

Multi-Mission Antenna Reservation System (ARS) Development Request For Information (RFI)

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**Canadian Space
Agency**

**Agence Spatiale
Canadienne**

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1 INTRODUCTION

Canadian Space Agency (CSA) is releasing this Request For Information (RFI) as a first step to inform all interested parties of the possible procurement of an Antenna Reservation System (ARS) addressing the need for antenna resource coordination in the context of a multi-mission satellite control center and to solicit information that will help CSA to refine their procurement strategy.

1.1 BACKGROUND INFORMATION

1.1.1 General Context

CSA is responsible for the operations of several Low-Earth Orbit (LEO) satellites/missions. Satellite operations include direct communications from the ground called “contacts” or “passes” with the satellites in order to receive telemetry and science data from them, as well as send commands to be executed on them. For CSA satellite operations, these communications are possible by using S-band antennas (for telemetry and commands) and X-band antennas (for science data reception). CSA doesn’t own antennas, so they totally rely on antennas owned by other Canadian government departments, international partners and private industry. The network of antennas that CSA uses comprises antennas that are located all around the world.

LEO satellites go around the Earth in predictable orbits and their visibility over an antenna is limited in time for each orbit; contact time is about 10 to 15 minutes every orbit. Fortunately, it is possible to predict very accurately when the satellites are visible to the various antennas based on orbital mechanics calculations.

A satellite usually operate under nominal conditions but emergencies, that are conditions that could endanger the health of the satellite and jeopardize mission continuity, can arise. In that case, being able to reserve antenna usage to communicate with the satellite is key to re-establish nominal operational conditions of the satellite.

In the same sense, operational requirements for certain satellites also require timely access to antenna usage. Two types of operational requirements are defined for CSA missions and most particularly for the RADARSAT Constellation Mission (RCM), a constellation of 3 satellites, that is currently under development:

1. Some clients that order products produced by RCM will need their products as fast as possible for operational purposes (e.g. ice monitoring in the oceans bordering Canada coastlines). Therefore, the satellites need to downlink the science data as soon as possible to the ground after its acquisition for processing and fast delivery to these clients.
2. Some clients may request urgent acquisitions of science data over a certain location on the Earth due, for instance, to natural disasters or national security threats. These urgent acquisitions are made by “fast-tasking” the satellite. Fast-tasking is the process by which commands, including instructions for fast data acquisition by a satellite, need to be uplinked to the satellite as fast as possible.

Because of physical constraints of the antennas (e.g. objects such as buildings surrounding the antennas, active regulations, limitations in the range of operations of the antennas, etc.), communications with satellites may not be possible for all horizontal (azimuth) and vertical

(elevation) angles for some antennas. These “holes” are called masks and can range in size depending on the physical constraints involved.

Antennas that are able to communicate with satellites are owned and operated by public or private entities that have different ways to interface with their customers regarding their antenna usage. Some entities, such as the Canada Centre for Mapping and Earth Observation (CCMEO), offer a schedule viewer of the antennas they own. Clients having access to this viewer are able to know in advance if one of the CCMEO’s antennas is available at a given time period.

The trend in satellite operations is operation automation. That means that antennas, such as CCMEO’s antennas, may be operated in a lights-out configuration, that is without any human intervention in nominal operations. Therefore, reserving antenna usage in a lights-out configuration implies that a computer on the antenna owners’ side must process the requests from satellite owners.

It is also important to emphasize that antenna owners all around the world operate not only CSA’s satellites, but potentially all satellites orbiting the Earth having compatible requirements with their antennas. Antenna usage is thus limited to satellite owners, since antennas cannot communicate with more than one satellite at a time. However, a same antenna can transmit and receive using more than one band (e.g. X-band and S-band) if its specifications allow to do so. Therefore, antenna owners are always seeking to optimize the use of their antennas among all the satellites that they need to communicate with.

In order to optimize the use of antennas, antenna owners need to receive requests from satellite owners that include parameters specific to the satellites and the time period when they need to communicate with the satellites. Some requests may come routinely and some may come at the last minute due to satellite emergency situations or fast-tasking. Antenna owners (or the computer that receives the requests) then need to analyze the requests coming from different agencies and private industry and confirm availability of their antennas to the satellite owners who then can request to reserve an antenna for a specific contact with one of their satellites.

Since CSA is responsible for several satellites, a reservation system for antenna resources is therefore key to successfully conduct satellite operations for all the reasons explained above.

1.1.2 Specific Context

Within the CSA satellite operations department, the ARS will be a functional sub-system as part of the CSA’s Multi-Mission Operation Center (MMOC) architecture.

The ARS will interface with missions like:

- Scisat (already in orbit);
- NEOSat (already in orbit);
- M3MSat (launch planned for 2014); and
- RCM (launch planned for 2018).

The ARS will interface with the following Canadian antennas:

- CCMEO’s [Prince-Albert \(PASS\)](#);
- CCMEO’s [Gatineau \(GSS\)](#);

- CCMEO's [Inuvik \(ICAN1\)](#); and
- DND's Polar Epsilon 2 (PE2) Facilities in Aldergrove (CAAL) in British Columbia, Canada and Masstown (CAMA) in Nova Scotia, Canada.

The ARS may interface with the following expected other external facilities:

- MDA's St-Hubert (SHUB) and Saskatoon (SASK) facilities;
- DRDC Shirley's Bay Satellite Facility (DRDC) in Ottawa;
- [KSAT's Facility](#) operated from Svalbard, Norway;
- [SSC Facilities](#) operated from Kiruna, Sweden;
- DLR Facilities operated from Oberpfaffenhofen, Germany; and
- CNES Facilities.

1.2 ENVISIONED SOLUTION

An existing De-Conflict System (DCS) located at CSA headquarters in SHUB, Quebec is still operational, but is now obsolete to support RCM and CCMEO's new antennas in particular and therefore need to be replaced by a multi-mission multi-antenna system for which technical requirements are described in Attachment 1: Multi-Mission Antenna Reservation System (ARS) Requirements Document (MMCSA-SP0001 Rev. Initial Release).

For the purpose of this RFI, the envisioned solution may be one of the two options:

1. The requirements analysis, design, coding, testing, shipping and installation of an ARS already customized to CSA's requirements; or
2. A Commercial-Off-The-Shelf (COTS) product that could partly or fully meet the technical requirements described in Attachment 1: Multi-Mission Antenna Reservation System (ARS) Requirements Document (MMCSA-SP0001 Rev. Initial Release). For instance, the COTS product could be a generic resource reservation system that would be either customized or integrated to an interface that would convert its use for antenna reservation.

1.3 ATTACHMENTS

The list of attachments to this RFI are:

Attachment 1 : Multi-Mission Antenna Reservation System (ARS) Requirements Document (MMCSA-SP0001 Rev. Initial Release)

2 REQUEST FOR INFORMATION

“Respondents” to this RFI are defined as companies (or a consortia led by a company) with the capabilities to deliver an ARS compliant with the technical requirements described in Attachment 1: Multi-Mission Antenna Reservation System (ARS) Requirements Document (MMCSA-SP0001 Rev. Initial Release). The word “companies” also includes, in this context, space agencies.

These respondents are invited to submit a reply to the RFI that addresses any or all of the topics listed below.

To facilitate the review of the responses to this RFI, respondents are asked to please address and present the requested information in the order in which the topics are presented. Such topics are described in the following subsections.

2.1 RESPONDENT INFORMATION

Please provide background information on your company (or consortium members that would be created for such a project), company/consortium management team and company/consortium experience with similar projects in the area of antenna reservation systems or in the development and delivery of software applications used to reserve resources.

Please provide the name, telephone number, and email address of a representative who may be contacted for clarification or other matters related to the response.

2.2 TECHNICAL SOLUTION

Please provide a description of the solution that you would put forward to address any or all of the performance requirements available in Attachment 1: Multi-Mission Antenna Reservation System (ARS) Requirements Document (MMCSA-SP0001 Rev. Initial Release). This description should provide a first elaboration, detailed as far as practical, of the technical evidence that the proposed solution would meet or exceed CSA’s minimal performance requirements.

As well, indicate the proportion of COTS and new development that would be required to deliver the proposed solution.

Finally, indicate if you could provide a technical solution (generic COTS or proprietary system) that could then be customized by CSA’s software experts to meet the performance requirements of the ARS.

2.3 SCHEDULE AND LEAD TIME

Please provide the estimated timeframe for each of the following elements involved in the development of your technical solution:

- Period when your team would be ready to start working on your technical solution;
- New development portion of the technical solution; and
- Delivery of final product.

The current plan is to have a RFP posting in the second half of 2014 for a forecasted contract award in Spring 2015. CSA expects that the ARS will be delivered and ready for use by September 2016.

2.4 ACQUISITION COST ESTIMATES

Please provide cost estimates for the acquisition of your technical solution, broken down in three (3) types of cost:

- 1) COTS elements essential to your technical solution;
- 2) Software development labour costs, including design, coding, testing, documentation; and
- 3) Software development direct costs (licenses fees and type (annual, one-time, etc.), development platform, etc.).

Please indicate any significant underlying assumptions used to establish these costs estimates and any areas that could be potential cost risks.

2.5 TECHNICAL REQUIREMENTS ANALYSIS

Please provide results of an analysis on the technical requirements defined in Attachment 1: Multi-Mission Antenna Reservation System (ARS) Requirements Document (MMCSA-SP0001 Rev. Initial Release) based on the following three (3) questions, including substantiation for the information provided.

- 1) Identify the technical requirements that could be problematic if implemented as is in the proposed solution and suggest improvements to the requirements to solve the issues.
- 2) Identify technical requirements that are missing from the document and that you feel would be beneficial to have for the proposed solution.
- 3) Suggest modifications to the technical requirements that would improve overall performance of the proposed solution.

2.6 RECOMMENDATIONS, SUGGESTIONS OR COMMENTS

Please provide general feedback and/or any recommendations, inputs or comments (including technical information) that could assist the Government of Canada in developing the future RFP documents.

3 OTHER INFORMATION TO INTERESTED RESPONDENTS

3.1 IMPORTANT NOTE TO INTERESTED RESPONDENTS

Respondents should note that this RFI is not a pre-selection process. There will be no short listing of firms for purposes of undertaking any future works, as a result of this RFI. Similarly, participation in this process is not a condition or prerequisite for participation in an eventual RFP.

This RFI is neither a Call for Tenders, nor a RFP, and no agreement or contract will be entered into with any contractor, based on responses to this RFI. The issuance of this RFI is not to be considered in any way as a commitment by Canada, or as authority for the respondent to undertake any work which could be charged to Canada, nor is this RFI to be considered a commitment to issue eventual RFPs or award eventual contracts in relation to this project.

Canada shall not be bound by anything stated in this RFI. Canada reserves the right to change all or any parts of this RFI as deemed necessary.

3.2 CONFIDENTIALITY

Potential respondents are advised that any information submitted to Canada in response to this RFI may be used by Canada in the development of a subsequent competitive RFP. As such, respondents responding to this RFI should identify any submitted information that is to be considered as either company confidential or proprietary. This information will then be treated as Protected B.

3.3 COSTS FOR RESPONSES

No payment shall be made to the respondents by Canada for costs incurred in the preparation and submission of responses to this RFI.

3.4 REQUESTS FOR INFORMATION

Requests for information should be sent by **E-MAIL ONLY** to:

Isabelle Doray
Procurement Officer

Canadian Space Agency (CSA)

6767 route de l'Aéroport

St-Hubert, QC J3Y 8Y9

Telephone Number: 450-926-4873

Email Address: SoumissionsContracts@asc-csa.gc.ca

The closing date to submit a response is: **Friday, May 16, 2014, 2:00 pm EDT.**

The electronic file format of the response must be in either the Adobe *Portable Document Format* (PDF)[™] or in a file format that is readable by the Microsoft Office[™] Suite.

Responses are to be submitted in one of the two Official Languages of Canada (English or French).

All the documentation submitted must be marked with the following:

Name of Respondent
Multi-Mission Antenna Reservation System (ARS) Development RFI Response - Reference
9F044-13-1005
Date (YYYY-MM-DD)

3.5 INDIVIDUAL PRESENTATION TO CSA

It is CSA's intention to invite respondents to this RFI to make a presentation to the CSA project team about their proposed solution. Such presentations would be held after the RFI closing date and most likely on the week of May 20, 2014.

Respondents that are interested in making such a presentation should write a statement to that effect in their response to this RFI. CSA will then make the necessary arrangements with the interested parties for the presentation to be held in person, at CSA's headquarters in St-Hubert, Quebec or via video conferencing or web conference.

It should be noted that Canada will not be responsible for any costs associated with attendance or participation to those individual presentations.

---END---

APPENDICES

A APPENDIX A - ACRONYMS AND ABBREVIATIONS

ARS	Antenna Reservation System
CAAL	Canadian Aldergrove Facility
CAMA	Canadian Masstown Facility
CCMEO	Canada Centre for Mapping and Earth Observation
CNES	Centre National d'Études Spatiales
COTS	Commercial-Off-The-Shelf
CSA	Canadian Space Agency
DCS	De-Conflict System
DLR	Deutsches Zentrum für Luft- und Raumfahrt (German Space Agency)
DND	Department of National Defence
DRDC	Defence Research and Development Canada
EDT	Eastern Daylight Time
FC	Fully Compliant
GFE	Government Furnished Equipment
GSS	Gatineau Satellite Station
ICAN1	Inuvik Canadian Station One
KSAT	Kongsberg Satellite Services
LEO	Low-Earth Orbit
MDA	MacDonald, Dettwiler and Associated Ltd.
MMOC	Multi-Mission Operation Center
NC	Not Compliant
PASS	Prince-Albert Satellite Station
PC	Partially Compliant
PDF	Portable Document Format
PE2	Polar Epsilon 2
PWGSC	Public Works and Government Services Canada
RCM	RADARSAT Constellation Mission
RFI	Request For Information
RFP	Request For Proposal
ROM	Rough Order of Magnitude
SASK	Saskatoon
SHUB	Saint-Hubert
SSC	Swedish Space Corporation

TBC To Be Confirmed

TBD To Be Determined