Canadian Space Agency

MULTI-MISSION OPERATION CENTER (MMOC)

Multi-Mission Antenna Reservation System (ARS) Interface Control Document

Revision 1.0

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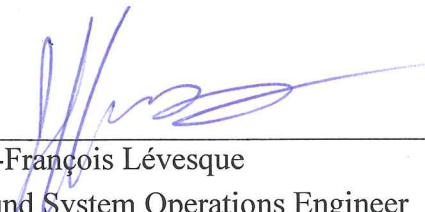**Canadian Space Agency**   **Agence Spatiale Canadienne**

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PREFACE

This document and all changes to it shall be approved by the Canadian Space Agency (CSA)'s Multi-Mission Operation Center manager. Proposed changes to the currently approved baselined version of this document shall be forwarded to the CSA Configuration Management (CM) Receipt Desk for evaluation and submission for approval. Approved changes shall be incorporated in the next revision.

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REVISION HISTORY

Rev.	Description	Initials	Date
1.0	Initial Release Released by the approval of CSA CR ##	PC / JFL	February 7, 2014

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1   INTRODUCTION

1.1   PURPOSE

The purpose of this document is to specify the interface definition of the Antenna Reservation System (ARS) addressing the need for antenna resource coordination in the context of a multi-mission satellite control center. The ARS is functional sub-system as part of the CSA's Multi-Mission Operation Center (MMOC) architecture. With respect to the RADARSAT Constellation Mission (RCM), the ARS is also a sub-system component of the Government Furnished Equipment (GFE) in support of the overall RCM Ground Segment (GS).

1.2   SCOPE

The ARS Interface Control Document (ICD) shall comply with the interface of facilities not controlled by the MMOC (External Facilities). The ARS shall also comply with the interface of actual missions and missions under development such as the RCM. This document comes with the companion Multi-Mission Antenna Reservation System (ARS) Requirements Document (AD-1), which details the system requirements.

1.3   APPLICABILITY

This document defines the standard antenna reservation interface for RCM and all future Canadian missions. In case of discrepancies with the RCM Reservation System ICD, this document shall prevail. Also, current operational missions are to be brought to this standard interface, where possible. However, interface migration is discussed more in detail in this document. This standard philosophy also applies to the interface with facilities that are controlled by the MMOC (Internal Facilities).

2   DEFINITIONS

2.1   ACRONYMS AND ABBREVIATIONS

ACS	Attitude Control System
AD	Applicable Document
AOS	Acquisition of Signal
ARS	Antenna Reservation System
ASCII	American Standard Code for Information Interchange
CAAL	Canadian Aldergrove Facility
CAMA	Canadian Masstown Facility
CCMEO	Canada Centre for Mapping and Earth Observation
CM	Configuration Management
CSA	Canadian Space Agency
DCS	De-Conflict System
DLR	Deutches Zentrum für Luft- und Raumfart (German Space Agency)
DOY	Day of Year
DR	Data Reception
DRDC	Defence Research and Development Canada
GFE	Government Furnished Equipment
GS	Ground Segment
GSS	Gatineau Satellite Station
GUI	Graphic User Interface
ICD	Interface Control Document
ID	Identification
INSS	Inuvik Satellite Station
kbps	Kilobit per second
KSAT	Kongsberg Satellite Services
LEOP	Launch and Early Operations Phase
LOS	Loss of Signal
MMOC	Multi-Mission Operation Center
MPS	Mission Planning Subsystem
NASA	National Aeronautics and Space Administration
NGT	Northern Ground Terminal
NORAD	North American Aerospace Defense Command
NRT	Near-Real-Time
PASS	Prince-Albert Satellite Station

PD	Parent Document
PE2	Polar Epsilon 2
RCM	RADARSAT Constellation Mission
RD	Reference Document
RF	Radio Frequency
RNG	Ranging
RT	Real-Time
SAR	Synthetic Aperture Radar
SASK	Saskatoon Facility
SCS	Satellite Control Subsystem
SF	Store and Forward
SHUB	St-Hubert Facility
SOE	Satellite Orbit Ephemeris
SRD	Specification Requirement Document
SSC	Swedish Space Corporation
TBC	To Be Confirmed
TBD	To Be Determined
TC	Telecommand
TLE	Two-Line Elements
TM	Telemetry
TT&C	Telemetry, Tracking & Commanding
UTC	Coordinated Universal Time
XML	Extensible Markup Language

2.2 TERMINOLOGY

TABLE 2-1 TERMINOLOGY DEFINITIONS

System	Is the physical implementation (hardware and software) of the ARS functionalities. (Note: In addition to the System, the overall ARS may include other elements such as a Backup System, the Operator interface, the network connectivity, the voice interface, the System maintenance, the programmatic layer, etc.)
Operator	Is the personnel that commands and controls the System. The Operator has delegated rights to operate the ARS, approve Schedules, generate or edit Configurations, modify scheduling rules and algorithms, and manually reserve Antenna time.
Antenna	Is composed of a tracking dish reflector with RF components and baseband equipment required to conduct ranging, TT&C and/or Data Reception (DR) operations for a satellite mission.
Facility	Consists of one or multiple unique ground station Antennas, and appropriate equipment to conduct either or both TT&C and DR operations. Facilities exclude transponders and Network Stations like the ones used by RADARSAT.
Internal Facility	Is a Facility that is owned and operated by the CSA. It is assumed that Internal Facilities will be controlled by the ARS Operator.
External Facility	Is a Facility, domestic or foreign, that is controlled by a third-party organization.
Network Station	Is an Antenna station used for local DR of commercial data dedicated to a commercial client of a given Mission. Network Station is not considered a schedulable Facility in the scope of the ARS.
Mission	Consists of one or multiple Earth orbiting Satellites, and appropriate ground segment functional elements required to conduct the mission operations such as the Mission Planning Subsystem (MPS).
Satellite Orbital Ephemeris	Is the orbital ephemeris information required to propagate a Satellite's orbit and that is translated in a standard message format like the NORAD Two-Line Elements (TLE).
Satellite Contact	Is the time period where the Mission Satellite have a contact line-of-sight with a Facility Antenna resource, and which the resource can be allocated to the Mission on a Schedule.
Contingency Contact	Is a backup or alternate Satellite Contact to a nominal one that occurs on another Antenna within a defined time window.
Compliant Contact	Is a contact that satisfies all the System, Mission and Facility Configuration Constraints while being a valid contact as propagated

from the Satellite Orbital Ephemeris.

Accepted Contact	Is the status of a requested Satellite Contact from an Antenna Access Request that has been accepted by the Facility.
Committed Contact	Is the status of a Satellite Contact that has been accepted by the Facility and committed by the ARS.
Deleted Contact	Is the status of a previously requested Satellite Contact that has been deleted by the Mission on a subsequent Satellite Contact Request.
Rejected Contact	Is the status of a requested Satellite Contact that has been rejected either by the Facility or by the ARS.
Cancelled Contact	Is the status of a previously Accepted or Committed Satellite Contact that has now been cancelled by the Facility for exceptional reasons.
Rescheduled Contact	Is the status of a requested Satellite Contact that has been rejected either by the Facility or by the ARS and that has been automatically rescheduled from another available Contact by the ARS.
Locked Contact	Is a Committed Contact that has been Locked by the operator to prevent any future automatic unallocation or rescheduling by the System.
Contact Criticality	Is the qualifier of a Contact that allows prioritization during the de-conflicting process in the computation of a Schedule. Criticality levels could be defined as Critical, Important and Routine.
Critical Contact	Relates to spacecraft Health & Safety (launch, collision avoidance, satellite recovery).
Important Contact	Relates to time-sensitive or emergency operations of the Mission (Fast-Tasking, Near-Real-Time (NRT) download, disaster monitoring, national security).
Routine Contact	Relates to all other operational Contacts.
Proficiency Contact	Relates to a contact that is required for periodical or ad-hoc validation and testing of the end-to-end ground systems with a specific Facility.
Satellite Contact Request	Is a list of desired Satellite Contacts that are requested by the Mission for allocation by the System on the Schedule. A Request may also include added, removed and modified Contacts from a previous Request with respect to the same time window.
Request Validity Report	Is a Satellite Contact Request that was checked and validated by the System against a Compliant Satellite Contact List. The Report includes an invalidity explanation field.
Compliant Satellite Contact List	Is the list of all Compliant Contacts for all Satellites and all Antennas generated by the ARS propagator and associated with a defined

	Schedule time window.
Antenna Access Request	Is a list of time periods where the System requests access to Facility Antenna resources in support of Missions.
Request Acknowledgment	Is a return message acknowledging reception of a Satellite Contact Request by the ARS or Antenna Access Request by the Facility.
Request Confirmation	Is a return message accepting, rejecting or cancelling Contacts from the Schedule of an Antenna Access Request.
Antenna Unavailability Report	Is a list of time periods where the Facility Antenna is not available for allocation to a Mission.
Schedule	Is a list of time-tagged Satellite Contacts for all Missions that have been allocated amongst the pool of Facility Antennas. A Schedule is conflict-free, that is only a single Satellite Contact is allocated at any given time to an Antenna. It contains in addition a set of fields describing for each Contact, the Mission Satellite ID, the Facility Antenna ID, the Acquisition of Signal (AOS) time, Contact duration, Loss of Signal (LOS) time, Satellite RF On/Off time, maximum antenna elevation, RF bands, RF data rate, etc.
Preliminary Schedule	Is a Schedule that has been generated by the System but is pending Operator's approval before sending requests to Facilities.
Approved Schedule	Is a Preliminary Schedule that has been approved by the Operator for access request to External Facilities.
Accepted Schedule	Is a Schedule containing all Accepted Contacts from Facilities but is pending Operator's final commitment.
Committed Schedule	Is an Accepted Schedule that has been approved by the Operator for distribution to Missions and Internal Facilities.
Obsolete Schedule	Is a Schedule that has been overruled by a new Committed Schedule.
Antenna Schedule	Is a subset of the Schedule that represents only the Satellite Contacts and fields relevant to a Facility.
Satellite Contact Schedule	Is a subset of the Schedule that represents only the Satellite Contacts and fields relevant to a Mission.
Performance Report	Is a summary of Mission requirements fulfillment and Facility usage resulting from a specific Schedule. This may include the total time allocated for each Mission Satellite on Facility Antennas, the unallocated/reallocated Satellite Contacts from Requests, and relative figures of merit of allocation time and requirement fulfillment.
Antenna Reservation Performance Report	Is a subset of the Performance Report that displays the specific Antenna usage relevant to a Facility.

Satellite Contact Performance Report	Is a subset of the Performance Report that displays the Satellite Contact allocation relevant to a Mission.
Configuration	Is a set of user-configurable parameters that captures the definition, constraints and requirements of a Facility, a Mission or the System . Its format could be stored as readable, binary or XML file, or simply captured by a user interface. Every System, Facility and Mission Configuration uses their respective structure type but each individual has its unique parameter Configuration.
Configuration Constraints	Is a subset of the Configuration parameters that specifically address constraints to be used during orbit propagation and also for validation of Satellite Contact Requests.
Configuration Requirements	Is a subset of the Configuration parameters that specifically address minimal Mission autonomous scheduling requirements to be met when the Mission does not provide a Satellite Contact Request or to be taken into account during rescheduling of Contacts. This also proves useful for keeping regular contacts with a Satellite for health monitoring when there is only little mission operations needed over a long period of time.

2.3   TRANSPORT DESIGN CONVENTIONS

2.3.1 File Transfer

File transfer is used for point-to-point transfer of messages and data as discrete files exchanged asynchronously via predefined channels (e.g. dropboxes).

2.3.2 Date/Time Convention

In order to reduce size and complexity of the document, the following table will detail the format used to describe dates and times during this document.

Format	Description	Range
DD	Day two-digits number (in month)	01 … 31
DOY	Day of the year three-digit number	001 … 366
Mon	Month three-letter name	Jan ... Dec
Month	Month complete name	January … December
MM	Month two-digit number (in year)	01 … 12
YYYY	Year four-digit number	2000 … 2099
hh	Hour two-digit number	00 … 23
mm	Minute two-digit number	00 … 59
ss	Second two-digit number	00 … 59
ww	Two-digit week number	01...52
ff…f	Fraction of a second	Depends on the number of digits
nn…n	Integer value	Depends on the number of digits. Note: If related to the orbit field inside of the product file (and not in the file name), all leading digits will not be printed/shown if zero.
cc	Two-digit cyclic counter	00 … 99
aa…a	Variable length character string	Depends on the number of characters.

NOTE: UNLESS OTHERWISE MENTIONED, NUMBERS WILL BE ADDED WITH LEADING ZEROS IF THEIR VALUE IS TOO SMALL TO FIT THE FORMAT.

TABLE 2: FIELDS FORMAT

Within the MMOC, the specific format for displaying a generic time will be used as follows:

YYYY-MM-DDThh:mm:ss.fff   in the case where fractional seconds are necessary;

YYYY-MM-DDThh:mm:ss   in the case where whole seconds are acceptable.

This format for full date and time will be used whenever possible (both in header information and within the data itself).

2.3.3 File Name Convention

For the File Transfer transport mechanism, the file naming convention used, except where otherwise noted, is as follows:

<originator>__<recipient>__<xxx…xx>.<info type>.<extension>

where

      <originator> is a constant string that identifies the originator of the file;

      <recipient> is a constant string that identifies the recipient of the file;

      <xxx…xx> is a variable length string that makes the file name unique and is such that when files from a particular originator to a particular recipient are alphanumerically sorted based on this string, they will be sorted in order of the creation time of the file;

      <info type> is a constant string that identifies the information flow type;

      <extension> is a constant string that identifies the file type;

      <originator>, *<recipient>*, *<xxx…xx>*, *<info type>*, and *<extension>* all conform to the regular expression [0-9A-Za-z_\-]+ and do not contain any double underscore sequences;

      there are two consecutive underscores immediately after *<originator>*;

      if *<recipient>* is included in the filename then there are two consecutive underscores immediately after *<recipient>*;

      the maximum file name length including the file extension is 140 characters.

If the information flow is not directed at a single recipient (for example with a broadcast or subscription paradigm), the recipient string and its trailing underscores may be omitted from the file name.

If a date/time stamp is used in the file name, it must be in UTC and of the form YYYY-MM-DDThh-mm-ss-ff…f, where "-ff…f" is optional. (Hyphen is used for time separation in file names as the colon character is avoided in order to maintain cross-platform compatibility)

Details of the file name format are specified in the File Name Format section for each information flow.

3 DOCUMENTS

3.1 APPLICABLE DOCUMENTS

The following documents of the exact issue date and revision level shown are applicable and form an integral part of this document to the extent specified herein.

Ref #	Document Number	Rev.	Title
AD-1	MMCSA-SP0001	1.0	Multi-Mission Antenna Reservation System (ARS) Requirements Document
AD-2	http://celestrak.com/columns/v04n03/#FAQ01 http://celestrak.com/NORAD/documentation/ADCOM%20DO%20Form%2012.pdf		Two-Line Element set format (Celestrak)
AD-3	http://spaceflight.nasa.gov/realdata/sightings/SSapplications/Post/JavaSSOP/SSOP_Help/tle_def.html		Two-Line Element set format (NASA)
AD-4	http://www.celestrak.com/SpaceTrack/TLERetriever3Help.asp		Space Track TLE Retriever v3
AD-5	https://www.space-track.org/documentation#formats		Space Track interface formats

3.2 REFERENCE DOCUMENTS

The following documents provide additional information or guidelines that either may clarify the contents or are pertinent to the history of this document.

Ref #	Document Number	Revision	Title
RD-1	RCM-IC-53-1948	1/3	RCM Reservation System ICD
RD-2	RSCSA-IC0015	E	De-Conflict System Tool (DCS) ICD
RD-3	RJ-IC-51-0929	4/0	Reception, Archiving and Cataloguing Controller (RACC) ICD
RD-4		1.0	KSAT Scheduling and Post Pass Reporting ICD
RD-5			KSAT Scheduling – XML format description for customers
RD-6			KSAT Acquisition availability – XML format description for customers
RD-7	MMCSA-IC0002	C	Live Schedule Board ICD

Note: Without their respective ICD, it is assumed that the interfaces of SASK, SHUB, DRDC and PE2 Facilities will conform to this document.

4   ANTENNA RESERVATION SYSTEM OVERVIEW

Please refer to Section 4 of AD-1 for the Antenna Reservations System overview.

5   MISSION INTERFACE

5.1   MESSAGE FORMAT

The message format used for the Mission interface are files coded using the Extensible Markup Language (XML). The content and tag descriptions for each message types are defined below.

5.2   TRANSPORT MECHANISM

The transport mechanism used between the Mission and the ARS is file transfer. This mechanism allows the information to be exchanged asynchronously as point-to-point discrete files via predefined channels (i.e. dropboxes).

The transport mechanism shall rely on the Secure Shell File Transfer Protocol (SFTP) to transfer files to the designated mission dropboxes.

5.3   MESSAGE DESCRIPTIONS

5.3.1   Satellite Orbital Ephemeris (SOE)

5.3.1.1 Message Composition

Field	Format	Description
header		Tag in which to enter file header tags
originator	e.g. SCISAT	Organization or mission identifier
recipient	CSA_ARS	
generation_time	YYYY-MM-DDThh:mm:ss	file generation time (UTC)
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition. Optional and if used, any instance of <satellite_name> under the <contact_request> tag will be disregarded.
body		Tag containing an unlimited number of <TLE> tags
TLE		Tag in which to enter TLE information, each with a single <satellite_name>, <TLE-1> and <TLE-2> tag. Unlimited.
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition
TLE-1	As per AD-2 and AD-3	First line of TLE
TLE-2	As per AD-2 and AD-3	Second line of TLE

5.3.1.2 File Name Format

The filename format for Satellite Orbital Ephemeris uses the filename convention Section 2.3.2:

<originator>__<recipient>__<xxx…xx>.<info type>.<extension>

Where:

<originator> is the <Mission identifier>,

<recipient> is CSA_ARS,

<xxx…xx> is a Satellite Orbital Ephemeris unique reference number that shall contain a date/time stamp,

<info type> is SOE,

<extension> is xml.

5.3.2 Satellite Contact Request

5.3.2.1 Message Composition

Field	Format	Description
header		Tag in which to enter file header tags
originator	e.g. SCISAT	Organization or mission identifier
recipient	CSA_ARS	
generation_time	YYYY-MM-DDThh:mm:ss	file generation time (UTC)
request_reference	e.g. S1R001	Any unique Request identifier
schedule_valid_from	YYYY-MM-DDThh:mm:ss	
schedule_valid_to	YYYY-MM-DDThh:mm:ss	
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition. Optional and if used, any instance of <satellite_name> under the <contact_request> tag will be disregarded.
antenna_name	e.g. SASK	Antenna name. Optional and if used, any instance of <antenna_name> under the <contact_request> tag will be disregarded.
body		Tag containing an unlimited number of <contact_request> tags
contact_request		Tag in which to enter contact-specific tags
contact_id	e.g. S1R001C001	Any unique Contact identifier on a Request

Field	Format	Description
contact_request_action	ADD or DELETE	
contact_criticality	ROUTINE, IMPORTANT, CRITICAL.	CRITICAL relates to spacecraft Health & Safety, IMPORTANT relates to time-sensitive or user emergency operations (Fast-Tasking, Near-Real-Time (NRT).
contact_reschedulability	DROP, RESCHEDULE or hh:mm:ss	Specify what to do in case of conflicts. Drop the contact or reschedule any time or within the specified validity time window from <start_time>. Optional, and if omitted will default to RESCHEDULE any time.
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition
antenna_name	e.g. SASK	Requested antenna name, optional
orbit	nnnnnn	Satellite orbit number. Optional
start_time	YYYY-MM-DDThh:mm:ss	
end_time	YYYY-MM-DDThh:mm:ss	
rf_on_time	YYYY-MM-DDThh:mm:ss	Optional
rf_off_time	YYYY-MM-DDThh:mm:ss	Optional
rf_band	S, X, C, SX, SC, SCX	Optional
rf_service	RNG, TC, RT-TM, SF-TM, RT-DR, SF-DR	Optional
uplink	YES or NO	Optional
configuration		Single tag containing an unlimited number of <parameter> tags. Optional.
parameter		Tag in which to enter optional parameters, each with a single <name> and <value> tag. Optional, unlimited.
name	e.g. sband_rate	
value	e.g. nnnn.fffkbps	

5.3.2.2 File Name Format

The filename format for Satellite Contact Request uses the filename convention Section 2.3.2:

<originator>__<recipient>__<xxx…xx>.<info type>.<extension>

Where:

<originator> is the <Mission identifier>,

<recipient> is CSA_ARS,

<xxx…xx> is a Satellite Contact Request unique reference number that may contain a date/time stamp,

<info type> is SCR,

<extension> is xml.

5.3.3 Satellite Contact Request Acknowledgement

5.3.3.1 Message Composition

Field	Format	Description
header		Tag in which to enter file header tags
originator	e.g. SCISAT	Organization or mission identifier
recipient	CSA_ARS	
generation_time	YYYY-MM-DDThh:mm:ss	file generation time (UTC)
request_reference	e.g. S1R001	Any unique Request identifier
schedule_valid_from	YYYY-MM-DDThh:mm:ss	
schedule_valid_to	YYYY-MM-DDThh:mm:ss	
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition. Optional and if used, any instance of <satellite_name> under the <contact_request> tag will be disregarded.
antenna_name	e.g. SASK	Antenna name. Optional and if used, any instance of <antenna_name> under the <contact_request> tag will be disregarded.
body		Tag containing an unlimited number of <contact_request> tags
contact_request		Tag in which to enter contact-specific tags
contact_id	e.g. S1R001C001	Any unique Contact identifier on a Request
contact_request_action	ADD or DELETE	
contact_criticality	ROUTINE, IMPORTANT,	CRITICAL relates to spacecraft

Field	Format	Description
	CRITICAL.	Health & Safety, IMPORTANT relates to time-sensitive or user emergency operations (Fast-Tasking, Near-Real-Time (NRT).
contact_reschedulability	DROP, RESCHEDULE or hh:mm:ss	Specify what to do in case of conflicts. Drop the contact or reschedule any time or within the specified validity time window from <start_time>. Optional, and if omitted will default to RESCHEDULE any time.
contact_request_status	DELETED, REJECTED, PENDING	
rejected_reason	OVERRULED, INCOMPLIANT ANTENNA, WRONG RF BAND, WRONG SERVICE, WRONG TIME.	Optional, if <contact_request_status> is REJECTED
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition
antenna_name	e.g. SASK	Requested antenna name, optional
orbit	nnnnn	Satellite orbit number. Optional
start_time	YYYY-MM-DDThh:mm:ss	
end_time	YYYY-MM-DDThh:mm:ss	
rf_on_time	YYYY-MM-DDThh:mm:ss	Optional
rf_off_time	YYYY-MM-DDThh:mm:ss	Optional
rf_band	S, X, C, SX, SC, SCX	Optional
rf_service	RNG, TC, RT-TM, SF-TM, RT-DR, SF-DR	Optional
uplink	YES or NO	Optional
configuration		Single tag containing an unlimited number of <parameter> tags. Optional.
parameter		Tag in which to enter optional parameters, each with a single <name> and <value> tag. Optional, unlimited.

Field	Format	Description
name	e.g. sband_rate	
value	e.g. nnnn.fffkbps	

5.3.3.2 File Name Format

The filename format for Satellite Contact Request Acknowledgment uses the filename convention Section 2.3.2:

   <originator>__<recipient>__<xxx…xx>.<info type>.<extension>

Where:

   <originator> is CSA_ARS,

   <recipient> is the *<Mission identifier>*,

   <xxx…xx> is the dependant Satellite Contact Request unique reference number,

   <info type> is SCA,

   <extension> is xml.

5.3.4 Satellite Contact Schedule

5.3.4.1 Message Composition

Field	Format	Description
header		Tag in which to enter file header tags
originator	CSA_ARS	
recipient	e.g. SCISAT	Organization or mission identifier
generation_time	YYYY-MM-DDThh:mm:ss	file generation time (UTC)
schedule_reference	e.g. SCI0001	Unique Schedule identifier, incremental numbering
schedule_valid_from	YYYY-MM-DDThh:mm:ss	
schedule_valid_to	YYYY-MM-DDThh:mm:ss	
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition. Optional and if used, any instance of <satellite_name> under the < scheduled_contact > tag will be disregarded.
antenna_name	e.g. SASK	Antenna name. Optional and if used, any instance of <antenna_name> under the < scheduled_contact > tag will be disregarded.

Field	Format	Description
body		Tag containing an unlimited number of <contact_request> tags
scheduled_contact		Tag in which to enter contact-specific tags
contact_id	e.g. S1R001C001	Any unique Contact identifier from the Request
contact_criticality	ROUTINE, IMPORTANT, CRITICAL.	CRITICAL relates to spacecraft Health & Safety, IMPORTANT relates to time-sensitive or user emergency operations (Fast-Tasking, Near-Real-Time (NRT).
contact_reschedulability	DROP, RESCHEDULE or hh:mm:ss	Optional. Specify what to do in case of conflicts. Drop the contact or reschedule any time or within the specified validity time window from <start_time>. Optional, and if omitted will default to RESCHEDULE any time.
contact_request_status	DELETED, COMMITTED, REJECTED, CANCELLED, RESCHEDULED	
rejected_reason	OVERRULED, INCOMPLIANT ANTENNA, WRONG RF BAND, WRONG SERVICE, WRONG TIME.	Optional, if <contact_request_status> is REJECTED or CANCELLED
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition
antenna_name	e.g. SASK	Requested antenna name, optional
orbit	nnnnn	Satellite orbit number. Optional
start_time	YYYY-MM-DDThh:mm:ss	
end_time	YYYY-MM-DDThh:mm:ss	
rf_on_time	YYYY-MM-DDThh:mm:ss	Optional
rf_off_time	YYYY-MM-DDThh:mm:ss	Optional
rf_band	S, X, C, SX, SC, SCX	Optional
rf_service	RNG, TC, RT-TM, SF-TM,	Optional

Field	Format	Description
	RT-DR, SF-DR	
uplink	YES or NO	Optional
configuration		Single tag containing an unlimited number of <parameter> tags. Optional.
parameter		Tag in which to enter optional parameters, each with a single <name> and <value> tag. Optional, unlimited.
name	e.g. sband_rate	
value	e.g. nnnn.fffkbps	

5.3.4.2 File Name Format

The filename format for Satellite Contact Schedule uses the filename convention Section 2.3.2:

        <originator>__<recipient>__<xxx…xx>.<info type>.<extension>

Where:

        <originator> is CSA_ARS,

        <recipient> is the *<Mission identifier>*,

        <xxx…xx> is a Satellite Contact Schedule unique reference number that may contain a date/time stamp,

        <info type> is SDL,

        <extension> is xml.

5.3.5 Satellite Contact Schedule Acknowledgement

5.3.5.1 Message Composition

Field	Format	Description
header		Tag in which to enter file header tags
originator	e.g. SCISAT	Organization or mission identifier
recipient	CSA_ARS	
generation_time	YYYY-MM-DDThh:mm:ss	file generation time (UTC)
schedule_reference	e.g. SCI0001	Unique Schedule identifier, incremental numbering
schedule_valid_from	YYYY-MM-DDThh:mm:ss	
schedule_valid_to	YYYY-MM-DDThh:mm:ss	

Field	Format	Description
satellite_name	e.g. SCISAT-1	Optional
antenna_name	e.g. SASK	Optional

5.3.5.2 File Name Format

The filename format for Satellite Contact Schedule Acknowledgment uses the filename convention Section 2.3.2:

<originator>__<recipient>__<xxx…xx>.<info type>.<extension>

Where:

<originator> is the *<Mission identifier>*,

<recipient> is CSA_ARS,

<xxx…xx> is the respective Satellite Contact Schedule unique reference number,

<info type> is SDLA,

<extension> is xml.

5.3.6 Satellite Contact Performance Report

5.3.6.1 Message Composition
TBD

5.3.6.2 File Name Format

The filename format for Satellite Contact Schedule Acknowledgment uses the filename convention Section 2.3.2:

<originator>__<recipient>__<xxx…xx>.<info type>.<extension>

Where:

<originator> is the *<Mission identifier>*,

<recipient> is CSA_ARS,

<xxx…xx> is the respective Satellite Contact Schedule unique reference number,

<info type> is SCPR,

<extension> is xml.

5.4   COMPATIBILITY OF ACTUAL MISSIONS

5.4.1 Scisat Interface Migration
TBD

5.4.2 Radarsat-2 Interface Migration
TBD

5.4.3 NEOSSat Interface Migration
TBD

5.4.4 M3MSat Interface Migration
TBD

6   INTERNAL FACILITY INTERFACE

6.1   MESSAGE FORMAT

The message format used for the Internal Facility interface are files coded using XML. The content and tag descriptions for each message types are defined below.

6.2   TRANSPORT MECHANISM

The transport mechanism used between the Internal Facility and the ARS is file transfer. This mechanism allows the information to be exchanged asynchronously as point-to-point discrete files via predefined channels (i.e. dropboxes).

The transport mechanism shall rely on the Secure Shell File Transfer Protocol (SFTP) to transfer files to the designated mission dropboxes.

6.3   MESSAGE DESCRIPTIONS

6.3.1   Antenna Unavailability Report

6.3.1.1   Message Composition

Field	Format	Description
header		Tag in which to enter file header tags
originator	e.g. CCMEO	Organization or mission identifier
recipient	CSA_ARS	
generation_time	YYYY-MM-DDThh:mm:ss	file generation time (UTC)
report_reference	e.g. CCMEO001	Unique identifier, incremental numbering
schedule_valid_from	YYYY-MM-DDThh:mm:ss	
schedule_valid_to	YYYY-MM-DDThh:mm:ss	
antenna_name	e.g. PASS-1	Antenna name. Optional and if used, any instance of <antenna_name> under the <unavailability> tag will be disregarded.
body		Tag containing an unlimited number of <contact_request> tags
unavailability		Tag in which to enter unavailability entry tags
antenna_name	e.g. PASS-1	
start_time	YYYY-MM-DDThh:mm:ss	
end_time	YYYY-MM-DDThh:mm:ss	

Field	Format	Description
reason		Optional

6.3.1.2 File Name Format

The filename format for Antenna Unavailability Report uses the filename convention Section 2.3.2:

<originator>__<recipient>__<xxx…xx>.<info type>.<extension>

Where:

<originator> is the *<Facility identifier>*,

<recipient> is CSA_ARS,

<xxx...xx> is an Antenna Unavailability Report unique reference number that shall include a date/time stamp,

<info type> is AUR,

<extension> is xml.

6.3.2 Antenna Schedule

6.3.2.1 Message Composition

Field	Format	Description
header		Tag in which to enter file header tags
originator	CSA_ARS	
recipient	e.g. CCMEO	Organization or mission identifier
generation_time	YYYY-MM-DDThh:mm:ss	file generation time (UTC)
schedule_reference	e.g. CCMEO001	Unique Schedule identifier, incremental numbering
schedule_valid_from	YYYY-MM-DDThh:mm:ss	
schedule_valid_to	YYYY-MM-DDThh:mm:ss	
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition. Optional and if used, any instance of <satellite_name> under the < scheduled_contact > tag will be disregarded.
antenna_name	e.g. PASS-1	Antenna name. Optional and if used, any instance of <antenna_name> under the < scheduled_contact > tag will be disregarded.
body		Tag containing an unlimited number

Field	Format	Description
		of <contact_request> tags
scheduled_contact		Tag in which to enter contact-specific tags
contact_id	e.g. S1R001C001	Any unique Contact identifier from the Request
contact_criticality	ROUTINE, IMPORTANT, CRITICAL, PROFICIENCY.	CRITICAL relates to spacecraft Health & Safety, IMPORTANT relates to time-sensitive or user emergency operations (Fast-Tasking, Near-Real-Time (NRT). PROFICIENCY is used for ground system check tests.
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition
antenna_name	e.g. SASK	Requested antenna name, optional
orbit	nnnnn	Satellite orbit number. Optional
start_time	YYYY-MM-DDThh:mm:ss	
end_time	YYYY-MM-DDThh:mm:ss	
rf_on_time	YYYY-MM-DDThh:mm:ss	Optional
rf_off_time	YYYY-MM-DDThh:mm:ss	Optional
rf_band	S, X, C, SX, SC, SCX	Optional
rf_service	RNG, TC, RT-TM, SF-TM, RT-DR, SF-DR	Optional
uplink	YES or NO	Optional
configuration		Single tag containing an unlimited number of <parameter> tags. Optional.
parameter		Tag in which to enter optional parameters, each with a single <name> and <value> tag. Optional, unlimited.
name	e.g. sband_rate	
value	e.g. nnnn.fffkbps	

6.3.2.2 Message Format

6.3.2.3 File Name Format

The filename format for Antenna Schedule uses the filename convention Section 2.3.2:

<originator>__<recipient>__<xxx…xx>.<info type>.<extension>

Where:

<originator> is CSA_ARS,

<recipient> is the *<Facility identifier>*,

<xxx…xx> is an Antenna Schedule unique reference number that shall include a date/time stamp,

<info type> is ASDL,

<extension> is xml.

6.3.3   Antenna Schedule Acknowledgment

6.3.3.1 Message Composition

Field	Format	Description
header		Tag in which to enter file header tags
originator	e.g. CCMEO	Organization or mission identifier
recipient	CSA_ARS	
generation_time	YYYY-MM-DDThh:mm:ss	file generation time (UTC)
schedule_reference	e.g. CCMEO001	Unique Schedule identifier, incremental numbering
schedule_valid_from	YYYY-MM-DDThh:mm:ss	
schedule_valid_to	YYYY-MM-DDThh:mm:ss	
satellite_name	e.g. SCISAT-1	Optional
antenna_name	e.g. PASS-1	Optional

6.3.3.2 File Name Format

The filename format for Antenna Schedule Acknowledgment uses the filename convention Section 2.3.2:

<originator>__<recipient>__<xxx…xx>.<info type>.<extension>

Where:

<originator> is the *<Facility identifier>*,

<recipient> is CSA_ARS,

<xxx…xx> is the respective Antenna Schedule unique reference number,

<info type> is ASDLA,

<extension> is xml.

6.4   COMPATIBILITY OF ACTUAL FACILITIES

6.4.1   SASK/SHUB Interface Migration

TBD

7 GENERIC EXTERNAL FACILITY INTERFACE

7.1 MESSAGE FORMAT

The message format used for the generic External Facility interface are files coded using XML. The content and tag descriptions for each message types are defined below.

7.2 TRANSPORT MECHANISM

The transport mechanism used between the generic External Facility and the ARS is file transfer. This mechanism allows the information to be exchanged asynchronously as point-to-point discrete files via predefined channels (i.e. dropboxes).

The transport mechanism shall rely on the Secure Shell File Transfer Protocol (SFTP) to transfer files to the designated mission dropboxes.

7.3 MESSAGE DESCRIPTIONS

7.3.1 Antenna Unavailability Report

7.3.1.1 Message Composition
Same as Internal Facility Interface Section 6.3.1.1.

7.3.1.2 File Name Format
Same as Internal Facility Interface Section 6.3.1.2.

7.3.2 Antenna Access Request

7.3.2.1 Message Composition

Field	Format	Description
header		Tag in which to enter file header tags
originator	CSA_ARS	
recipient	e.g. CCMEO	Organization or mission identifier
generation_time	YYYY-MM-DDThh:mm:ss	file generation time (UTC)
request_reference	e.g. CCMEO001	Unique Request identifier, incremental numbering
schedule_valid_from	YYYY-MM-DDThh:mm:ss	
schedule_valid_to	YYYY-MM-DDThh:mm:ss	
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition. Optional and if used, any instance of <satellite_name> under the <contact_request> tag will be disregarded.

Field	Format	Description
antenna_name	e.g. PASS-1	Antenna name. Optional and if used, any instance of <antenna_name> under the <contact_request> tag will be disregarded.
body		Tag containing an unlimited number of <contact_request> tags
contact_request		Tag in which to enter contact-specific tags
contact_id	e.g. S1R001C001	Any unique Contact identifier on a Request
contact_request_action	ADD or DELETE	
contact_criticality	ROUTINE, IMPORTANT, CRITICAL.	CRITICAL relates to spacecraft Health & Safety, IMPORTANT relates to time-sensitive or user emergency operations (Fast-Tasking, Near-Real-Time (NRT).
contact_reschedulability	DROP, RESCHEDULE or hh:mm:ss	Specify what to do in case of conflicts. Drop the contact or reschedule any time or within the specified validity time window from <start_time>. Optional, and if omitted will default to RESCHEDULE any time.
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition
antenna_name	e.g. PASS-1	Requested antenna name, optional
orbit	nnnnn	Satellite orbit number. Optional
start_time	YYYY-MM-DDThh:mm:ss	
end_time	YYYY-MM-DDThh:mm:ss	
rf_on_time	YYYY-MM-DDThh:mm:ss	Optional
rf_off_time	YYYY-MM-DDThh:mm:ss	Optional
rf_band	S, X, C, SX, SC, SCX	Optional
rf_service	RNG, TC, RT-TM, SF-TM, RT-DR, SF-DR	Optional
uplink	YES or NO	Optional
configuration		Single tag containing an unlimited number of <parameter> tags.

Field	Format	Description
		Optional.
parameter		Tag in which to enter optional parameters, each with a single <name> and <value> tag. Optional, unlimited.
name	e.g. sband_rate	
value	e.g. nnnn.fffkbps	

7.3.2.2 File Name Format

The filename format for Antenna Schedule uses the filename convention Section 2.3.2:

<originator>__<recipient>__<xxx…xx>.<info type>.<extension>

Where:

<originator> is CSA_ARS,

<recipient> is the *<Facility identifier>*,

<xxx…xx> is an Antenna Access Request unique reference number that shall include a date/time stamp,

<info type> is AAR,

<extension> is xml.

7.3.3 Antenna Access Request Acknowledgment

7.3.3.1 Message Composition

Field	Format	Description
header		Tag in which to enter file header tags
originator	e.g. CCMEO	Organization or mission identifier
recipient	CSA_ARS	
generation_time	YYYY-MM-DDThh:mm:ss	file generation time (UTC)
request_reference	e.g. CCMEO001	Unique Request identifier, incremental numbering
schedule_valid_from	YYYY-MM-DDThh:mm:ss	
schedule_valid_to	YYYY-MM-DDThh:mm:ss	
satellite_name	e.g. SCISAT-1	Optional
antenna_name	e.g. PASS-1	Optional

7.3.3.2 File Name Format

The filename format for Antenna Schedule Acknowledgment uses the filename convention Section 2.3.2:

<originator>__<recipient>__<xxx…xx>.<info type>.<extension>

Where:

<originator> is the *<Facility identifier>*,

<recipient> is CSA_ARS,

<xxx…xx> is the respective Antenna Access Request unique reference number,

<info type> is AARA,

<extension> is xml.

7.3.4 Antenna Access Confirmation

7.3.4.1 Message Composition

Field	Format	Description
header		Tag in which to enter file header tags
originator	e.g. CCMEO	Organization or mission identifier
recipient	CSA_ARS	
generation_time	YYYY-MM-DDThh:mm:ss	file generation time (UTC)
request_reference	e.g. CCMEO001	Unique Request identifier, incremental numbering
schedule_valid_from	YYYY-MM-DDThh:mm:ss	
schedule_valid_to	YYYY-MM-DDThh:mm:ss	
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition. Optional and if used, any instance of <satellite_name> under the <contact_request> tag will be disregarded.
antenna_name	e.g. PASS-1	Antenna name. Optional and if used, any instance of <antenna_name> under the <contact_request> tag will be disregarded.
body		Tag containing an unlimited number of <contact_request> tags
contact_request		Tag in which to enter contact-specific tags
contact_id	e.g. S1R001C001	Any unique Contact identifier on a

Field	Format	Description
		Request
contact_request_status	ACCEPTED, REJECTED, CANCELLED	
rejected_reason	UNAVAILABLE, WRONG RF BAND, WRONG SERVICE, WRONG TIME.	Optional, if <contact_request_status> is REJECTED
contact_criticality	ROUTINE, IMPORTANT, CRITICAL.	CRITICAL relates to spacecraft Health & Safety, IMPORTANT relates to time-sensitive or user emergency operations (Fast-Tasking, Near-Real-Time (NRT).
contact_reschedulability	DROP, RESCHEDULE or hh:mm:ss	Specify what to do in case of conflicts. Drop the contact or reschedule any time or within the specified validity time window from <start_time>. Optional, and if omitted will default to RESCHEDULE any time.
satellite_name	e.g. SCISAT-1	Satellite name as per satellite catalog definition
antenna_name	e.g. PASS-1	Requested antenna name, optional
orbit	nnnnn	Satellite orbit number. Optional
start_time	YYYY-MM-DDThh:mm:ss	
end_time	YYYY-MM-DDThh:mm:ss	
rf_on_time	YYYY-MM-DDThh:mm:ss	Optional
rf_off_time	YYYY-MM-DDThh:mm:ss	Optional
rf_band	S, X, C, SX, SC, SCX	Optional
rf_service	RNG, TC, RT-TM, SF-TM, RT-DR, SF-DR	Optional
uplink	YES or NO	Optional
configuration		Single tag containing an unlimited number of <parameter> tags. Optional.
parameter		Tag in which to enter optional parameters, each with a single <name> and <value> tag. Optional, unlimited.

Field	Format	Description
name	e.g. sband_rate	
value	e.g. nnnn.fffkbps	

7.3.4.2 File Name Format

The filename format for Antenna Schedule Acknowledgment uses the filename convention Section 2.3.2:

        <originator>__<recipient>__<xxx…xx>.<info type>.<extension>

Where:

        <originator> is the *<Facility identifier>*,

        <recipient> is CSA_ARS,

        <xxx…xx> is the respective Antenna Access Request unique reference number,

        <info type> is AAC,

        <extension> is xml.

8 SPECIFIC EXTERNAL FACILITY INTERFACES

8.1 DRDC INTERFACE
TBD

8.2 KSAT INTERFACE
As per RD-4, RD-5 and RD-6.

8.3 DLR INTERFACE

8.3.1 Message Format
The message format used for DLR Facility interface is plain ASCII file using tab separated columns.

8.3.2 Transport Mechanism
The transport mechanism used between the ARS and the DLR Facilities is through email directed to the station coordinator in Oberpfaffenhofen, Germany.

8.3.3 Sample Message
Good day,
We would like to schedule one NEOSSAT contact on January 30 .
Please confirm if it can be supported.

```
    DATE       SAT   STN   REVN  MAX.ELE     AOS    LOS
14 01 30      NEO   WHM   04862      0.0  030-18:44:57   030-18:57:55
```

Thank you,

8.4 SSC INTERFACE

8.4.1 Message Format
The message format used for SSC Facility interface is plain ASCII file using tab separated columns.

8.4.2 Transport Mechanism
The transport mechanism used between the ARS and the SSC Facilities is through email directed to the station coordinator in Kiruna, Sweden.

8.4.3 Sample Message
```
DATE         SAT STN   REV    MAX EL    AOS        LOS        OPRN
2014-01-13 SCI KRN   56110 016.7     00:23:05   00:31:16   TM 4 Mbps

2014-01-13 SCI KRN   56111 049.8     02:02:51   02:10:55   TM 4 Mbps

2014-01-13 SCI KRN   56114 043.1     07:02:30   07:10:26   TM 4 Mbps
```

```
2014-01-14 SCI KRN  56125 025.1    00:47:06  00:56:09  TM 4 Mbps

2014-01-14 SCI KRN  56126 073.1    02:28:10  02:35:40  TM 4 Mbps

2014-01-14 SCI KRN  56128 039.2    05:47:58  05:55:13  TM 4 Mbps


2014-01-15 SCI KRN  56144 063.2    07:51:41  08:00:25  TM 4 Mbps

2014-01-15 SCI KRN  56154 018.7    23:57:39  00:06:05  TM 4 Mbps


2014-01-16 SCI KRN  56155 055.5    01:38:11  01:45:41  TM 4 Mbps

2014-01-16 SCI KRN  56157 040.1    04:58:02  05:05:03  TM 4 Mbps


2014-01-17 SCI KRN  56174 070.5    08:40:45  08:48:22  TM 4 Mbps

2014-01-17 SCI KRN  56183 013.6    23:08:37  23:15:55  TM 4 Mbps


2014-01-18 SCI KRN  56184 041.5    00:48:13  00:55:42  TM 4 Mbps

2014-01-18 SCI KRN  56187 041.1    05:47:33  05:55:05  TM 4 Mbps
```

9   ONLINE SATELLITE CATALOGUE INTERFACE

As per interface description AD-5.