The Consultative Committee for Space Data Systems

Draft Recommendation for
Space Data System Standards

SIMPLE SCHEDULE FORMAT SPECIFICATION

DRAFT RECOMMENDED STANDARD

CCSDS 902.1-R-1

RED BOOK
September 2014

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September 2014

AUTHORITY

Issue:	Red Book, Issue 1
Date:	September 2014
Location:	Not Applicable

(WHEN THIS RECOMMENDED STANDARD IS FINALIZED, IT WILL CONTAIN THE FOLLOWING STATEMENT OF AUTHORITY:)

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 *Organization and Processes for the Consultative Committee for Space Data Systems* (CCSDS A02.1-Y-4), and the record of Agency participation in the authorization of this document can be obtained from the CCSDS Secretariat at the e-mail address below.

This document is published and maintained by:

CCSDS Secretariat
National Aeronautics and Space Administration
Washington, DC, USA
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FOREWORD

Through the process of normal evolution, it is expected that expansion, deletion, or modification of this document may occur. This Recommended Standard is therefore subject to CCSDS document management and change control procedures, which are defined in the *Organization and Processes for the Consultative Committee for Space Data Systems* (CCSDS A02.1-Y-4). Current versions of CCSDS documents are maintained at the CCSDS Web site:

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PREFACE

This document is a draft CCSDS Recommended Standard. Its 'Red Book' status indicates that the CCSDS believes the document to be technically mature and has released it for formal review by appropriate technical organizations. As such, its technical contents are not stable, and several iterations of it may occur in response to comments received during the review process.

Implementers are cautioned **not** to fabricate any final equipment in accordance with this document's technical content.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

DOCUMENT CONTROL

Document	Title	Date	Status
CCSDS 902.1-R-1	Simple Schedule Format Specification, Draft Recommended Standard, Issue 1	September 2014	Current draft

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE

1.1.1 PURPOSE

This Simple Schedule Format Recommended Standard specifies a standard format for use in transferring scheduling information related to ground stations and/or relay satellites between space agencies and commercial or governmental spacecraft operators. Such exchanges are used in:

a) mission design, e.g., in investigating the feasibility of a mission with respect to its uplink/downlink requirements and the availability of suitable ground station/relay satellite availability;

b) mission planning, e.g., to ensure that there are sufficient ground station/relay satellite resources available to carry out the planned operations;

c) mission operations, e.g., to inform the spacecraft operator of the actual allocation of ground station/relay satellites to their mission;

d) mission operations, e.g., to inform the spacecraft operator of any unused times of the ground stations and/or relay satellites.

1.1.2 SCOPE

The scope of this Recommended Standard is limited to the exchange of Simple Schedule information. The contents of the simple schedule format described here were derived from the analysis of the standard schedule formats used by a number of space agencies/parts of space agencies. This analysis lead to the identification of a ‘core’ content that was (almost) universally present in all schedules analyzed. It was however also identified that there was a need to permit some extension to the core content to cover some use cases. Consequently an extension mechanism has been provided that can be used to add further information in the eventuality that the core content is insufficient for the required purpose.

Definition of the extended content for any specific case is outside the scope of this Recommended Standard and should be specified in an Interface Control Document (ICD) agreed between the involved parties.

While this Recommended Standard has been developed within the scope of the Space Communication Cross Support Service Management (SCCS SM) (references [E1] and [E2]) activity, it is intended that the Simple Schedule Format can be used to exchange schedule information where no other use of SCCS SM is made. In view of this, schedule data that is only of relevance when used in the scope of SCCS SM has been made optional. Thus there is no limiting dependency on Service Management in the Simple Schedule Format specification.

1.2 APPLICABILITY

This Recommended Standard is applicable only to the schedule format and content, but not to its transmission. With respect to the transmission of the Simple Schedule between agencies and operators there are two scenarios:

a) The first involves exchange of the Simple Schedule within the context of SCCS SM.

b) The second involves exchange of the Simple Schedule outside the scope of SCCS SM. Here the mechanism by which the Simple Schedule is transmitted is outside of the scope of this document and should be specified in an ICD agreed by the parties involved.

1.3 RATIONALE

1.3.1 GENERAL

The primary goal of CCSDS is to increase the level of interoperability among agencies. This Recommended Standard furthers that goal by establishing the means to exchange schedule information where most cross support activity occurs: between the tracking stations or ground data handling systems of various agencies and the mission-specific components of a mission ground system.

The use cases described in the following subsections were considered in deriving this Recommended Standard.

1.3.2 USE CASES

1.3.2.1 Mission Design

During the design phase of a mission it is often desirable to be able to obtain some idea of the availability of ground station/relay satellite availability so that the feasibility of obtaining the required uplink and downlink bandwidth can be assessed. Typically, during the mission design phase, the information required relates to periods several years in the future. Currently there is no standardized way for obtaining this information from different agencies.

While this Recommended Standard does not address the mechanism by which the required schedule information can be requested (this possibly being covered in the negotiations involved in establishing the service agreement), it provides a standard format in which the possible availability of ground stations/relay satellites can be returned.

1.3.2.2 Mission Planning

In the mission planning use case the provider agency provides the user agency with a schedule that gives the user agency the information it requires to plan its spacecraft

operations with respect to the availability of uplink/downlink resources. The means by which the provider agency determines the availability for the user agency can be either:

a) derived from a request from the user agency;

NOTE – The contents and format of such a request are outside the scope of this Recommended Standard (although this may be addressed elsewhere in the SCCS SM Recommended Standard at a later date).

b) derived from what is specified in the service agreement between the agencies.

The planning process will typically go through a number of cycles, starting months before the actual activities are expected to take place and being finalized a few days before execution. During these planning cycles the status of the schedule can change with the initial exchanges being of a 'provisional' schedule that will probably change. The final schedule provided is typically considered as 'operational' and can be expected to provide the actual schedule that will be executed, subject to unexpected events such as equipment failure or spacecraft emergencies.

1.3.2.3 Dissemination of Network Schedules

It is desirable that a standardized approach be available for disseminating network schedules, both between agencies and also within agencies. This Recommended Standard aims to provide that. There are however differences in policies between agencies with regard to the contents of distributed schedules. Some agencies provide complete schedules to all users, containing information regarding all spacecraft supported by the agency (and possibly unallocated time as well). At the other extreme, other agencies provide only details regarding a spacecraft's allocation to the operators of that mission.

In view of this, this Recommended Standard has been designed to be flexible enough to be able to cope with the different policies of the various agencies with respect to the information they wish to provide in disseminating their network schedules.

1.3.2.4 Dissemination of Unallocated Time Schedules

Some agencies publish a list of unallocated time of the ground stations/relay satellites in the network. This information can be used by missions to see if it is possible to request additional coverage by using resources during periods when they would otherwise be unused.

Although not addressing the method by which the usage of unallocated resources can be requested, this Recommended Standard can be used to publish a network's unallocated time schedule. It can also be used to inform a mission of the result of a request to use an unallocated resource.

1.3.2.5 Response to Schedule Query

The final use case of the Simple Schedule Format is to return schedule information resulting from a query about network availability. While the contents and format of such a query are outside the scope of this Recommended Standard, the Simple Schedule Format provides a standard mechanism by which the information can be returned to the requestor.

1.4 DOCUMENT STRUCTURE

This document is organized as follows:

a) Section 1 provides the purpose, scope, applicability, and rationale of this Recommended Standard and identifies the conventions and references used throughout the document. This section also describes how this document is organized. A brief description is provided for each section and annex so that the reader will have an idea of where information can be found in the document. It also identifies terminology that is used in this document but is defined elsewhere.

b) Section 2 provides a brief overview of the CCSDS-recommended Simple Schedule Format.

c) Section 3 provides details about the structure and content of the Simple Schedule Format.

d) Annex A provides the normative Implementation Conformance Statement (ICS) proforma.

e) Annex B consists of an informative XML schema for the Simple Schedule Format.

f) Annex C discusses security, SANA, and patent considerations.

g) Annex D contains a list of Acronyms applicable to the Simple Schedule Format.

h) Annex E is a list of informative references.

i) Annex F contains the definition of the frequency bands used in the Recommended Standard.

1.5 DEFINITIONS

For the purposes of this document, the following definitions apply:

a) the word ‘agencies’ may also be construed as meaning ‘satellite operators’ or ‘satellite service providers’;

b) the notation ‘n/a’ signifies ‘not applicable’.

1.6 NOMENCLATURE

1.6.1 NORMATIVE TEXT

The following conventions apply for the normative specifications in this Recommended Standard:

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.

NOTE – These conventions do not imply constraints on diction in text that is clearly informative in nature.

1.6.2 INFORMATIVE TEXT

In the normative sections of this document, informative text is set off from the normative specifications either in notes or under one of the following subsection headings:

– Overview;

– Background;

– Rationale;

– Discussion.

1.7 CONVENTIONS—THE UNIFIED MODELING LANGUAGE

The Unified Modeling Language (UML) diagrams used in the specification (including class diagrams, package diagrams, sequence diagrams, and activity diagrams) follow the notation, semantics, and conventions imposed by the Version 2.4.1 UML specification of the Object Management Group (OMG) (reference [4]). An overview of UML diagramming conventions can be found in Annex E of reference [1].

Within the document use is made only of class diagrams. A UML class diagram describes the structure of a message, its parts, and how those parts interrelate. A UML class, represented in the diagram as a box, represents a data set. Class diagram conventions include composition, generalization, multiplicity, and constraints. Enumeration notation is also used but only when it is involved in a composition constraint.

1.8 REFERENCES

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

[1] *Space Communication Cross Support—Service Management—Service Specification*. Issue 1. Recommendation for Space Data System Standards (Blue Book), CCSDS 910.11-B-1. Washington, D.C.: CCSDS, August 2009.

[2] "CCSDS-910.11-B-1_XML_schemas." http://public.ccsds.org/publications/archive/CCSDS-910.11-B-1_XML_schemas.zip.

[3] *Time Code Formats*. Issue 4. Recommendation for Space Data System Standards (Blue Book), CCSDS 301.0-B-4. Washington, D.C.: CCSDS, November 2010.

[4] *Unified Modeling Language (UML)*. Version 2.4.1. Needham, Massachusetts: Object Management Group, August 2011.

2 OVERVIEW

2.1 GENERAL

This section provides a high-level overview of the CCSDS-recommended Simple Schedule Format, which is designed to facilitate standardized exchanges of ground station and/or relay satellite schedule information between space agencies.

2.2 SIMPLE SCHEDULE

A Simple Schedule file is XML formatted. The format of the Simple Schedule file is suitable for automated interaction and/or (by means of a suitable XML viewer) human interaction.

Data in the Simple Schedule is either mandatory, in which case suitable values must be present, or optional, in which case values may be present or not. In addition it is possible to extend the contents of the Simple Schedule by defining additional parameters. The content of any additional parameters so defined is outside the scope of this document and should be documented in an ICD agreed by the involved parties.

2.3 MAPPING TO W3C XML SCHEMA

This Recommended Standard includes the specification of a mapping to World Wide Web Consortium (W3C) Extensible Markup Language (XML) schema. The normative mapping of this Recommended Standard to XML W3C schemas is a virtual annex to this Recommended Standard and is contained in a stand-alone set of schema files (reference [2]).

NOTE – The XML schema has been elaborated on the basis of the mapping guidelines described in reference [E1].

3 SIMPLE SCHEDULE

3.1 GENERAL

The Simple Schedule shall consist of digital data exchanged in the form of a file.

3.2 SIMPLE SCHEDULE CONTENT/STRUCTURE

3.2.1 OVERVIEW

Figure 3-1 shows the UML Class diagram for the Simple Schedule.

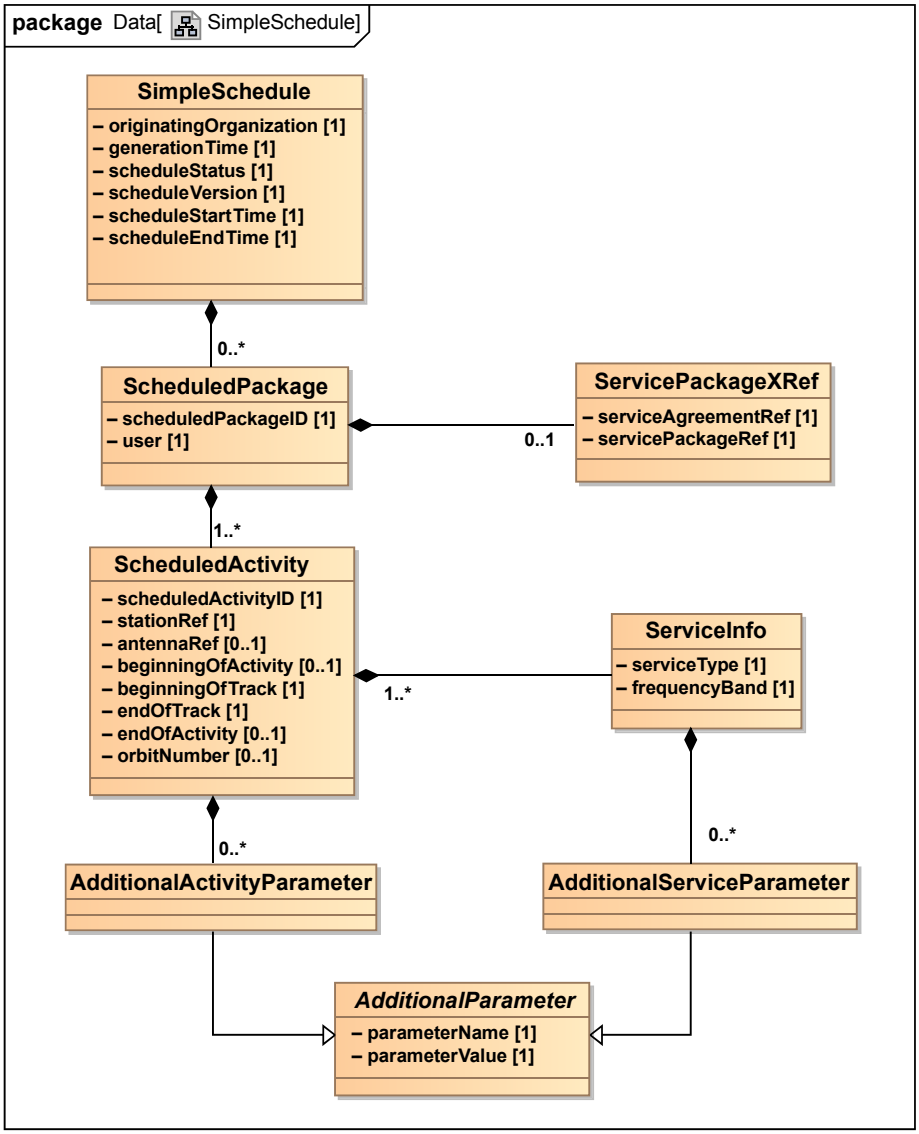

Figure 3-1: Simple Schedule Class Diagram

The attributes of each class are described further in the following subsections and tables.

3.2.2 CLASS SimpleSchedule

3.2.2.1 The SimpleSchedule class is mandatory and shall constitute the 'header' of the Simple Schedule.

3.2.2.2 The SimpleSchedule class parameters specified in table 3-1 shall be used to identify the originating organization, status of the schedule, status version, the time at which the schedule was generated, the time at which the schedule starts, and the time at which it ends.

Table 3-1: Class SimpleSchedule Parameters

Parameter	Description	Data Type	Data Units
`originatingOrganization`	The organization that generated the schedule.	String1024—Permitted values registered in SANA	n/a
`generationTime`	Time at which the schedule was generated.	CCSDS ASCII Time Code B (reference [3])	UTC
`scheduleStatus`	The status of the schedule.	Enumeration – TEST indicates that the schedule has been generated for test purposes only. – PROVISIONAL indicates that the schedule contained is provisional and may still be subject to change. – OPERATIONAL indicates that this is an operational schedule.	
`scheduleVersion`	The version of the schedule. This increments by 1 every time a schedule for the same schedule status and time range is generated (i.e., has the same scheduleStartTime and scheduleEndTime).	Positive Integer	n/a
`scheduleStartTime`	The time at which the schedule starts.	CCSDS ASCII Time Code B (reference [3])	UTC
`scheduleEndTime`	The time at which the schedule ends.	CCSDS ASCII Time Code B (reference [3])	UTC

3.2.3 CLASS ScheduledPackage

3.2.3.1 The ScheduledPackage class is optional and may be used to specify the information for service packages that have been scheduled in the time interval bounded by the SimpleSchedule parameters scheduleStartTime and scheduleEndTime.

3.2.3.2 There shall be zero or more instances of the ScheduledPackage class for each instance of the SimpleSchedule class.

3.2.3.3 The ScheduledPackage class shall include the parameters specified in table 3-2 to identify the Scheduled Package and the user of the service package.

3.2.3.4 Scheduled Package ID must be unique for every scheduled package in a schedule.

3.2.3.5 The user shall be one of

a) a spacecraft (the typical case);

b) TEST (indicating that the package indicates time allocated for testing); or

c) UNALLOCATED (indicating that the antenna/relay satellite is unallocated during the specified time range).

Table 3-2: Class ScheduledPackage Parameters

Parameter	Description	Data Type	Data Units
`scheduledPackageID`	An identifier that is unique for every ScheduledPackage in a schedule. NOTE – If a schedule is regenerated, then the scheduledPackageID for a particular Scheduled Package may change.	String1024	n/a
`user`	The user of the scheduled package. These will typically be spacecraft names as specified in SANA, but also TEST and UNALLOCATED with the meanings indicated in the adjacent column.	String1024—Permitted values registered in SANA The following strings are also permitted values with the meaning indicated; – UNALLOCATED used to indicate that the time is unallocated. – TEST used to indicate that the time is allocated for tests.	n/a

3.2.4 CLASS ServicePackageXRef

3.2.4.1 The ServicePackageXRef class is optional and may be used to map the contents of the Simple Schedule to the appropriate SCCS SM service packages.

3.2.4.2 There shall be zero or one instance of the ServicePackageXRef class for each instance of the ScheduledPackage class.

3.2.4.3 The ServicePackageXRef class shall include the parameters specified in table 3-3.

NOTE – The contents of the ServicePackageXRef class are relevant only when the Simple Schedule is used in the context of SCCS SM.

Table 3-3: Class ServicePackageXRef Parameters

Parameter	Description	Data Type	Data Units
`serviceAgreementRef`	The Service Agreement (as per CCSDS 910.11-B-1, reference [1]; see also reference [E2] for additional information) to which the following servicePackageRef applies.	String1024	n/a
`servicePackageRef`	Cross-reference to the service package (as per CCSDS 910.11-B-1, reference [1]; see also reference [E2] for additional information), where the station allocation is contained in the event that the station allocation was obtained via SCCS SM. NOTE – Several ScheduledActivity instances may have the same servicePackageRef since one service package can contain a number of station allocations.	String1024	n/a

3.2.5 CLASS ScheduledActivity

3.2.5.1 The ScheduledActivity class shall contain the details of the scheduled activity and shall include parameters specified in table 3-4.

3.2.5.2 The ScheduledActivity class shall include two time windows,

a) the interval within which the station is allocated (optional);

b) the interval within the first window within which the spacecraft is actually being tracked by the ground station/relay satellite.

3.2.5.3 There shall be at least one instance of the ScheduledActivity class for each instance of the ScheduledPackage class.

Table 3-4: Class ScheduledActivity Parameters

Parameter	Description	Data Type	Data Units
`scheduledActivityID`	An identifier that is unique for every ScheduledActivity in a schedule. It should be noted that if a schedule is regenerated then the scheduledActivityID for a particular Scheduled Activity may change	String1024	n/a
`stationRef`	The ground station or relay satellite to which the scheduled activity applies	String1024—Permitted values registered in SANA	n/a
`antennaRef`	Optional parameter. Identifier specifying which antenna at a particular ground station or relay satellite is to be used if this is of significance to the supported mission. If it is not relevant this parameter may be omitted.	String1024—Permitted values registered in SANA	n/a
`beginningOfActivity`	Optional parameter: must be present if `endOfActivity` parameter is present. Time at which the allocation of the station/antenna starts. This is assumed to allow for all necessary setup activities, etc. Where available this time should be supplied subject to agency policy. If it is not possible to specify the actual value this parameter shall be omitted.	CCSDS ASCII Time Code B (reference [3])	UTC
`beginningOfTrack`	Time at which tracking the spacecraft is scheduled to start.	CCSDS ASCII Time Code B (reference [3])	UTC

Parameter	Description	Data Type	Data Units
`endOfTrack`	Time at which tracking the spacecraft is scheduled to end.	CCSDS ASCII Time Code B (reference [3])	UTC
`endOfActivity`	Optional parameter: must be present if `beginningOfActivity` parameter is present. Time at which the allocation of the station/antenna ends. This is assumed to allow for all necessary teardown activities, etc. Where available this time should be supplied subject to agency policy. If it is not possible to specify the actual value this parameter shall be omitted.	CCSDS ASCII Time Code B (reference [3])	UTC
`orbitNumber`	Optional parameter. The Orbit Number on which the `beginningOfTrack` occurs. If this is not relevant (e.g., deep space missions) or not available, this parameter shall be omitted.	Non-Negative Integer	n/a

3.2.6 CLASS AdditionalActivityParameter

3.2.6.1 The AdditionalActivityParameter class is optional and may be used to permit the instantiation of additional parameters for a ScheduledActivity.

NOTE – The AdditionalActivityParameter class is a specialization of class AdditionalParameter described in 3.2.9 below, and the description of the parameters is given in that subsection.

3.2.6.2 There shall be zero or more instances of the AdditionalActivityParameter class for each instance of the ScheduledActivity class.

3.2.6.3 The usage of these additional parameters is not within the scope of this document and should be specified in an ICD between by the relevant parties.

3.2.7 CLASS ServiceInfo

3.2.7.1 The ServiceInfo class shall be used to provide information about the type of operations to be carried out during a pass.

3.2.7.2 The ServiceInfo class shall include the parameters specified in table 3-5 to contain arrays of enumerated values specifying the type of service and frequency band to be used.

NOTE – It can be valid to have more than one instance of a particular ServiceType, e.g., where the spacecraft is downlinking telemetry simultaneously on both X- and S-band.

3.2.7.3 There shall be at least one instance of the ServiceInfo class for each instance of the ScheduledActivity class.

Table 3-5: Class ServiceInfo Parameters

Parameter	Description	Data Type	Data Units
`serviceType`	The type of service(s) that will be carried out during an activity.	Enumeration: – DELTADOR – OFFLINE-TM – RANGING – RESERVED – TBD – TELECOMMAND – TELEMETRY – TEST – UNUSED	n/a
`frequencyBand`	The frequency band that will be used by the service. If the frequency band is not relevant the value N/A (not applicable) shall be used. (See annex F for a definition of the frequencies each band refers to.)	Enumeration: – C-Band – Ka-Band – Ku-Band – L-Band – S-Band – V-Band – X-Band – Optical – N/A	n/a

3.2.8 CLASS AdditionalServiceParameter

3.2.8.1 The AdditionalServiceParameter class is optional and may be used to permit the instantiation of additional parameters for a ServiceInfo.

NOTE – The AdditionalServiceParameter class is a specialization of class AdditionalParameter described in 3.2.9 below, and the description of the parameters is given in that subsection.

3.2.8.2 There shall be zero or more instances of the AdditionalServiceParameter class for each instance of the ServiceInfo class.

3.2.8.3 The usage of these additional parameters is not within the scope of this document and should be specified in an ICD between by the relevant parties.

3.2.9 CLASS AdditionalParameter (ABSTRACT)

3.2.9.1 The AdditionalParameter class shall be used to permit the instantiation of additional parameters for a ScheduledActivity or ServiceInfo by allowing the specification of parameter name/value pairs using the parameters specified in table 3-6.

3.2.9.2 The usage of these additional parameters is not within the scope of this document and should be specified in an ICD between by the relevant parties.

Table 3-6: Class AdditionalParameter Parameters

Parameter	Description	Data Type	Data Units
`parameterName`	Name of the additional parameter. This is used to enable the specification of additional parameters if these are required on a bilateral basis.	String1024	n/a
`parameterValue`	The value of the required parameter.	As required by the additional parameter	As required by the additional parameter

3.3 ORDERING OF SCHEDULED PACKAGES

3.3.1 The ordering of ScheduledPackages in a file containing a Simple Schedule shall be by increasing order of the earliest beginningOfTrack times of all the ScheduledActivities contained in a ScheduledPackage.

3.3.2 In the event that two or more ScheduledPackages contain ScheduledActivities that have the same earliest beginningOfTrack times, the user value of ScheduledPackage shall be used as a secondary key in increasing alphabetic order.

NOTE – Figure 3-2 is an example of how the order of ScheduledPackages should appear. For clarity not all parameters of ScheduledActivities are shown.

```
ScheduledPackage
      scheduledPackageID      = Package-A
      user                    = Mission-A
      ScheduledActivity
            scheduledActivityID     = Activity-A1
            beginningOfTrack        = 2020-123T12:00:00.000Z
            .
            .
      ScheduledActivity
            scheduledActivityID     = Activity-A2
            beginningOfTrack        = 2020-123T12:30:00.000Z
            .
            .
ScheduledPackage
      scheduledPackageID      = Package-B
      user                    = Mission-B
      ScheduledActivity
            scheduledActivityID     = Activity-B1
            beginningOfActivity     = 2020-123T12:15:00.000Z
            beginningOfTrack        = 2020-123T12:30:00.000Z
            .
            .
ScheduledPackage
      scheduledPackageID      = Package-C
      user                    = Mission-C
      ScheduledActivity
            scheduledActivityID     = Activity-C1
            beginningOfActivity     = 2020-123T12:00.00.000Z
            beginningOfTrack        = 2020-123T12:30:00.000Z
            .
            .
      ScheduledActivity
            scheduledActivityID     = Activity-C2
            beginningOfActivity     = 2020-123T12:10:00.000Z
            beginningOfTrack        = 2020-123T12:40:00.000Z
            .
            .
ScheduledPackage
      scheduledPackageID      = Package-D
      user                    = Mission-A
      ScheduledActivity
            scheduledActivityID     = Activity-A3
            beginningOfTrack        = 2020-123T13:00:00.000Z
            .
            .
      ScheduledActivity
            scheduledActivityID     = Activity-A4
            beginningOfTrack        = 2020-123T13:30:00.000Z
            .
            .
```

Figure 3-2: Example of Ordering of Scheduled Packages in Simple Schedule

3.4 USAGE OF SIMPLE SCHEDULE FOR ANTENNA FREE TIME

3.4.1 DISCUSSION

There are specific usage recommendations in case of exchange of the Antenna Free Time information over Simple Schedule Format. Figure 3-3 below shows the principle understanding of an Antenna Free Time. As of this issue, Antenna Free Time is not user-/spacecraft-specific.

The Antenna Free Time is specified as an antenna time which the provider is willing to provide to a specific user or all users, outside any orbit or spacecraft specific information.

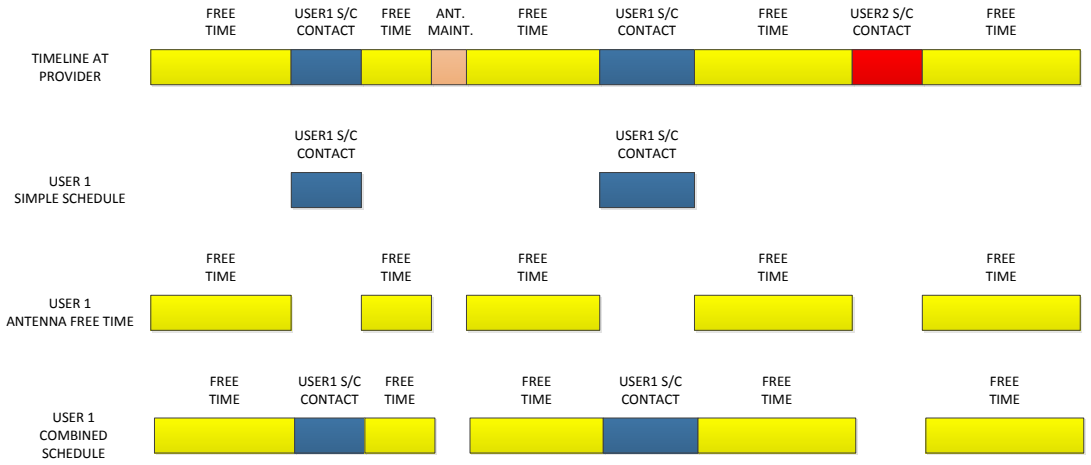

Figure 3-3: Schematic of Schedule to Illustrate Use of Simple Schedule for Antenna Free Time

It is possible for the provider and user to exchange a combined schedule, containing user-scheduled contacts as well as Antenna Free Time in one file.

3.4.2 REQUIREMENTS

3.4.2.1 When specifying Antenna Free Time in the Simple Schedule Format:

a) the user parameter shall be specified as ‘UNALLOCATED’;

b) the serviceType parameter shall be set to ‘UNUSED’;

c) the frequencyBand parameter shall be set to ‘N/A’.

3.4.2.2 Antenna Free Time shall be specified with beginningOfTrack and endOfTrack parameters; beginningOfActivity and endOfActivity shall be omitted.

NOTE – The full extent of tracking passes can be specified with *beginningOfActivity* and *endOfActivity*. This fact needs to be taken into account when generating Antenna Free Time.

ANNEX A

IMPLEMENTATION CONFORMANCE STATEMENT (ICS) PROFORMA

(NORMATIVE)

A1 INTRODUCTION

A1.1 OVERVIEW

This annex provides the Implementation Conformance Statement (ICS) Requirements List (RL) for an implementation of the *Simple Schedule Format Specification* (CCSDS 902.1-R-1). The ICS for an implementation is generated by completing the RL in accordance with the instructions below. An implementation shall satisfy the mandatory conformance requirements referenced in the RL.

The RL in this annex is blank. An implementation's completed RL is called the ICS. The ICS states which capabilities and options have been implemented. The following can use the ICS:

- the implementer, as a checklist to reduce the risk of failure to conform to the standard through oversight;
- a supplier or potential acquirer of the implementation, as a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the standard ICS proforma;
- a user or potential user of the implementation, as a basis for initially checking the possibility of interworking with another implementation (it should be noted that, while interworking can never be guaranteed, failure to interwork can often be predicted from incompatible ICSes);
- a tester, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

A1.2 ABBREVIATIONS AND CONVENTIONS

A1.2.1 General

The RL consists of information in tabular form. The status of features is indicated using the abbreviations and conventions described below.

A1.2.2 Item Column

The item column contains sequential numbers for items in the table.

A1.2.3 Feature Column

The feature column contains a brief descriptive name for a feature. It implicitly means 'Is this feature supported by the implementation?'

NOTE – The features itemized in the RL are elements of the Simple Schedule Format. Therefore support for a mandatory feature indicates that a generated file will include that feature, and support for an optional feature indicates that generated files can include that feature.

A1.2.4 Class Column/Parameters

The Class/Parameters column contains, where applicable, the Simple Schedule Format class associated with the feature.

A1.2.5 Reference Column

The reference column indicates the relevant subsection or table in the *Simple Schedule Format Specification* (CCSDS 902.1-R-1) (this document).

A1.2.6 Status Column

The status column uses the following notations:

M mandatory.

O optional.

It should be noted that a parameter may be marked as M(andatory) while the class that contains it is marked O(ptional). This should be interpreted to mean that while the class is optional if it is present then the parameter must be present.

A1.2.7 Support Column Symbols

The support column is to be used by the implementer to state whether a feature is supported by entering Y, N, or N/A, indicating:

Y Yes, supported by the implementation.

N No, not supported by the implementation.

N/A Not applicable.

A1.3 INSTRUCTIONS FOR COMPLETING THE RL

An implementer shows the extent of compliance to the Recommended Standard by completing the RL; that is, the state of compliance with all mandatory requirements and the options supported are shown. The resulting completed RL is called an ICS. The implementer shall complete the RL by entering appropriate responses in the support or values supported column, using the notation described in A1.2. If a conditional requirement is inapplicable, N/A should be used. If a mandatory requirement is not satisfied, exception information must be supplied by entering a reference *Xi*, where *i* is a unique identifier, to an accompanying rationale for the noncompliance.

A2 ICS PROFORMA FOR SIMPLE SCHEDULE FORMAT

A2.1 GENERAL INFORMATION

A2.1.1 Identification of ICS

Date of Statement (DD/MM/YYYY)	
ICS serial number	
System Conformance statement cross-reference	

A2.1.2 Identification of Implementation Under Test (IUT)

Implementation name	
Implementation version	
Special Configuration	
Other Information	

A2.1.3 Identification of Supplier

Supplier	
Contact Point for Queries	
Implementation Name(s) and Versions	
Other Information necessary for full identification, e.g., names(s) and version(s) for machines and/or operating systems;	

A2.1.4 Document Version

CCSDS 902.1-R-1, draft issue 1	
Have any exceptions been required? (Note: A YES answer means that the implementation does not conform to the Recommended Standard. Non-supported mandatory capabilities are to be identified in the ICS, with an explanation of why the implementation is non-conforming	Yes _____ No _____

A2.1.5 Requirements List

A2.1.5.1 Class SimpleSchedule

A2.1.5.1.1 General

Item	Description	Ref.	Status	Support
1.	SimpleSchedule	3.2.2	M	

A2.1.5.1.2 Class SimpleSchedule Parameters

Item	Parameter	Ref.	Status	Item Support or Values Supported
1.1.	originatingOrganization	Table 3-1	M	
1.2.	generationTime	Table 3-1	M	
1.3.	scheduleStatus	Table 3-1	M	
1.4.	scheduleVersion	Table 3-1	M	
1.5.	scheduleStartTime	Table 3-1	M	
1.6.	scheduleEndTime	Table 3-1	M	

A2.1.5.2 Class ScheduledPackage

A2.1.5.2.1 General

Item	Description	Ref.	Status	Support
2.	ScheduledPackage	3.2.3	O	

A2.1.5.2.2 Class ScheduledPackage Parameters

Item	Parameter	Ref.	Status	Item Support or Values Supported
2.1.	scheduledPackageID	Table 3-2	M	
2.2.	user	Table 3-2	M	

A2.1.5.3 Class ServicePackageXRef

A2.1.5.3.1 General

Item	Description	Ref.	Status	Support
3.	ServicePackageXRef	3.2.4	O	

A2.1.5.3.2 Class ServicePackageXRef Parameters

Item	Parameter	Ref.	Status	Item Support or Values Supported
3.1.	serviceAgreementRef	Table 3-3	M	
3.2.	servicePackageRef	Table 3-3	M	

A2.1.5.4 Class ScheduledActivity

A2.1.5.4.1 General

Item	Description	Ref.	Status	Support
4.	ScheduledActivity	3.2.5	C1	

C1: If a ScheduledPackage class is contained in the Simple Schedule then there must be at least one ScheduledActivity for each ScheduledPackage.

A2.1.5.4.2 Class ScheduledActivity Parameters

Item	Parameter	Ref.	Status	Item Support or Values Supported
4.1.	scheduledActivityID	Table 3-4	M	
4.2.	stationRef	Table 3-4	M	
4.3.	antennaRef	Table 3-4	O	
4.4.	beginningOfActivity	Table 3-4	O	
4.5.	beginningOfTrack	Table 3-4	M	
4.6.	endOfTrack	Table 3-4	M	
4.7.	endOfActivity	Table 3-4	O	
4.8.	orbitNumber	Table 3-4	O	

A2.1.5.5 Class AdditionalActivityParameter

A2.1.5.5.1 General

Item	Description	Ref.	Status	Support
5.	AdditionalActivityParameter	3.2.6	O	

A2.1.5.5.2 Class AdditionalActivityParameter Parameters

The AdditionalActivityParameter class is used to specify additional parameters for ScheduledActivity. The additional parameters and permitted values for these should be specified in table A-1 below.

In the following table A-1 the columns have the following use:

- parameterName — This column is used to specify the names of the additional parameter(s).
- Description — This column is used to enter the description of what the additional parameter(s) is/are.
- parameterValueType — This column is used to specify what type the parameterValue is, e.g., String1024, Integer, Unsigned Integer, Real, CCSDS ASCII Time Code B, etc.
- Permitted Values — This column is used to specify the values that are permitted for the additional parameter(s).
- Data units — This column is used to specify the Data Unit of the additional parameter(s), e.g., Seconds, Hertz, Volts, UTC, etc.

Table A-1: Class AdditionalParameter Instantiated for Class AdditionalActivityParameter

parameterName	Description	parameterValue Type	Permitted Values	Data units

A2.1.5.6 Class ServiceInfo

A2.1.5.6.1 General

Item	Class	Ref.	Status	Support
6.	ServiceInfo	3.2.7	C2	

C2: If a ScheduledActivity class is contained in the Simple Schedule then there must be at least one ServiceInfo for each ScheduledActivity.

A2.1.5.6.2 Class ServiceInfo Parameters

Item	Parameter	Ref.	Status	Item Support or Values Supported
6.1.	serviceType	Table 3-5	M	
6.2.	frequencyBand	Table 3-5	M	

A2.1.5.7 Class AdditionalServiceParameter

A2.1.5.7.1 General

Item	Description	Ref.	Status	Support
7.	AdditionalServiceParameter	3.2.8	O	

A2.1.5.7.2 Class AdditionalServiceParameter Parameters

If this class is used to specify additional parameters for ServiceInfo, the additional parameters and permitted values for these should be specified in table A-2 below.

In the following table A-2 the columns have the following use:

- parameterName — This column is used to specify the names of the additional parameter(s).
- Description — This column is used to enter the description of what the additional parameter(s) is/are.
- parameterValueType — This column is used to specify what type the parameterValue is, e.g., String1024, Integer, Unsigned Integer, Real, CCSDS ASCII Time Code B, etc.
- Permitted Values — This column is used to specify the values that are permitted for the additional parameter(s).
- Data units — This column is used to specify the Data Unit of the additional parameter(s), e.g., Seconds, Hertz, Volts, UTC, etc.

Table A-2: Class AdditionalParameter Instantiated for Class AdditionalServiceParameter

parameterName	Description	parameterValue Type	Permitted Values	Data units

A2.1.5.8 Class AdditionalParameter

A2.1.5.8.1 General

Item	Description	Ref.	Status	Support
8.	`AdditionalParameter`	3.2.9	O	

NOTES

1 If this class is used to specify additional parameters for ScheduledActivity, the additional parameters and permitted values for these should be specified in A2.1.5.5.2.

2 If this class is used to specify additional parameters for ServiceInfo the additional parameters and permitted values for these should be specified in A2.1.5.7.2.

A2.1.5.8.2 Class AdditionalParameter Parameters

Item	Parameter	Ref.	Status	Item Support or Values Supported
8.1.	`parameterName`	Table 3-6	M	
8.2.	`parameterValue`	Table 3-6	M	

ANNEX B

XML SCHEMA FOR THE SIMPLE SCHEDULE FORMAT

(INFORMATIVE)

B1 SCHEMA ORGANIZATION AND PACKAGING

The XML schemas for the Simple Schedule are contained in the file 'SmSchemaServiceSchedule-v1_0'. The root element of the SmSchemaServiceSchedule-v1_0 schemas is the `SimpleSchedule` element. The zip file also contains a text version of the example XML document presented in B10.

While this Recommended Standard is being developed, the SmSchemaServiceSchedule-v1_0 schema file is contained in the zip file 'SimpleScheduleSchema-v1_0' located in the CWE/Cross Support Services Area (CSS)/Documents/CSS-SM/Red Book XML Schemas folder at URL http://cwe.ccsds.org/css/docs/Forms/AllItems.aspx?RootFolder=%2Fcss%2Fdocs%2FCSS%2DSM%2FRed%20Book%20XML%20Schemas&FolderCTID=0x012000A2CFA608DF169C4EB988261660CEFAEB&View={8045374D-F8E0-4356-83CA-993252A38FE8}

At or before publication of this Recommended Standard, the schemas will be made available via the SANA registry.

For ease in reading, the graphical representation of the corresponding XML schema has been split into two diagrams. Figure B-1 is the XMLSpy graphical representation of the SimpleSchedule, ScheduledPackage, and ServicePackageXRef components. As shown in figure B-1, the ScheduledPackage contains one or more instances of ScheduledActivity. Figure B-2 is the XMLSpy graphical representation of the ScheduledActivity, ServiceInfo, AdditionalServiceParameter, and AdditionalActivityParameter components.

The following subsections describe the XML types that make up the Simple Schedule XML schema and relate the parameters of those types to the corresponding UML classes in section 3.

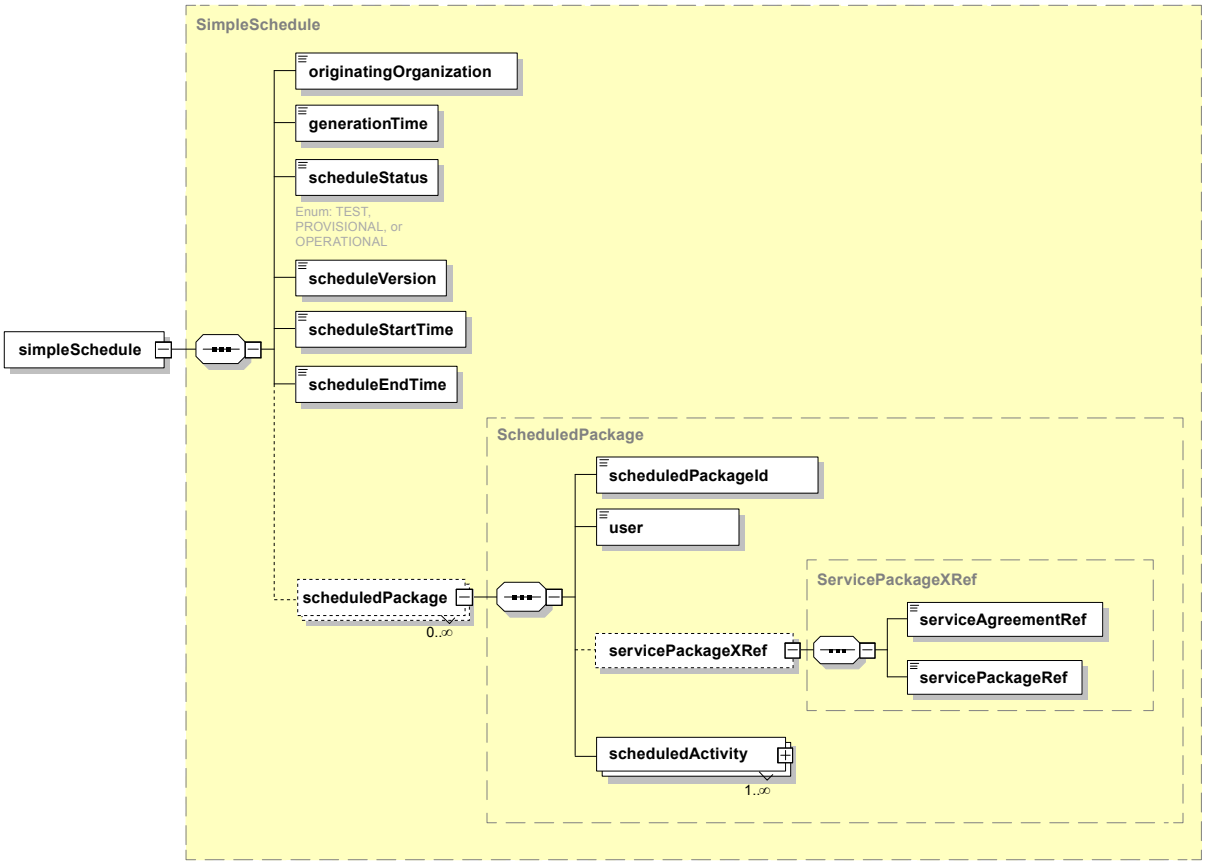

Figure B-1: XML Schema for the Simple Schedule: SimpleSchedule, ScheduledPackage, and ServicePackageXRef Types

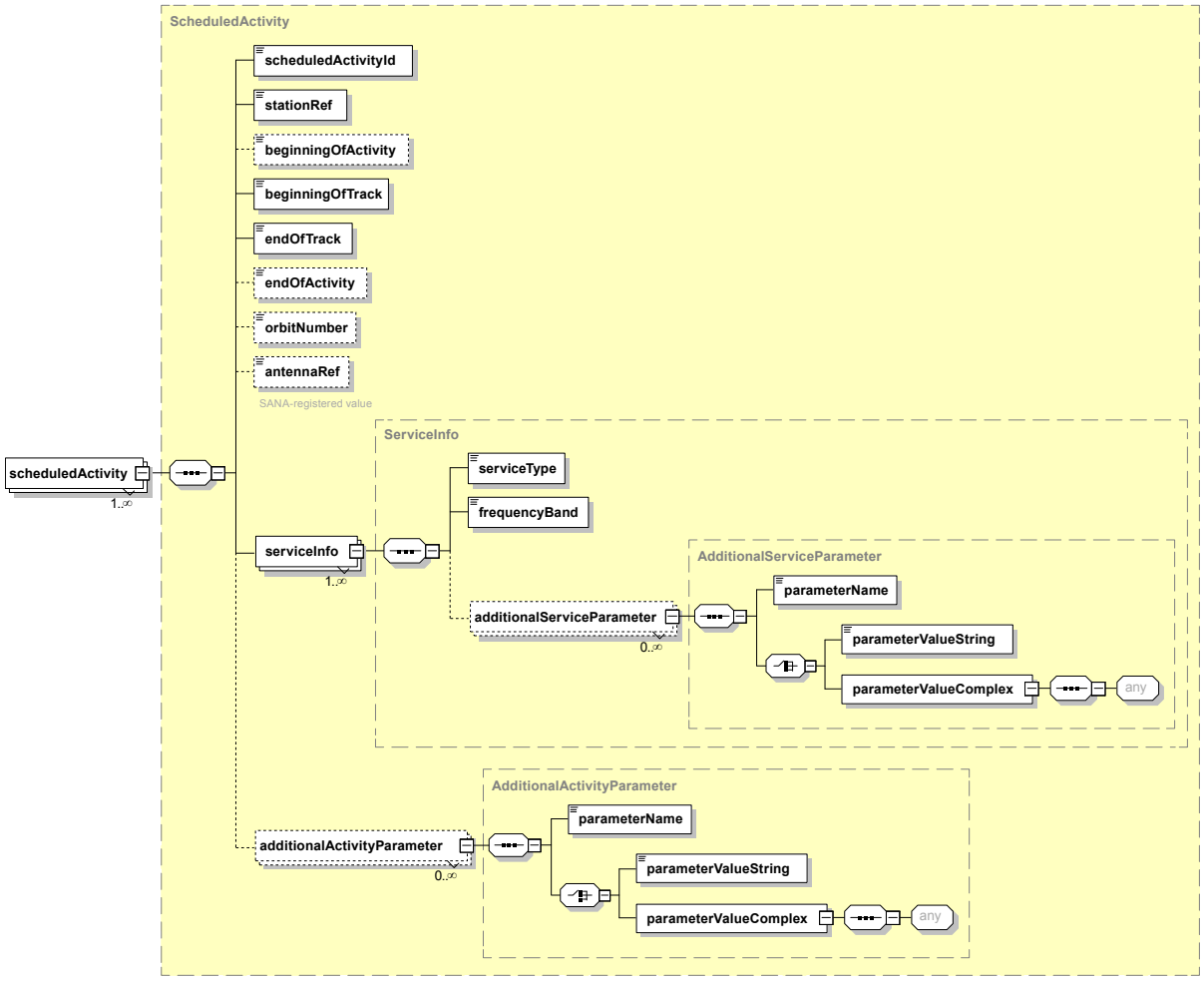

Figure B-2: XML Schema for the Simple Schedule: ScheduledActivity, ServiceInfo, AdditionalServiceParameter, and AdditionalActivityParameter Types

B2 `SimpleSchedule` TYPE

Table B-1 lists the parameters of the `SimpleSchedule` XML schema type and the XML schema types of those parameters. All parameters of the `SimpleSchedule` XML schema type have the same names, definitions, and data units as the corresponding parameters of the Simple Schedule UML class except the `scheduledPackage` parameter, which represents the containment of the Scheduled Package UML class by the Simple Schedule UML class.

The `CcsdsAsciiTimeCodeBType` XML type has been defined, which enforces the regular expression '`\d{4}-\d{3}T\d{2}:\d{2}:\d{2}\.\d+Z?`', which represents CCSDS ASCII Time Code B (YYYY-DDDThh:mm:ss.d->dZ). The `generationTime`, `scheduleStartTime`, and `scheduleStopTime` parameters are cast as `CcsdsAsciiTimeCodeBType`.

NOTE – This regular expression does not enforce the ranges of the field; e.g., it will accept 537 as a 'day of year'.

The `ScheduleStatus` XML type has been defined to represent the enumerated type with values 'TEST', 'PROVISIONAL', and 'OPERATIONAL' (see table 3-1).

Table B-1: SimpleSchedule Parameters

Parameter	Data Type
originatingOrganization	String1024Type
generationTime	CcsdsAsciiTimeCodeBType
scheduleStatus	ScheduleStatus
scheduleStartTime	CcsdsAsciiTimeCodeBType
scheduleEndTime	CcsdsAsciiTimeCodeBType
scheduleVersion	xsd:positiveInteger
scheduledPackage	ScheduledPackage

B3 `ScheduledPackage` TYPE

Table B-2 lists the parameters `ScheduledPackage` type and the XML schema types of those parameters. All parameters of the `ScheduledPackage` XML schema type have the same names, definitions, and data units as the corresponding parameters of the ScheduledPackage UML class except the `servicePackageXref` and `scheduledActivity` parameters, which represents the containment of the ServicePackageXRef and ScheduledActivity UML classes, respectively, by the ScheduledPackage UML class.

Table B-2: ScheduledPackage Parameters

Parameter	Data Type
scheduledPackageId	String1024Type
user	String1024Type
servicePackageXRef	ServicePackageXRef
scheduledActivity	ScheduledActivity

B4 `ServicePackageXRef` TYPE

Table B-3 lists the parameters of the `ServicePackageXRef` type and the XML schema types of those parameters. All parameters of the `ServicePackageXRef` XML schema type have the same names, definitions, and data units as the corresponding parameters of the ServicePackageXRef UML class.

Table B-3: ServicePackageXRef Parameters

Parameter	Data Type
`serviceAgreementRef`	`String1024Type`
`servicePackageRef`	`String1024Type`

B5 `ScheduledActivity` TYPE

Table B-4 lists the parameters of the `ScheduledActivity` XML type and the XML schema types of those parameters. All parameters of the `ScheduledActivity` XML schema type have the same names, definitions, and data units as the corresponding parameters of the ScheduledActivity UML class except the `serviceInfo` and `additionalActivityParameter` parameters, which represents the containment of the ServiceInfo and AdditionalActivityParameter UML classes, respectively, by the ScheduledActivity UML class.

Table B-4: ScheduledActivity Parameters

Parameter	Data Type
`scheduledActivityId`	`String1024Type`
`stationRef`	`String1024Type`
`BeginningOfActivity`	`CcsdsAsciiTimeCodeBType`. The element is defined as optional: the NULL value is represented by the absence of this element.
`beginningOfTrack`	`CcsdsAsciiTimeCodeBType`
`endOfTrack`	`CcsdsAsciiTimeCodeBType`
`EndOfActivity`	`CcsdsAsciiTimeCodeBType`. The element is defined as optional: the NULL value is represented by the absence of this element.
`orbitNumber`	`xsd:NonNegativeInteger`. The element is defined as optional: the NULL value is represented by the absence of this element.
`antennaRef`	`String1024Type`.
`serviceInfo`	`ServiceInfo`
`additionalActivity-Parameter`	`AdditionalActivityParameter`

B6 `ServiceInfo` TYPE

Table B-5 lists the parameters of the `ServiceInfo` XML type and the XML schema types of those parameters. All parameters of the `ServiceInfo` XML schema type have the same names, definitions, and data units as the corresponding parameters of the ServiceInfo UML class except the `additionalServiceParameter` parameter, which represents the containment of the AdditionalServiceParameter UML class by the ServiceInfo UML class.

Table B-5: ServiceInfo Parameters

Parameter	Data Type
`serviceType`	`xsd:string` with values restricted to the enumeration values: – TELEMETRY – TELECOMMAND – RANGING – DELTADOR – TEST – UNUSED – OFFLINE-TM – RESERVED – TBD
`frequencyBand`	`xsd:string` with values restricted to the enumeration values: – S-Band – X-Band – Ka-Band – Ku-Band – C-Band – L-Band – V-Band – Optical – N/A
`additionalServiceParameter`	`AdditionalServiceParameter`

B7 `AdditionalActivityParameter` TYPE

The `AdditionalActivityParameter` XML schema type is a subtype of the `AdditionalParameter` type, without extension or modification.

B8 `AdditionalServiceParameter` TYPE

The `AdditionalServiceParameter` XML schema type is a subtype of the `AdditionalParameter` type, without extension or modification.

B9 `AdditionalParameter` TYPE

Table B-6 lists the parameters of the `AdditionalParameter` XML type and the XML schema types of those parameters. All parameters of the `AdditionalParameter` XML schema type have the same names, definitions, and data units as the corresponding parameters of the AdditionalParameter UML class.

Table B-6: AdditionalParameter Type

Parameter	Data Type
`parameterName`	`String1024Type`
`parameterValue`	choice between a `String256Type` value and an `xsd:any` value.

B10 EXAMPLE XML DOCUMENT

Listing B-1 is an example XML document that conforms to version 1_0 of the Simple Schedule Format XML schema. It is pretty-printed to show the nesting of the type elements.

Figure B-3 is the XML Spy grid view of the example XML document.

Listing B-1: Example XML Document for Simple Schedule Format Schema V1.0

```
<?xml version="1.0" encoding="UTF-8"?>
<simpleSchedule xsi:schemaLocation="urn:ccsds:document:902x1r1
SmSchemaServiceSchedule-v1_0.xsd" xmlns="urn:ccsds:document:902x1r1"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <originatingOrganization>WOTIS</originatingOrganization>
   <generationTime>0000-000T00:00:00.0</generationTime>
   <scheduleStatus>TEST</scheduleStatus>
   <scheduleVersion>1</scheduleVersion>
   <scheduleStartTime>0000-000T00:00:00.0</scheduleStartTime>
   <scheduleEndTime>0000-000T00:00:00.0</scheduleEndTime>
   <scheduledPackage>
      <scheduledPackageId>SOLB-15</scheduledPackageId>
      <user>SOLB-SSOC</user>
      <servicePackageXRef>
         <serviceAgreementRef>WOTIS:SOLB-1</serviceAgreementRef>
         <servicePackageRef>SOLB-15</servicePackageRef>
      </servicePackageXRef>
      <scheduledActivity>
         <scheduledActivityId>2012-244-5</scheduledActivityId>
         <stationRef>MGS</stationRef>
```

```
            <beginningOfActivity>0000-000T00:00:00.0</beginningOfActivity>
            <beginningOfTrack>0000-000T00:00:00.0</beginningOfTrack>
            <endOfTrack>0000-000T00:00:00.0</endOfTrack>
            <endOfActivity>0000-000T00:00:00.0</endOfActivity>
            <orbitNumber>10982</orbitNumber>
            <antennaRef>10M</antennaRef>
            <serviceInfo>
               <serviceType>TELEMETRY</serviceType>
               <frequencyBand>S-Band</frequencyBand>
            </serviceInfo>
            <additionalActivityParameter>
               <parameterName>supportActivityCode</parameterName>
               <parameterValueString>TR1</parameterValueString>
            </additionalActivityParameter>
         </scheduledActivity>
      </scheduledPackage>
</simpleSchedule>
```

XML					
	version	1.0			
	encoding	UTF-8			
simpleSchedule					
	xsi:schemaLocation	urn:ccsds:document:902x1r1 SmSchemaServiceSchedule-v1_0.xsd			
	xmlns	urn:ccsds:document:902x1r1			
	xmlns:xsi	http://www.w3.org/2001/XMLSchema-instance			
	originatingOrganization	WOTIS			
	generationTime	0000-000T00:00:00.0			
	scheduleStatus	TEST			
	scheduleVersion	1			
	scheduleStartTime	0000-000T00:00:00.0			
	scheduleEndTime	0000-000T00:00:00.0			
	scheduledPackage				
		scheduledPackageId	SOLB-15		
		user	SOLB-SSOC		
		servicePackageXRef			
			serviceAgreementRef	WOTIS:SOLB-1	
			servicePackageRef	SOLB-15	
		scheduledActivity			
			scheduledActivityId	2012-244-5	
			stationRef	MGS	
			beginningOfActivity	0000-000T00:00:00.0	
			beginningOfTrack	0000-000T00:00:00.0	
			endOfTrack	0000-000T00:00:00.0	
			endOfActivity	0000-000T00:00:00.0	
			orbitNumber	10982	
			antennaRef	10M	
			serviceInfo		
				serviceType	TELEMETRY
				frequencyBand	S-Band
			additionalActivityParameter		
				parameterName	supportActivityCode
				parameterValueS...	TR1

Figure B-3: XML Spy Grid View of Example XML Document for Simple Schedule Format Schema V1.0

ANNEX C

SECURITY, SANA, AND PATENT CONSIDERATIONS

(INFORMATIVE)

C1 SECURITY CONSIDERATIONS

C1.1 OVERVIEW

This section presents the results of an analysis of security considerations applied to the technologies specified in this Recommended Standard.

C1.2 CONSEQUENCES OF NOT APPLYING SECURITY TO THE TECHNOLOGY

The consequences of not applying security to the systems and networks on which this Recommended Standard is implemented could include potential loss, corruption, and theft of data. Since it is possible to utilize these messages in preparing and disseminating schedules relating to the availability of communications and tracking resources for spacecraft, the consequences of not applying security to the systems and networks on which this Recommended Standard is implemented could include compromise or loss of the mission if malicious tampering of a particularly severe nature occurs.

C1.3 POTENTIAL THREATS AND ATTACK SCENARIOS

Potential threats or attack scenarios include, but are not limited to, (a) unauthorized access to the programs/processes that generate and interpret the messages, and (b) unauthorized access to the messages during transmission between exchange partners. Protection from unauthorized access during transmission is especially important if the mission utilizes open ground networks such as the Internet to provide ground station connectivity for the exchange of data formatted in compliance with this Recommended Standard. It is strongly recommended that potential threats or attack scenarios applicable to the systems and networks on which this Recommended Standard is implemented be addressed by the management of those systems and networks and the utilization of adequate authentication, suitable protocols, and secured interfaces for the exchange of this information.

C1.4 SECURITY CONCERNS RELATED TO THIS RECOMMENDED STANDARD

C1.4.1 Data Privacy

Privacy of data formatted in compliance with the specifications of this Recommended Standard should be assured by the systems and networks on which this Recommended Standard is implemented.

C1.4.2 Data Integrity

Integrity of data formatted in compliance with the specifications of this Recommended Standard should be assured by the systems and networks on which this Recommended Standard is implemented.

C1.4.3 Authentication of Communicating Entities

Authentication of communicating entities involved in the transport of data which complies with the specifications of this Recommended Standard should be provided by the systems and networks on which this Recommended Standard is implemented.

C1.4.4 DATA TRANSFER BETWEEN COMMUNICATING ENTITIES

The transfer of data formatted in compliance with this Recommended Standard between communicating entities should be accomplished via secure mechanisms approved by the Information Technology Security functionaries of exchange participants.

C1.4.5 Control of Access to Resources

Control of access to resources should be managed by the systems upon which provider formatting and recipient processing are performed.

C1.4.6 Auditing of Resource Usage

Auditing of resource usage should be handled by the management of systems and networks on which this Recommended Standard is implemented.

C1.5 UNAUTHORIZED ACCESS

Unauthorized access to the programs/processes that generate and interpret the messages should be prohibited in order to minimize potential threats and attack scenarios.

C1.6 DATA SECURITY IMPLEMENTATION SPECIFICS

Specific information-security interoperability provisions that apply between agencies and other independent users involved in an exchange of data formatted in compliance with this Recommended Standard should be specified in an ICD.

C2 SANA CONSIDERATIONS

C2.1 GENERAL

The recommendations of this document request SANA to create the registries described below. New assignments in these registries will be shown at the SANA registry Web site: http://sanaregistry.org. Therefore, the reader shall look at the SANA Web site for all the assignments contained in these registries.

Already registered values shall not be affected by the extension of this Recommended Standard and definition of new services.

Requests to add assignments to these registries shall be submitted to SANA and shall come from a member Agency, or an observer Agency, or a CCSDS Associate, or an industry partner supported by a member Agency. The request shall be related to a cross support activity. After evaluation of the request and approval by the CSS Area Director (AD) or CSS Area Deputy Area Directory (DAD) or a person duly authorized by the AD or DAD her/him, a new value will be allocated and added to the appropriate registry.

C2.2 SCCS-SM originatingOrganization REGISTRY

The registry named ‘SCCS-SM originatingOrganization’ consists of a list of organizations (see table 3-1) along with a description:

originatingOrganization:	a string of between 1 and 1024 characters in length.
Description:	a string of text describing the originatingOrganization.

C2.3 SCCS-SM USER REGISTRY

The registry named ‘SCCS-SM user’ consists of a list of users (see table 3-2) along with a description:

user:	a string of between 1 and 1024 characters in length.
Description:	a string of text describing the user.

The initial registry should be filled with the following values:

user	Description
UNALLOCATED	Indicates that the time is unallocated.
TEST	Indicates that the time is allocated for tests.

In addition to the above values in the 'user' column, any value contained in the SANA Spacecraft Identifiers Registry (http://sanaregistry.org/r/spacecraftid/spacecraftid.html) column 'Spacecraft Name' is also a valid value for the user parameter described in table 3-2 of this document.

For details of the governance policy of the Spacecraft Identifiers Registry please refer to http://sanaregistry.org/r/spacecraftid/spacecraftid.html.

C2.4 SCCS-SM stationAndAntennaRef REGISTRY

The registry named 'SCCS-SM stationAndAntennaRef' consists of a list of station references (see table 3-4) with (optionally) associated antenna references (see table 3-4) along with a description:

stationRef: a string of between 1 and 1024 characters in length.

antennaRef: a string of between 0 and 1024 characters in length.

Description: a string of text describing the stationRef and antennaRef.

NOTES

1 If a particular station has only one antenna, then the antennaRef field may be left blank.

2 If a particular station has two or more antennas then there shall be as many entries for the station in the registry as there are antennas, with each of the stationRef entries having a unique antennaRef.

The following table presents examples of how this registry should be populated.

stationRef	antennaRef	Description
STATION-1		An example of a station with only 1 antenna. In this case the antennaRef is left blank.
STATION-2	ANTENNA-1	An example of a station with only 1 antenna. In this case the antennaRef has been specified.
STATION-3	ANTENNA-1	This example is of a station which has 3 antennas. This entry refers to antenna-1 at that station.
STATION-3	ANTENNA-2	This example is of a station which has 3 antennas. This entry refers to antenna-2 at that station.
STATION-3	ANTENNA-3	This example is of a station which has 3 antennas. This entry refers to antenna-3 at that station.

C3 PATENT CONSIDERATIONS

No patent rights are known to adhere to any of the specifications of the Recommended Standard.

ANNEX D

ABBREVIATIONS AND ACRONYMS

(INFORMATIVE)

ASCII	American Standard Code for Information Interchange
CCSDS	Consultative Committee on Space Data Systems
ICD	Interface Control Document
OMG	Object Management Group
SANA	Space Assigned Numbers Authority
TBD	To Be Decided
UML	Unified Modeling Language
UTC	Coordinated Universal Time
W3C	World Wide Web Consortium
XML	eXtensible Markup Language

ANNEX E

INFORMATIVE REFERENCES

(INFORMATIVE)

[E1] *Space Communication Cross Support—Service Management—Operations Concept*. Issue 1. Report Concerning Space Data System Standards (Green Book), CCSDS 910.14-G-1. Washington, D.C.: CCSDS, May 2011.

[E2] *Extensible Space Communication Cross Support—Service Management—Concept*. Report Concerning Space Data System Standards (Green Book). Washington, D.C.: CCSDS, forthcoming.

ANNEX F

FREQUENCY BAND DEFINITIONS

(INFORMATIVE)

NOTE – The frequency bands definitions below are for informative purposes only; the actual details of the specific frequencies used for uplink, downlink, etc., will be specified in the service agreement. The following definitions, which do not distinguish between uplink or downlink or specify sub-bands, are thus sufficient for the purposes of this Recommended Standard.

Band	Range (MHz)	Comment
C-Band	3400 - 6725	
Ka-Band	18000 - 35000	
Ku-Band	10700 - 14500	
L-Band	1215 - 1850	
S-Band	2025 - 2400	
V-Band	37500 - 50200	
X-Band	7025 - 8500	
Optical		This is essentially a placeholder. May need further refinement as Optical communications standards mature.