAP address: a Time Access Service address that is used to identify a single TASAP.

1.5.2.3 Terms defined in this Recommended Practice

For the purposes of this Recommended Practice, the following definitions also apply.

accuracy: closeness of the agreement between the times reported by a local time source and the master onboard time source of the spacecraft.

application: component of the onboard software that makes use of the Time Access Service.

NOTE – Such components include flight software applications and higher-layer services.

error bound: indication of the theoretical error range of a particular time value.

NOTES

1 This is dependent upon the mechanisms of the time source used to obtain the time value. It may be related to the precision and resolution of the time value but also any associated synchronisation mechanisms.

2 Larger values for the error bound indicate less accuracy in the returned time value.

precision: smallest significant time increment that can be reported by a time source.

NOTE – For example, a time source that reports time as *minutes:seconds:milliseconds* has a precision of 1ms. The precision of a time source is normally less than the resolution of that time source.

resolution: smallest significant time increment that can be measured by a time source.

NOTE – For example, a time source driven by a 1MHz oscillator has a resolution of 1µs.

time correlation: process of maintaining coherence between the master time source and each local time source, such that all time sources provide the same time value within some bounded uncertainty.

NOTE – This maximizes the accuracy of each time source with respect to the master onboard time source.

1.6 DOCUMENT NOMENCLATURE

The following conventions apply throughout this Recommended Practice:

a) the words 'shall' and 'must' imply a binding and verifiable specification;

b) the word 'should' implies an optional, but desirable, specification;

c) the word 'may' implies an optional specification;

d) the words 'is', 'are', and 'will' imply statements of fact.

1.7 REFERENCES

The following documents contain provisions which, through reference in this text, constitute provisions of this Recommended Practice. At the time of publication, the editions indicated were valid. All documents are subject to revision, and users of this Recommended Practice are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. The CCSDS Secretariat maintains a register of currently valid CCSDS Documents.

NOTE – This document contains no normative references. Informative references are contained in annex A.

2 OVERVIEW

2.1 FUNCTION

The Time Access Service provides a user entity with a consistent interface to a local time source that is correlated to some centrally maintained master onboard time source.

2.2 CONTEXT

The Time Access Service is defined within the context of the overall SOIS architecture (reference [A6]) as one of the services of the Application Support Layer, as illustrated in figure 2-1.

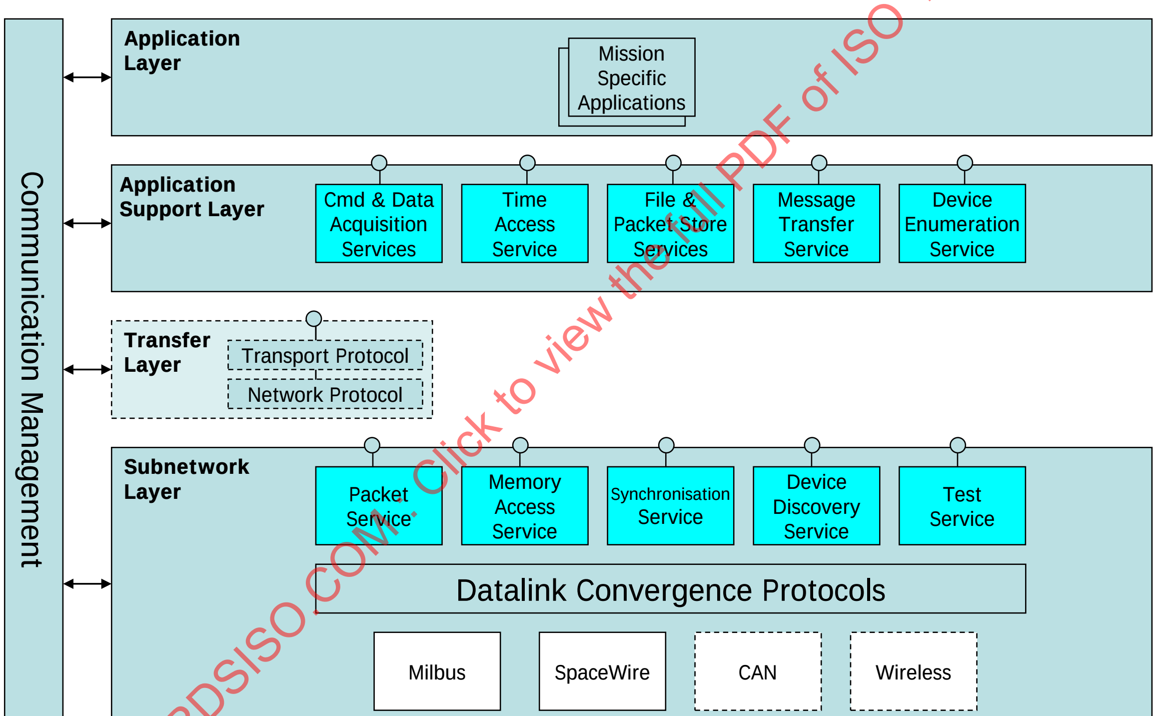

Figure 2-1: Time Access Service Context

The Time Access Service provides applications with a consistent interface to a local time source that is correlated to some centrally maintained master onboard time source. The time values provided by this service might typically be used by the application to schedule some operation, such as the acquisition of an image or to time stamp locally generated telemetry data.

The need to provide a local, correlated time source in onboard processor nodes is common to all spacecraft that have more than one processing node connected to an onboard bus or LAN. A typical architectural scenario is shown in figure 2-2. The Time Access Service is concerned only with providing the interface to the local time source. It is not concerned with the provision of the local time source and mechanisms that may be used to correlate the time between the local and other time sources, the latter of which is addressed by the SOIS Subnetwork Synchronisation Service (reference [A7]).

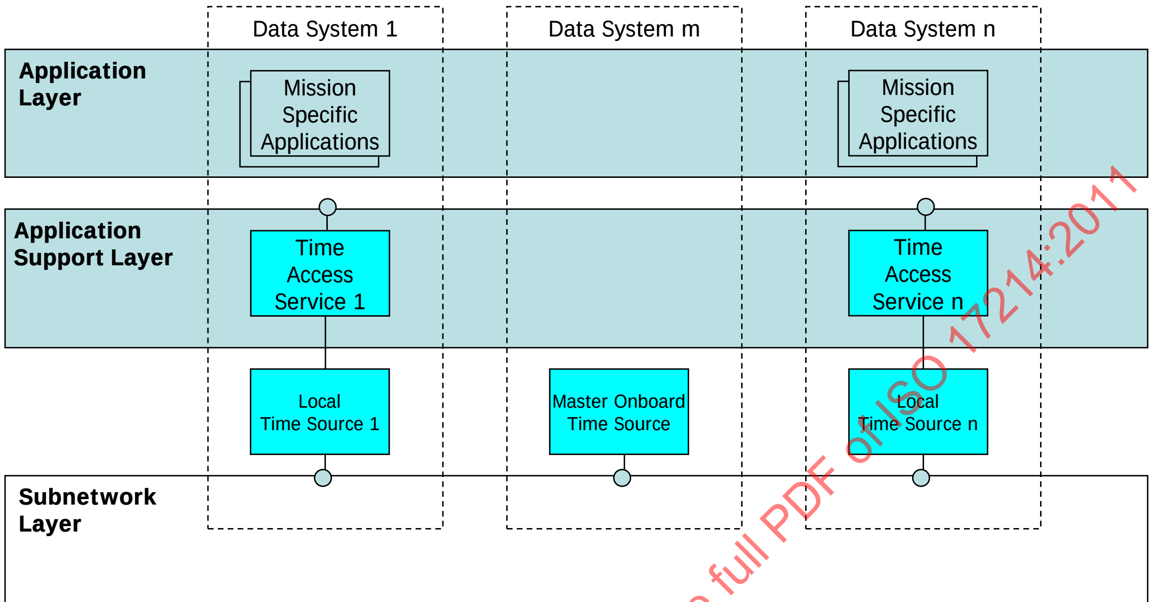

Figure 2-2: Typical Onboard Time System Architecture

NOTE – A typical onboard time system architecture consists of local and master onboard time sources implemented in hardware. The Time Access Service provides access to a local time source only.

In this architecture the local time sources are typically free-running hardware counters accumulating seconds and sub-seconds of elapsed time. Each of these counters is driven by its own oscillator, and the absolute frequency and frequency stability of each oscillator are different in each node. The master onboard time source, the reference for onboard time for all onboard mission operations, is usually a similar free-running counter driven by an oscillator with precise absolute frequency and high stability.[1] The value provided by this time source is usually called the Mission Elapsed Time (MET) or the Spacecraft Elapsed Time (SCET).

The actual method of implementing the master onboard time source and the local time sources and the mechanisms used to correlate them is outside the scope of this document. However, annex B describes a scheme that is typically used today.

This document defines a standard interface between applications hosted on each node and the local time source for that node. The scope of this document is indicated by the dashed box in figure 2-2. The basic capability provided by the Time Access Service is the ability to read the time on demand, i.e., a '*wall clock*' capability. Two optional extensions are also defined

[1] In certain orbits it is possible to use a time source that is correlated to an external reference time source, such as a GPS receiver, as the master onboard time source.

which reflect common requirements for onboard software systems. The first of these is an '*alarm clock*' capability, which enables the application to request notification at a particular time. The second is a '*metronome*' capability, which enables the application to request periodic notifications with a specified interval and starting at a particular time.

The benefit to the user is that all applications have a uniform interface to the local time source, regardless of their location on the spacecraft and how time correlation is actually performed, and do not have to access local hardware directly. This simplifies the development of the applications and means that they can be relocated if necessary and can be re-used in other missions.

2.3 PURPOSE AND OPERATION OF THE TIME ACCESS SERVICE

Applications should use the Time Access Service to obtain the time from the local time source rather than, for example, reading directly from the local elapsed time counter hardware registers. The time provided by the Time Access Service can be used for a variety of purposes, for example, for scheduling of onboard operations and for time stamping of acquired data, possibly using onboard time synchronised across a spacecraft subnetwork.

The Time Access Service is not intended to be used as a multi-purpose timing mechanism for applications requiring specialised hardware; for example, it should not be used for software real-time task scheduling.

From the application software perspective, use of the Time Access Service will result in applications that are more portable, easier to develop, and independent of the hardware implementations of the onboard time sources. From the spacecraft platform implementers' perspective, use of the Time Access Service will make it easier to control the access to shared hardware resources.

The Time Access Service is operated using service requests and service indications passed between the service user and the service provider.

2.4 SECURITY

2.4.1 SECURITY BACKGROUND

The SOIS services are intended for use with protocols that operate solely within the confines of an onboard subnet. It is therefore assumed that SOIS services operate in an isolated environment which is protected from external threats. Any external communication is assumed to be protected by services associated with the relevant space-link protocols. The specification of such security services is outside the scope of this document.

2.4.2 SECURITY CONCERNS

At the time of writing there are no identified security concerns. If confidentiality of data is required within a spacecraft it is assumed it is applied at the Application layer. Reference [A8] contains more information regarding the choice of service and where it can be implemented.

2.4.3 POTENTIAL THREATS AND ATTACK SCENARIOS

Potential threats and attack scenarios typically derive from external communication and are therefore not the direct concern of the SOIS services, which make the assumption that the services operate within a safe and secure environment. It is assumed that all applications executing within the spacecraft have been thoroughly tested and cleared for use by the mission implementer. Confidentiality of applications can be provided by Application layer mechanisms or by specific implementation methods such as time and space partitioning. Such methods are outside the scope of SOIS.

2.4.4 CONSEQUENCES OF NOT APPLYING SECURITY

The security services are outside the scope of this document and are expected to be applied at layers above or below those specified in this document. If confidentiality is not implemented, science data or other parameters transmitted within the spacecraft might be visible to other applications resident within the spacecraft, resulting in disclosure of sensitive or private information.

3 TIME ACCESS SERVICE

3.1 PROVIDED SERVICE

3.1.1 GENERAL

a) The Time Access Service shall implement the wall clock capability specified in 3.1.2.

b) The Time Access Service may implement the alarm clock capability specified in 3.1.3.

c) The Time Access Service may implement the metronome capability specified in 3.1.4.

3.1.2 WALL CLOCK CAPABILITY

a) The wall clock capability shall allow the user to obtain the local onboard time on demand.

b) To obtain the time, the user shall issue a TIME.request primitive.

c) The service shall respond to a TIME.request with a TIME.indication primitive.

NOTE – As specified in 3.4.3, this primitive contains the outcome of obtaining the local onboard time, the obtained current local time, and an indication of the accuracy and validity of this time value.

3.1.3 ALARM CLOCK CAPABILITY (OPTIONAL)

a) If implemented, the alarm clock capability shall allow the user to register for an alarm call at a specified time.

b) To register for an alarm call, the user shall issue an ALARM.request primitive with the time (absolute or relative) at which the alarm call is to be issued.

c) The service shall respond to an ALARM.request immediately with an ALARM.indication indicating the outcome of the registration and, for a successful registration, a TIME.indication primitive issued at the specified time.

d) The user may cancel a pending alarm call by issuing a CANCEL_ALARM.request.

e) The service shall respond to a CANCEL_ALARM.request immediately with a CANCEL_ALARM.indication indicating the outcome of the cancellation.

3.1.4 METRONOME CAPABILITY (OPTIONAL)

a) If implemented, the metronome capability shall allow the user to register for a periodic indication of the time at a specified frequency and starting at a specific time.

b) To register for a periodic indication of the time, the user shall issue a METRONOME.request primitive with the time at which the first periodic indication is to be issued and the frequency of subsequent indications.

c) The service shall respond to a METRONOME.request immediately with a METRONOME.indication indicating the outcome of the registration and, for a successful registration, periodic TIME.indication primitives with the first indication being issued at the specified start time and subsequent indications being issued at the specified frequency.

d) To stop the metronome, the user shall issue a CANCEL_METRONOME.request.

e) The service shall respond to a CANCEL_METRONOME.request immediately with a CANCEL_METRONOME.indication indicating the outcome of the cancellation.

3.2 DISCUSSION: EXPECTED SERVICES FROM UNDERLYING LAYERS

The expected service from the underlying layers is a locally maintained clock that indicates seconds and sub-seconds of monotonically increasing elapsed time.

This does not preclude the locally maintained clock's being 'wound back', e.g., because of an inaccuracy causing it to run fast. This may be expressed as an elapsed time from some specific epoch, such as the start of the mission, or may be a real-time clock. The maximum adjustment permissible per request will be defined in the Time Access Service's MIB, so as to minimise the affect upon the service users.

3.3 SERVICE PARAMETERS

3.3.1 GENERAL

The Time Access Service shall use the parameters specified in 3.3.2 to 3.3.11.

3.3.2 TIME ACCESS SERVICE ACCESS POINT ADDRESS

The Time Access Service Access Point (TASAP) parameter shall identify the SAP Address that identifies the user entity that wishes to invoke the Time Access Service.

3.3.3 TRANSACTION IDENTIFIER

a) The Transaction Identifier parameter shall be a value, assigned by the invoking user entity, which is subsequently used to associate indication primitives with the causal request primitives.

NOTE – The user entity is thus able to correlate all indications and confirmations with the originating service request.

b) Transaction Identifier shall be unique within the user entity.

c) Uniqueness in the service provider shall be achieved through the concatenation of TASAP Address and Transaction Identifier.

3.3.4 ALARM IDENTIFIER

a) The Alarm Identifier parameter shall be a value, assigned by the service provider, which is subsequently used to associate request primitives with a created alarm.

b) Alarm Identifier shall be unique within a service provider.

3.3.5 METRONOME IDENTIFIER

a) The Metronome Identifier parameter shall be a value, assigned by the service provider, which is subsequently used to associate request primitives with a created metronome.

b) Metronome Identifier shall be unique within a service provider.

3.3.6 RESULT METADATA

The Result Metadata parameter shall be used to provide information generated by the Time Access Service provider to the service invoking entity to provide information related to the successful or failed result of a time access operation.

NOTE – The parameter can also include other information indicating failure conditions, e.g., the specified request could not be serviced within the managed timeout period or the Time Access Service is not functioning correctly.

3.3.7 CURRENT TIME

The Current Time parameter shall provide the current onboard time as determined by the Time Access Service provider.

3.3.8 CURRENT TIME ERROR SPECIFICATION

The Current Time Error Specification parameter shall indicate the error of the associated Current Time parameter as determined by the Time Access Service provider.

3.3.9 ALARM-AT TIME

The Alarm-At Time parameter shall indicate the time at which the user wishes to receive a time indication.

3.3.10 FIRST ALARM TIME

The First Alarm Time parameter shall indicate the time at which the user wishes to receive the first of a series of periodic alarms.

3.3.11 INTER-ALARM INTERVAL

The Inter-Alarm Interval parameter shall indicate the requested inter-alarm time interval between successive alarms.

3.4 TIME ACCESS SERVICE PRIMITIVES

3.4.1 GENERAL

a) The Time Access Service interface shall implement the following primitives:

   1) TIME.request, as specified in 3.4.2.

   2) TIME.indication, as specified in 3.4.3.

b) The Time Access service interface may implement the following primitives:

   1) ALARM.request, as specified in 3.4.4.

   2) ALARM.indication, as specified in 3.4.5.

   3) CANCEL_ALARM.request, as specified in 3.4.6.

   4) CANCEL_ALARM.indication, as specified in 3.4.7.

   5) METRONOME.request, as specified in 3.4.8.

   6) METRONOME.indication, as specified in 3.4.9.

   7) CANCEL_METRONOME.request, as specified in 3.4.10.

   8) CANCEL_METRONOME.indication, as specified in 3.4.11.

3.4.2 TIME.REQUEST

3.4.2.1 Function

The **TIME.request** shall be used to request the service to retrieve the current time.

3.4.2.2 Semantics

The **TIME.request** primitive shall use the following semantics, with the meaning of the parameters specified in 3.3.

TIME.request (TASAP Address, Transaction Identifier)

3.4.2.3 When Generated

The **TIME.request** shall be passed to the Time Access Service provider to request the current time.

3.4.2.4 Effect on Receipt

Receipt of the **TIME.request** primitive shall cause the Time Access Service provider to determine the current time.

3.4.2.5 Additional Comments

None.

3.4.3 TIME.INDICATION

3.4.3.1 Function

The **TIME.indication** primitive shall be used to pass the current time to the user entity.

3.4.3.2 Semantics

The **TIME.indication** primitive shall use the following semantics, with the meaning of the parameters specified in 3.3.

> **TIME.indication** (TASAP Address, Transaction Identifier, Current Time, Current Time Error Specification, Result Metadata)

3.4.3.3 When Generated

The **TIME.indication** primitive shall be issued by the service provider to the receiving user entity in response to a TIME.request, ALARM.request, or a METRONOME.request.

NOTE – This primitive provides the current time (see 3.3.7 and 3.3.8), and metadata concerning whether the request was executed successfully or not (see 3.3.6).

3.4.3.4 Effect on Receipt

The response of the user entity to a **TIME.indication** primitive is unspecified.

3.4.3.5 Additional Comments

None.

3.4.4 ALARM.REQUEST

3.4.4.1 Function

The **ALARM.request** primitive shall be used to request the service create a one-shot alarm in the form of a time indication at a specific time in the future.

3.4.4.2 Semantics

The **ALARM.request** primitive shall use the following semantics, with the meaning of the parameters specified in 3.3.

ALARM.request (TASAP Address, Transaction Identifier, Alarm-At Time)

3.4.4.3 When Generated

The **ALARM.request** primitive shall be passed to the Time Access Service provider in order to request a one-shot alarm be created.

3.4.4.4 Effect on Receipt

Receipt of the **ALARM.request** primitive shall cause the Time Access Service provider to create a one-shot alarm.

3.4.4.5 Additional Comments

None.

3.4.5 ALARM.INDICATION

3.4.5.1 Function

The **ALARM.indication** primitive shall be used to indicate the outcome of creating a one-shot alarm to the user entity.

3.4.5.2 Semantics

The **ALARM.indication** primitive shall use the following semantics, with the meaning of the parameters specified in 3.3.

> **ALARM.indication** (TASAP Address, Transaction Identifier, Alarm Identifier, Result Metadata)

3.4.5.3 When Generated

The **ALARM.indication** primitive shall be issued by the service provider to the receiving user entity in response to an ALARM.request.

NOTE – This primitive provides metadata concerning whether the request was executed successfully or not (see 3.3.6).

3.4.5.4 Effect on Receipt

The response of the user entity to an **ALARM.indication** primitive is unspecified.

3.4.5.5 Additional Comments

None.

3.4.6 CANCEL_ALARM.REQUEST

3.4.6.1 Function

The **CANCEL_ALARM.request** primitive shall be used to request the service cancel a previously requested alarm.

3.4.6.2 Semantics

The **CANCEL_ALARM.request** primitive shall use the following semantics, with the meaning of the parameters specified in 3.3.

> **CANCEL_ALARM.request** (TASAP Address, Transaction Identifier, Alarm Identifier)

3.4.6.3 When Generated

The **CANCEL_ALARM.request** primitive shall be passed to the Time Access Service provider to request that a previously requested alarm be cancelled.

3.4.6.4 Effect on Receipt

Receipt of the **CANCEL_ALARM.request** primitive shall cause the Time Access Service provider to cancel the scheduled alarm and remove all state associated with it.

3.4.6.5 Additional Comments

None.

3.4.7 CANCEL_ALARM.INDICATION

3.4.7.1 Function

The **CANCEL_ALARM.indication** primitive shall be used to indicate the outcome of cancelling a one-shot alarm to the user entity.

3.4.7.2 Semantics

The **CANCEL_ALARM.indication** primitive shall use the following semantics, with the meaning of the parameters specified in 3.3.

> **CANCEL_ALARM.indication** (TASAP Address, Transaction Identifier, Result Metadata)

3.4.7.3 When Generated

The **CANCEL_ALARM.indication** primitive shall be issued by the service provider to the receiving user entity in response to a CANCEL_ALARM.request.

NOTE – This primitive provides metadata concerning whether the request was executed successfully or not (see 3.3.6).

3.4.7.4 Effect on Receipt

The response of the user entity to a **CANCEL_ALARM.indication** primitive is unspecified.

3.4.7.5 Additional Comments

None.

3.4.8 METRONOME.REQUEST

3.4.8.1 Function

The **METRONOME.request** primitive shall be used to request the service create a metronome in the form of a periodic time indication at a specific time in the future and at specified intervals thereafter.

3.4.8.2 Semantics

The **METRONOME.request** primitive shall use the following semantics, with the meaning of the parameters specified in 3.3.

> **METRONOME.request** (TASAP Address, Transaction Identifier, First Alarm Time, Inter-Alarm Interval)

3.4.8.3 When Generated

The **METRONOME.request** primitive shall be passed to the Time Access Service provider to request the creation of a metronome.

3.4.8.4 Effect on Receipt

Receipt of the **METRONOME.request** primitive shall cause the Time Access Service provider to create the metronome.

3.4.8.5 Additional Comments

None.

3.4.9 METRONOME.INDICATION

3.4.9.1 Function

The **METRONOME.indication** primitive shall be used to indicate the outcome of creating a metronome to the user entity.

3.4.9.2 Semantics

The **METRONOME.indication** primitive shall use the following semantics, with the meaning of the parameters specified in 3.3.

> **METRONOME.indication** (TASAP Address, Transaction Identifier, Metronome Identifier, Result Metadata)

3.4.9.3 When Generated

The **METRONOME.indication** primitive shall be issued by the service provider to the receiving user entity in response to a METRONOME.request.

NOTE – This primitive provides metadata concerning whether the request was executed successfully or not (see 3.3.6).

3.4.9.4 Effect on Receipt

The response of the user entity to a **METRONOME.indication** primitive is unspecified.

3.4.9.5 Additional Comments

None.

3.4.10 CANCEL_METRONOME.REQUEST

3.4.10.1 Function

The **CANCEL_METRONOME.request** primitive shall be used to request the service cancel a previously requested metronome.

3.4.10.2 Semantics

The **CANCEL_METRONOME.request** primitive shall use the following semantics, with the meaning of the parameters specified in 3.3.

> **CANCEL_METRONOME.request** (TASAP Address, Transaction Identifier, Metronome Identifier)

3.4.10.3 When Generated

The **CANCEL_METRONOME.request** primitive shall be passed to the Time Access Service provider to request that a previously requested metronome be cancelled.

3.4.10.4 Effect on Receipt

The **CANCEL_METRONOME.request** primitive shall cause the Time Access Service provider to cancel the metronome and remove all state associated with it.

3.4.10.5 Additional Comments

None.

3.4.11 CANCEL_METRONOME.INDICATION

3.4.11.1 Function

The **CANCEL_METRONOME.indication** primitive shall be used to indicate the outcome of cancelling a metronome to the user entity.

3.4.11.2 Semantics

The **CANCEL_METRONOME.indication** primitive shall use the following semantics, with the meaning of the parameters specified in 3.3.

CANCEL_METRONOME.indication (TASAP Address, Transaction Identifier, Result Metadata)

3.4.11.3 When Generated

The **CANCEL_METRONOME.indication** shall be issued by the service provider to the receiving user entity in response to a CANCEL_METRONOME.request.

NOTE – This primitive provides metadata concerning whether the request was executed successfully or not (see 3.3.6).

3.4.11.4 Effect on Receipt

The response of the user entity to a **CANCEL_METRONOME.indication** primitive is unspecified.

3.4.11.5 Additional Comments

None.

4 MANAGEMENT INFORMATION BASE

4.1 GENERAL

There is currently no Management Information Base associated with this service. All management items are associated with the protocol providing the service. However, guidance is provided as to MIB contents in section 4.3.

4.2 SPECIFICATIONS

Any protocol claiming to provide this service in a SOIS-compliant manner shall publish its Management Information Base as part of the protocol specification.

4.3 MIB GUIDANCE

The MIB of the protocol providing the Time Access Service should consider the following aspects:

a) Frequency, as specified in 4.4.

b) Drift, as specified in 4.5.

c) Maximum adjustment, as specified in 4.6.

NOTE – These aspects are not in any way an indication of the complete contents of a MIB for a protocol providing the Time Access Service but are offered as guidance as to those aspects of the MIB which may relate to the Time Access Service interface.

4.4 FREQUENCY

4.4.1 The **Frequency** parameter shall indicate the rate, in Hertz, at which the Time Access Service is updated.

NOTES

1 This parameter is not the frequency of a local time source, e.g., hardware clock. It is the frequency at which the Time Access Service samples it.

2 This parameter is defined in terms of frequency rather than interval. While this is inconsistent with the rest of the document, the terminology is retained since it is more usual to refer to the frequency of a local time source.

4.4.2 A service management entity should be able to access the frequency parameter.

NOTE – However, it is usually not possible to update it when the local time source is implemented in hardware.

4.5 DRIFT

4.5.1 The **Drift** parameter shall indicate the stability of the local oscillator used in the local clock.

4.5.2 A service management entity should be able to access the drift parameter.

4.5.3 A service management entity should be able to update the drift parameter to compensate for clock aging effects.

4.6 MAXIMUM ADJUSTMENT

The **Maximum Adjustment** parameter shall indicate the maximum permissible adjustment, forward or backward, that can be made to the local time source resident within the spacecraft.

5 SERVICE CONFORMANCE STATEMENT PROFORMA

For any implementation claiming to provide the Time Access Service, the proforma in table 5-1 shall be completed, giving details of the capabilities of the specification, and made available to any party evaluating the use of the implementation to which the completed proforma refers.

Table 5-1: Service Conformance Statement Proforma

Service Conformance Statement Time Access Service

Implementation Information

Protocol Specification Identification	
Version	
Underlying Services	

Mandatory Features

TIME.request	√
TIME.indication	√

Optional Features

ALARM.request	
ALARM.indication	
CANCEL_ALARM.request	
CANCEL_ALARM.indication	
METRONOME.request	
METRONOME.indication	
CANCEL_METRONOME.request	
CANCEL_METRONOME.indication	

Other Information

N/A	