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Space Telecommunications Interface (STI) Request For Proposal

OMG Document: mars/19-08-xx

Letters of Intent due: *26 December 2019*
Submissions due: *24 February 2020*

Objective of this RFP

Space communications place Software Defined Radio (SDR) systems into environmental conditions where unique provisions are required to accommodate communication services for space missions (such as new frequencies, latencies, data rates, dynamic reconfiguration of components versus remote uploads and pre-planned communication, and resource-constrained platforms [SSDR]). The objective of this RFP is to expand the PIM and PSM for the Software Radio Components Specification [SWR] to support space communications. Toward this end, the proposed Space Telecommunications Interface (STI) specification must support the following: 1) collect and provide voice, video, data and networking signals to process and share communications throughout the spectrum agnostically for future space communications, 2) include a networking layer and 3) include standardized interfaces for interacting with networks that support cross-platform security measures. This RFP solicits proposals for a PIM and PSM Profile expressed in some combination of UML and SysML representations supporting the software and system levels for SDRs.

For further details, see Chapter 6 of this document.

1 Introduction

1.1 Goals of OMG

The Object Management Group (OMG) is a software consortium with an international membership of vendors, developers, and end users. Established in 1989, its mission is to help computer users solve enterprise integration problems by supplying open, vendor-neutral portability, interoperability and reusability specifications based on Model Driven Architecture (MDA). MDA defines an approach to IT system specification that separates the specification of system functionality from the specification of the implementation of that functionality on a specific technology platform, and provides a set of guidelines for structuring specifications expressed as models. OMG has published many widely-used specifications such as UML [UML], BPMN [BPMN], MOF [MOF], XMI [XMI], DDS [DDS] and CORBA [CORBA], to name but a few significant ones.

1.2 Organization of this document

The remainder of this document is organized as follows:

Section 2 – *Architectural Context*. Background information on OMG's Model Driven Architecture.

Section 3 – *Adoption Process*. Background information on the OMG specification adoption process.

Section 4 – *Instructions for Submitters*. Explanation of how to make a submission to this RFP.

Section 5 – *General Requirements on Proposals*. Requirements and evaluation criteria that apply to all proposals submitted to OMG.

Section 6 – *Specific Requirements on Proposals*. Problem statement, scope of proposals sought, mandatory requirements, non-mandatory features, issues to be discussed, evaluation criteria, and timetable that apply specifically to this RFP.

Appendix A – References and Glossary Specific to this RFP

Appendix B – General References and Glossary

1.3 Conventions

The key words **"shall"**, **"shall not"**, **"should"**, **"should not"**, **"may"** and **"need not"** in this document should be interpreted as described in Part 2 of the ISO/IEC Directives [ISO2]. These ISO terms are compatible with the same terms in IETF RFC 2119 [RFC2119].

1.4 Contact Information

Questions related to OMG's technology adoption process and any questions about this RFP should be directed to *rfp@omg.org*.

OMG documents and information about the OMG in general can be obtained from the OMG's web site: *http://www.omg.org*. Templates for RFPs (like this document) and other standard OMG documents can be found on the Template Downloads Page: *http://www.omg.org/technology/template_download.htm*

2 Architectural Context

A Model-Driven Architecture (MDA) provides a set of guidelines for structuring specifications expressed as models and the mappings between those models. The MDA initiative and the standards that support it allow the same model, specifying business system or application functionality and behavior, to be realized on multiple platforms. MDA enables different applications to be integrated by explicitly relating their models; this facilitates integration and interoperability, and supports system evolution (deployment choices) as platform technologies change. The three primary goals of MDA are portability, interoperability and reusability.

Portability of any subsystem is relative to the subsystems on which it depends. The collection of subsystems that a given subsystem depends upon is often loosely called the *platform*, which supports that subsystem. Portability – and reusability – of such a subsystem is enabled if all the subsystems that it depends upon use standardized application programming interfaces (APIs) and usage patterns.

MDA provides a pattern comprising a portable subsystem that is able to use any one of multiple specific implementations of a platform. This pattern is repeatedly usable in the specification of systems. The five important concepts related to this pattern are:

1. *Model* – A model is a representation of a part of the function, structure and/or behavior of an application or system. A representation is said to be formal when it is based on a language that has a well-defined form ("syntax"), meaning ("semantics"), and possibly rules of analysis, inference, or proof for its constructs. The syntax may be graphical or textual. The semantics might be defined, more or less formally, in terms of things observed in the world being described (e.g. message sends and replies, object states and state changes, etc.), or by translating higher-level language constructs into other constructs that have a well-defined meaning. The (non-mandatory) rules of inference define what unstated properties can be deduced from explicit statements in the model. In MDA, a representation that is not formal in this sense is not a model. Thus, a diagram with boxes

and lines and arrows that is not supported by a definition of the meaning of a box, and the meaning of a line and of an arrow is not a model – it is just an informal diagram.

2. *Platform* – A set of subsystems/technologies that provide a coherent set of functionality through interfaces and specified usage patterns that any subsystem that depends on the platform can use without concern for the details of how the functionality provided by the platform is implemented.
3. *Platform Independent Model (PIM)* – A model of a subsystem that contains no information specific to the platform, or the technology that is used to realize it.
4. *Platform Specific Model (PSM)* – A model of a subsystem that includes information about the specific technology that is used in the realization of that subsystem on a specific platform, and hence possibly contains elements that are specific to the platform.
5. *Mapping* – Specification of a mechanism for transforming the elements of a model conforming to a particular metamodel into elements of another model that conforms to another (possibly the same) metamodel. A mapping may be expressed as associations, constraints, rules or templates with parameters that to be assigned during the mapping, or other forms yet to be determined.

OMG adopts standard specifications of models that exploit the MDA pattern to facilitate portability, interoperability and reusability, either through *ab initio* development of standards or by reference to existing standards. Some examples of OMG adopted specifications are:

1. *Languages* – e.g. IDL for interface specification [IDL], UML for model specification [UML], BPMN for Business Process specification [BPMN], etc.
2. *Mappings* – e.g. Mapping of OMG IDL to specific implementation languages (CORBA PIM to Implementation Language PSMs), UML Profile for EDOC (PIM) to CCM (CORBA PSM) and EJB (Java PSM), CORBA (PSM) to COM (PSM) etc.
3. *Services* – e.g. Naming Service [NS], Transaction Service [OTS], Security Service [SEC], Trading Object Service [TOS] etc.
4. *Platforms* – e.g. CORBA [CORBA], DDS [DDS]
5. *Protocols* – e.g. GIOP/IIOP [CORBA] (both structure and exchange protocol), DDS Interoperability Protocol [DDSI].
6. *Domain Specific Standards* – e.g. Model for Performance-Driven Government [MPG], Single Nucleotide Polymorphisms specification [SNP], TACSIT Controller Interface specification [TACSIT].

For an introduction to MDA, see [MDAa]. For a discourse on the details of MDA please refer to [MDAc]. To see an example of the application of MDA see [MDAb]. For general information on MDA, see [MDAd].

Object Management Architecture (OMA) is a distributed object computing platform architecture within MDA that is related to ISO's Reference Model of Open Distributed Processing RM-ODP [RM-ODP]. CORBA and any extensions to it are based on OMA. For information on OMA see [OMA].

3 Adoption Process

3.1 Introduction

OMG decides which specifications to adopt via votes of its Membership. The specifications selected should satisfy the architectural vision of MDA. OMG bases its decisions on both business and technical considerations. Once a specification is adopted by OMG, it is made available for use by both OMG members and non-members alike, at no charge.

This section 3 provides an extended summary of the RFP process. For more detailed information, see the *Policies and Procedures of the OMG Technical Process* [P&P], specifically Section 4.2, and the *OMG Hitchhiker's Guide* [Guide]. In case of any inconsistency between this document or the Hitchhiker's Guide and the Policies and Procedures, the P&P is always authoritative. All IPR-related matters are governed by OMG's *Intellectual Property Rights Policy* [IPR].

3.2 The Adoption Process in detail

3.2.1 Development and Issuance of RFP

RFPs, such as this one, are drafted by OMG Members who are interested in the adoption of an OMG specification in a particular area. The draft RFP is presented to the appropriate TF, discussed and refined, and when ready is recommended for issuance. If endorsed by the Architecture Board, the RFP may then be issued as an OMG RFP by a TC vote.

Under the terms of OMG's Intellectual Property Rights Policy [IPR], every RFP shall include a statement of the IPR Mode under which any resulting specification will be published. To achieve this, RFP authors choose one of the three allowable IPR modes specified in [IPR] and include it in the RFP – see section 6.10.

3.2.2 Letter of Intent (LOI)

Each OMG Member organization that intends to make a Submission in response to any RFP (including this one) shall submit a Letter of Intent (LOI) signed by an officer on or before the deadline specified in the RFP's timetable (see section

6.11). The LOI provides public notice that the organisation may make a submission, but does not oblige it to do so.

3.2.3 Voter Registration

Any interested OMG Members, other than Trial, Press and Analyst members, may participate in Task Force voting related to this RFP. If the RFP timetable includes a date for closing the voting list (see section 6.11), or if the Task Force separately decides to close the voting list, then only OMG Member that have registered by the given date and those that have made an Initial Submission may vote on Task Force motions related to this RFP.

Member organizations that have submitted an LOI are automatically registered to vote in the Task Force. Technical Committee votes are not affected by the Task Force voting list – all Contributing and Domain Members are eligible to vote in DTC polls relating to DTC RFPs, and all Contributing and Platform Members are eligible to vote in PTC polls on PTC RFPs.

3.2.4 Initial Submissions

Initial Submissions shall be made electronically on or before the Initial Submission deadline, which is specified in the RFP timetable (see section 6.11), or may later be adjusted by the Task Force. Submissions shall use the OMG specification template [TMPL], with the structure set out in section 4.9. Initial Submissions shall be written specifications capable of full evaluation, and not just a summary or outline. Submitters normally present their proposals to the Task Force at the first TF meeting after the submission deadline. Making a submission incurs obligations under OMG's IPR policy – see [IPR] for details.

An Initial Submission shall not be altered once the Initial Submission deadline has passed. The Task Force may choose to recommend an Initial Submission, unchanged, for adoption by OMG; however, instead Task Force members usually offer comments and feedback on the Initial Submissions, which submitters can address (if they choose) by making a later Revised Submission.

The goals of the Task Force's Submission evaluation are to:

- Provide a fair and open process
- Facilitate critical review of the submissions by OMG Members
- Provide feedback to submitters enabling them to address concerns in their revised submissions
- Build consensus on acceptable solutions
- Enable voting members to make an informed selection decision
- Actively contribute to the evaluation process.

3.2.5 Revised Submissions

Revised Submissions are due by the specified deadline. Revised Submissions cannot be altered once their submission deadline has passed. Submitters again normally present their proposals at the next meeting of the TF after the deadline. If necessary, the Task Force may set a succession of Revised Submission deadlines. Submitters choose whether or not to make Revised Submissions - if they decide not to, their most recent Submission is carried forward, unless the Submitter explicitly withdraws from the RFP process.

The evaluation of Revised Submissions has the same goals listed above.

3.2.6 Selection Votes

When the Task Force's voters believe that they sufficiently understand the relative merits of the available Submissions, a vote is taken to recommend a submission to the Task Force's parent Technical Committee. The Architecture Board reviews the recommended Submission for MDA compliance and technical merit. Once the AB has endorsed it, members of the relevant TC vote on the recommended Submission by email. Successful completion of this vote moves the recommendation to OMG's Board of Directors (BoD).

3.2.7 Business Committee Questionnaire

Before the BoD makes its final decision on turning a Technical Committee recommendation into an OMG published specification, it asks its Business Committee to evaluate whether implementations of the specification will be publicly available. To do this, the Business Committee will send a Questionnaire [BCQ] to every OMG Member listed as a Submitter on the recommended Submission. Members that are not Submitters can also complete a Business Committee Questionnaire for the Submission if they choose.

If no organization commits to make use of the specification, then the BoD will typically not act on the recommendation to adopt it – so it is very important that submitters respond to the BCQ.

Once the Business Committee has received satisfactory BCQ responses, the Board takes the final publication vote. A Submission that has been adopted by the Board is termed an *Alpha Specification*.

At this point the RFP process is complete.

3.2.8 Finalization & Revision

Any specification adopted by OMG by any mechanism, whether RFP or otherwise, is subject to Finalization. A Finalization Task Force (FTF) is chartered by the TC that recommended the Specification; its task is to correct any problems reported by early users of the published specification. The FTF first collaborates with OMG's Technical Editor to prepare a cleaned-up version

of the Alpha Specification with submission-specific material removed. This is the Beta1 specification, and is made publicly available via OMG's web site. The FTF then works through the list of bug reports ("issues") reported by users of the Beta1 specification, to produce a Finalization Report and another Beta specification (usually Beta2), which is a candidate for Formal publication. Once endorsed by the AB and adopted by the relevant TC and BoD, this is published as the final, Formal Specification.

Long-term maintenance of OMG specifications is handled by a sequence of Revision Task Forces (RTFs), each one chartered to rectify any residual problems in the most-recently published specification version. For full details, see P&P section 4.4 [P&P].

4 Instructions for Submitters

4.1 OMG Membership

To submit to an RFP issued by the Platform Technology Committee an organization shall maintain either Platform or Contributing OMG Membership from the date of the initial submission deadline, while to submit to a Domain RFP an organization shall maintain either a Contributing or Domain membership.

4.2 Intellectual Property Rights

By making a Submission, an organization is deemed to have granted to OMG a perpetual, nonexclusive, irrevocable, royalty-free, paid up, worldwide license to copy and distribute the document and to modify the document and distribute copies of the modified version, and to allow others to do the same. Submitter(s) shall be the copyright owners of the text they submit, or have sufficient copyright and patent rights from the copyright owners to make the Submission under the terms of OMG's IPR Policy. Each Submitter shall disclose the identities of all copyright owners in its Submission.

Each OMG Member that makes a written Submission in response to this RFP shall identify patents containing Essential Claims that it believes will be infringed if that Submission is included in an OMG Formal Specification and implemented.

By making a written Submission to this RFP, an OMG Member also agrees to comply with the Patent Licensing terms set out in section 6.10.

This section 4.2 is neither a complete nor an authoritative statement of a submitter's IPR obligations – see [IPR] for the governing document for all OMG's IPR policies.

4.3 Submission Effort

An RFP submission may require significant effort in terms of document preparation, presentations to the issuing TF, and participation in the TF evaluation process. OMG is unable to reimburse submitters for any costs in conjunction with their submissions to this RFP.

4.4 Letter of Intent

Every organization intending to make a Submission against this RFP shall submit a Letter of Intent (LOI) signed by an officer on or before the deadline listed in section 6.11, or as later varied by the issuing Task Force.

The LOI should designate a single contact point within the submitting organization for receipt of all subsequent information regarding this RFP and the submission. The name of this contact will be made available to all OMG members. LOIs shall be sent by email, fax or paper mail to the "RFP Submissions Desk" at the OMG address shown on the first page of this RFP.

A suggested template for the Letter of Intent is available at http://doc.omg.org/loi [LOI].

4.5 Business Committee terms

This section contains the text of the Business Committee RFP attachment concerning commercial availability requirements placed on submissions. This attachment is available separately as OMG document omg/12-12-03.

4.5.1 Introduction

OMG wishes to encourage rapid commercial adoption of the specifications it publishes. To this end, there must be neither technical, legal nor commercial obstacles to their implementation. Freedom from the first is largely judged through technical review by the relevant OMG Technology Committees; the second two are the responsibility of the OMG Business Committee. The BC also looks for evidence of a commitment by a submitter to the commercial success of products based on the submission.

4.5.2 Business Committee evaluation criteria

4.5.2.1 Viable to implement across platforms

While it is understood that final candidate OMG submissions often combine technologies before they have all been implemented in one system, the Business Committee nevertheless wishes to see evidence that each major feature has been implemented, preferably more than once, and by separate organizations. Pre-product implementations are acceptable. Since use of OMG specifications should not be dependent on any one platform, cross-platform availability and interoperability of implementations should also be demonstrated.

4.5.2.2 Commercial availability

In addition to demonstrating the existence of implementations of the specification, the submitter must also show that products based on the specification are commercially available, or will be within 12 months of the date when the specification was recommended for adoption by the appropriate Task Force. Proof of intent to ship product within 12 months might include a:

- Public product announcement with a shipping date within the time limit.
- Demonstration of a prototype implementation and accompanying draft user documentation.

Alternatively, and at the Business Committee's discretion, submissions may be adopted where the submitter is not a commercial software provider, and therefore will not make implementations commercially available. However, in this case the BC will require concrete evidence of two or more independent implementations of the specification being used by end-user organizations as part of their businesses.

Regardless of which requirement is in use, the submitter must inform the OMG of completion of the implementations when commercially available.

4.5.2.3 Access to Intellectual Property Rights

OMG will not adopt a specification if OMG is aware of any submitter, member or third party which holds a patent, copyright or other intellectual property right (collectively referred to in this policy statement as “IPR”) which might be infringed by implementation or recommendation of such specification, unless OMG believes that such IPR owner will grant an appropriate license to organizations (whether OMG members or not) which wish to make use of the specification. It is the goal of the OMG to make all of its technology available with as few impediments and disincentives to adoption as possible, and therefore OMG strongly encourages the submission of technology as to which royalty-free licenses will be available.

The governing document for all intellectual property rights (“IPR”) policies of Object Management Group is the Intellectual Property Rights statement, available at: http://doc.omg.org/ipr. It should be consulted for the authoritative statement of the submitter's patent disclosure and licensing obligations.

4.5.2.4 Publication of the specification

Should the submission be adopted, the submitter must grant OMG (and its sublicensees) a worldwide, royalty-free license to edit, store, duplicate and distribute both the specification and works derived from it (such as revisions and teaching materials). This requirement applies only to the written specification, not to any implementation of it. Please consult the Intellectual Property Rights

statement (http://doc.omg.org/ipr) for the authoritative statement of the submitter's copyright licensing obligations.

4.5.2.5 Continuing support

The submitter must show a commitment to continue supporting the technology underlying the specification after OMG adoption, for instance by showing the BC development plans for future revisions, enhancement or maintenance.

4.6 Responding to RFP items

4.6.1 Complete proposals

Submissions should propose full specifications for all of the relevant requirements detailed in Section 6 of this RFP. Submissions that do not present complete proposals may be at a disadvantage.

Submitters are encouraged to include any non-mandatory features listed in Section 6.

4.6.2 Additional specifications

Submissions may include additional specifications for items not covered by the RFP and which they believe to be necessary. Information on these additional items should be clearly distinguished. Submitters shall give a detailed rationale for why any such additional specifications should also be considered for adoption. Submitters should note that a TF is unlikely to consider additional items that are already on the roadmap of an OMG TF, since this would pre-empt the normal adoption process.

4.6.3 Alternative approaches

Submitters may provide alternative RFP item definitions, categorizations, and groupings so long as the rationale for doing so is clearly stated. Equally, submitters may provide alternative models for how items are provided if there are compelling technological reasons for a different approach.

4.7 Confidential and Proprietary Information

The OMG specification adoption process is an open process. Responses to this RFP become public documents of the OMG and are available to members and non-members alike for perusal. No confidential or proprietary information of any kind will be accepted in a submission to this RFP.

4.8 Proof of Concept

Submissions shall include a “proof of concept” statement, explaining how the submitted specifications have been demonstrated to be technically viable. The technical viability has to do with the state of development and maturity of the

technology on which a submission is based. This is not the same as commercial availability. Proof of concept statements can contain any information deemed relevant by the submitter; for example:

"This specification has completed the design phase and is in the process of being prototyped."

"An implementation of this specification has been in beta-test for 4 months."

"A named product (with a specified customer base) is a realization of this specification."

It is incumbent upon submitters to demonstrate the technical viability of their proposal to the satisfaction of the TF managing the evaluation process. OMG will favor proposals based on technology for which sufficient relevant experience has been gained.

4.9 Submission Format

4.9.1 General

- Submissions that are concise and easy to read will inevitably receive more consideration.
- Submitted documentation should be confined to that directly relevant to the items requested in the RFP.
- To the greatest extent possible, the submission should follow the document structure set out in "ISO/IEC Directives, Part 2 – Rules for the structure and drafting of International Standards" [ISO2]. An OMG specification template is available to make it easier to follow these guidelines.
- The key words
- **"shall"**, **"shall not"**, **"should"**, **"should not"**, **"may"** and **"need not"** shall be used as described in Part 2 of the ISO/IEC Directives [ISO2]. These ISO terms are compatible with the same terms in IETF RFC 2119 [RFC2119]. However, the RFC 2119 terms **"must"**, **"must not"**, **"optional"**, **"required"**, **"recommended"** and **"not recommended"** shall not be used (even though they are permitted under RFC2119).

4.9.2 Mandatory Outline

All submissions shall use the following structure, based on the OMG Specification template [TEMPL]:

Section 0 of the submission shall be used to provide all non-normative supporting material relevant to the evaluation of the proposed specification, including:

- The full name of the submission

- A complete list of all OMG Member(s) making the submission, with a named contact individual for each
- The acronym proposed for the specification (e.g. UML, CORBA)
- The name and OMG document number of the RFP to which this is a response
- The OMG document number of the main submission document
- Overview or guide to the material in the submission
- Statement of proof of concept (see 4.8)
- If the proposal does not satisfy any of the general requirements stated in Section 5, a detailed rationale explaining why
- Discussion of each of the "Issues To Be Discussed" identified in Section 6.
- An explanation of how the proposal satisfies the specific requirements and (if applicable) requests stated in Section 6.
- If adopting the submission requires making changes to already-adopted OMG specifications, include a list of those changes in a clearly-labelled subsection in Section 0. Identify exactly which version(s) of which OMG specification(s) shall be amended, and include the list of precise wording changes that shall be made to that specification.

Section 1 and subsequent sections of the submission shall contain the normative specification that the Submitter(s) is/are proposing for adoption by OMG, including:

- Scope of the proposed specification
- Overall design rationale
- Conformance criteria for implementations of the proposed specification, clearly stating the features that all conformant implementations shall support, and any features that implementations may support, but which are not mandatory.
- A list of the normative references that are used by the proposed specification
- A list of terms that are used in the proposed specification, with their definitions
- A list of any special symbols that are used in the proposed specification, together with their significance
- The proposed specification itself

Section 0 will be deleted from any specification that OMG adopts and publishes. Therefore, Section 0 of the submission shall contain no normative material (other than any instructions to change existing specifications; ensuring that these are implemented is the responsibility of the FTF that finalizes the specification, before it deletes section 0). Any non-normative material outside section 0 shall be explicitly identified.

The main submission document and any models or other machine-interpretable files accompanying it shall be listed in an inventory file conforming to the inventory template [INVENT].

The submission shall include a copyright waiver in a form acceptable to OMG. One acceptable form is:

> "Each of the entities listed above: (i) grants to the Object Management Group, Inc. (OMG) a nonexclusive, royalty-free, paid up, worldwide license to copy and distribute this document and to modify this document and distribute copies of the modified version, and (ii) grants to each member of the OMG a nonexclusive, royalty-free, paid up, worldwide license to make up to fifty (50) copies of this document for internal review purposes only and not for distribution, and (iii) has agreed that no person shall be deemed to have infringed the copyright in the included material of any such copyright holder by reason of having used any OMG specification that may be based hereon or having conformed any computer software to such specification."

Other forms of copyright waiver may only be used if approved by OMG legal counsel beforehand.

4.10 How to Submit

Submitters should send an electronic version of their submission to the *RFP Submissions Desk (rfp@omg.org)* at OMG Headquarters by 5:00 PM U.S. Eastern Standard Time (22:00 GMT) on the day of the Initial and Revised Submission deadlines. Acceptable formats are Adobe FrameMaker source, ISO/IEC 26300:2006 (OpenDoc 1.1), OASIS DocBook 4.x (or later) and ISO/IEC 29500:2008 (OOXML, .docx).

Submitters should ensure that they receive confirmation of receipt of their submission.

5 General Requirements on Proposals

5.1 Requirements

5.1.1 Use of modelling languages

Submitters are encouraged to express models using OMG modelling languages such as UML, MOF, CWM and SPEM (subject to any further constraints on the

types of the models and modelling technologies specified in Section 6 of this RFP). Submissions containing models expressed using OMG modelling languages shall be accompanied by an OMG XMI [XMI] representation of the models (including a machine-readable copy). A best effort should be made to provide an OMG XMI representation even in those cases where models are expressed via non-OMG modelling languages.

5.1.2 PIMs & PSMs

Section 6 of this RFP specifies whether PIM(s), PSM(s), or both are being solicited. If proposals specify a PIM and corresponding PSM(s), then the rules specifying the mapping(s) between the PIM and PSM(s) shall either be identified by reference to a standard mapping or specified in the proposal. In order to allow possible inconsistencies in a proposal to be resolved later, proposals shall identify whether it's the mapping technique or the resulting PSM(s) that shall be considered normative.

5.1.3 Complete submissions

Proposals shall be *precise* and *functionally complete*. Any relevant assumptions and context necessary to implement the specification shall be provided.

5.1.4 Reuse

Proposals shall *reuse* existing OMG and other standard specifications in preference to defining new models to specify similar functionality.

5.1.5 Changes to existing specifications

Each proposal shall justify and fully specify any *changes or extensions* to existing OMG specifications necessitated by adopting that proposal. In general, OMG favors proposals that are *upwards compatible* with existing standards and that minimize changes and extensions to existing specifications.

5.1.6 Minimalism

Proposals shall factor out functionality that could be used in different contexts and specify their models, interfaces, etc. separately. Such *minimalism* fosters re-use and avoids functional duplication.

5.1.7 Independence

Proposals shall use or depend on other specifications only where it is actually necessary. While re-use of existing specifications to avoid duplication will be encouraged, proposals should avoid gratuitous use.

5.1.8 Compatibility

Proposals shall be *compatible* with and *usable* with existing specifications from OMG and other standards bodies, as appropriate. Separate specifications

offering distinct functionality should be usable together where it makes sense to do so.

5.1.9 Implementation flexibility

Proposals shall preserve maximum *implementation flexibility*. Implementation descriptions should not be included and proposals shall not constrain implementations any more than is necessary to promote interoperability.

5.1.10 Encapsulation

Proposals shall allow *independent implementations* that are *substitutable* and *interoperable*. An implementation should be replaceable by an alternative implementation without requiring changes to any client.

5.1.11 Security

In order to demonstrate that the specification proposed in response to this RFP can be made secure in environments that require security, answers to the following questions shall be provided:

- What, if any, security-sensitive elements are introduced by the proposal?
- Which accesses to security-sensitive elements should be subject to security policy control?
- Does the proposed service or facility need to be security aware?
- What default policies (e.g., for authentication, audit, authorization, message protection etc.) should be applied to the security sensitive elements introduced by the proposal? Of what security considerations should the implementers of your proposal be aware?

The OMG has adopted several specifications, which cover different aspects of security and provide useful resources in formulating responses [SEC] [RAD].

5.1.12 Internationalization

Proposals shall specify the degree of internationalization support that they provide. The degrees of support are as follows:

a) Uncategorized: Internationalization has not been considered.

b) Specific to <region name>: The proposal supports the customs of the specified region only, and is not guaranteed to support the customs of any other region. Any fault or error caused by requesting the services outside of a context in which the customs of the specified region are being consistently followed is the responsibility of the requester.

c) Specific to <multiple region names>: The proposal supports the customs of the specified regions only, and is not guaranteed to support the customs of any other regions. Any fault or error caused by requesting the services outside

of a context in which the customs of at least one of the specified regions are being consistently followed is the responsibility of the requester.

d) Explicitly not specific to <region(s) name>: The proposal does not support the customs of the specified region(s). Any fault or error caused by requesting the services in a context in which the customs of the specified region(s) are being followed is the responsibility of the requester.

5.2 Evaluation criteria

Although the OMG adopts model-based specifications and not implementations of those specifications, the technical viability of implementations will be taken into account during the evaluation process. The following criteria will be used:

5.2.1 Performance

Potential implementation trade-offs for performance will be considered.

5.2.2 Portability

The ease of implementation on a variety of systems and software platforms will be considered.

5.2.3 Securability

The answer to questions in section 5.1.11 shall be taken into consideration to ascertain that an implementation of the proposal is securable in an environment requiring security.

5.2.4 Conformance: Inspectability and Testability

The adequacy of proposed specifications for the purposes of conformance inspection and testing will be considered. Specifications should provide sufficient constraints on interfaces and implementation characteristics to ensure that conformance can be unambiguously assessed through both manual inspection and automated testing.

5.2.5 Standardized Metadata

Where proposals incorporate metadata specifications, OMG standard XMI metadata [XMI] representations should be provided.

6 Specific Requirements on Proposals

6.1 Problem Statement

The PIM and PSM for the Software Radio Components Specification [SWR] (referred to as the SWRadio specification below for brevity) was focused on the portability of waveforms across SDRs. The SWRadio specification added communications, Open Systems Interconnection ([OSI] OSI – ITU-T Reference Model X.200) components and facilities, and a model/technology separation to the Software Communication Architecture (SCA)[1]. The SCA is an open architecture framework, published by the Joint Tactical Networking Center (JTNC) and developed by the Wireless Innovation Forum and the OMG in the 2001-2008 timeframe. The SCA defines a standard way for radios to instantiate, configure, and manage waveform applications running on many platforms. The OMG originally commercialized the SCA to: 1) provide wider standardization and modularization for improved specification and tools, 2) enable industry to offer alternative solutions, 3) allow other platform independent transports, 4) reduce the cost of maintaining other than the non-essential radio-specific portions of the SDR specifications, 5) leverage overlapping OMG standards to reduce SDR specification size and 6) serve a wider community. Figure 1 illustrates some of the space-based communication pathways affected by this RFP.

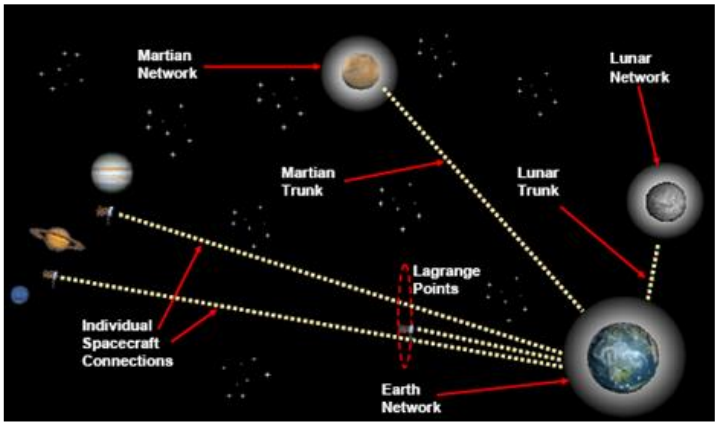

Figure 1: Space Communication Architecture – A Network of Networks

Even though the SWRadio specification defines radio infrastructure facilities that can be utilized in developing models and that promote the portability of waveforms across SDRs, it does not address key communications and platform

[1] The goal of the SCA (per SCA 2.2.2 [SCA]) is to provide for the deployment, management, interconnection, and intercommunication of software components in embedded, distributed-computing communication systems.

requirements imposed by the space domain sufficiently. These requirements, a subset of which is listed below and explained in more detail in Section 6.5, are the basic premise for extending (adding to) and/or specializing (constraining) the SWRadio specification. The extent of reuse of the existing SWRadio Profile will be up to the submitters.

There are several elements of the architecture that are unique to the space environment, or at least pose special considerations for operation in space compared to terrestrial systems. This RFP is intended to address issues with the following elements:

- **Radiation Suitable Processing**: The performance of SDRs in space is limited by radiation-hardened/tolerant hardware components, designed so they can survive the radiation environment. The electronics are chosen to survive radiation effects that range from single event upsets to total dose effects. Radiation hardened processors are available for space radios. For Field Programmable Gate Arrays (FPGAs), the current trend for single event upset handling is to use triple mode redundancy and scrubbing. Error detection and correction techniques are also used. A by-product of using these radiation capable processors is that they are not as capable as commercial off-the-shelf electronics, often lagging them by a generation or two. The use of these processors limits both the footprint and complexity of the infrastructure.
- **Spacecraft Resource Constraints**: An item limiting the size and complexity of the architecture is the available resources from the spacecraft, which often impose constraints on the size, weight and power the radios can use. Each mission has specific allowances for the resources that a radio can consume such as, real time performance, mission classes (high-capacity), network, reconfigurability, reprogrammability, etc. Overhead for supporting the open architecture must be balanced against these spacecraft constraints.
- **Reliability (fault tolerance, guaranteed delivery) and Availability**: Reliability is of paramount importance to space radios. The hardware is often designed to prevent single point failures from both the hardware and software perspective. Radios for manned missions have high reliability requirements, especially for safety critical applications. Unmanned missions also require high reliability and, since they are unmanned, any software changes or uploads require assurance that these changes can be done correctly. For example, if communication to a satellite is lost, the ability to command and control the satellite is also lost.
- **Specialized Signal Processing Abstraction**: The architecture should support the abstraction of the platforms that waveforms are deployed on so they are able to execute on a variety of different specialized signal processor elements including Digital Signal Processors (DSPs), FPGAs, and Application-Specific Integrated Circuits (ASICs). Realizing all these

processor elements are programmed differently, the hardware abstraction will improve the portability of waveforms to different platform variations. Power consumption and performance are also important considerations in the selection process for the device running the waveform algorithm, and specialized signal processing devices are more power efficient than general purpose processors. For example:

  - Space radios may continue to use ASICs where power or the radiation environment is of a concern.
  - Power efficiency is often more important to space applications than flexibility and portability.
  - The present capabilities of space rated processors may not meet the required mission specific data rates.

- **Static Deployment**: The hardware resources assigned to the radio platform onboard the spacecraft are fixed and verifiable, and rarely will be changed. All current and uploaded waveforms for on-orbit radios will be carefully tested on the ground for the intended platform configuration. However, this does not mean that dynamic changes to the waveform will not occur. Waveforms may change operating parameters, due to commands from the flight computer, or autonomously, due to waveform input signal levels or other predetermined conditions.
- **Long Mission Development Times**: The development time of the radios is often much longer compared to their commercial equivalents. The technology of the radio is often fixed early in the design cycle. Extensive characterization and testing are required to eliminate any undesirable modes or unrecoverable states. The long development time often affects the requirements of the radio, since requirements are often not firm early in the cycle. This often leads to requirements creep. The ability to make software changes aids in the ability to make any late enhancements before the radio has been launched. Any changes must be carefully analyzed and documented to ensure that the operation is not negatively impacted. The SDR enables more efficient change management.
- **Space Waveforms**: The waveforms that are used for these applications often are unique to the space environment. For example, NASA utilizes a selected set of waveforms that correspond to frequency allocations and existing space assets. The data rates range from low (Kbps) to high (Mbps), and the frequencies range from low (MHz) to high (GHz). The architecture will have applicability greater than 2 GHz. The waveforms used often will be deployed on a variety of platforms that scale in size and capabilities. A response might include a mapping from a Consultative Committee for Space Data Systems (CCSDS) waveform definition to an SDR definition.
- **Small Space Market:** The number of radios built for space use is much lower than most terrestrial markets. The cost to develop and maintain the open architecture must be in proportion to the overall market. Aligning with

other open architecture designs and standards is desired to reduce the architecture cost. This alignment must be balanced with the need to tailor the architecture for the constraints of the space domain. It is anticipated that this specification will be size agnostic and capable of being utilized on CubeSats.

6.2 Scope of Proposals Sought

The proposals sought through the STI RFP are expected to extend the SWRadio specification to incorporate space-based components tempered by space requirements for interoperability, reconfigurability, reprogrammability (static, possibly mission/mission only), reliability, scalability, modularity, extensibility and waveform portability.

Figure 2 illustrates a package diagram depicting the notional relationship between the relevant existing SWRadio OMG packages and dependencies with a potential set of space specification artifacts. This figure serves to illustrate how the existing SWRadio specification can be extended to define a PIM and PSM for Space Software Radio Components to serve space domain requirements associated with the Space Telecommunications Radio System (STRS [STRS]) and the Mission Requirements. Requirements derived from these sources will be described later in this document.

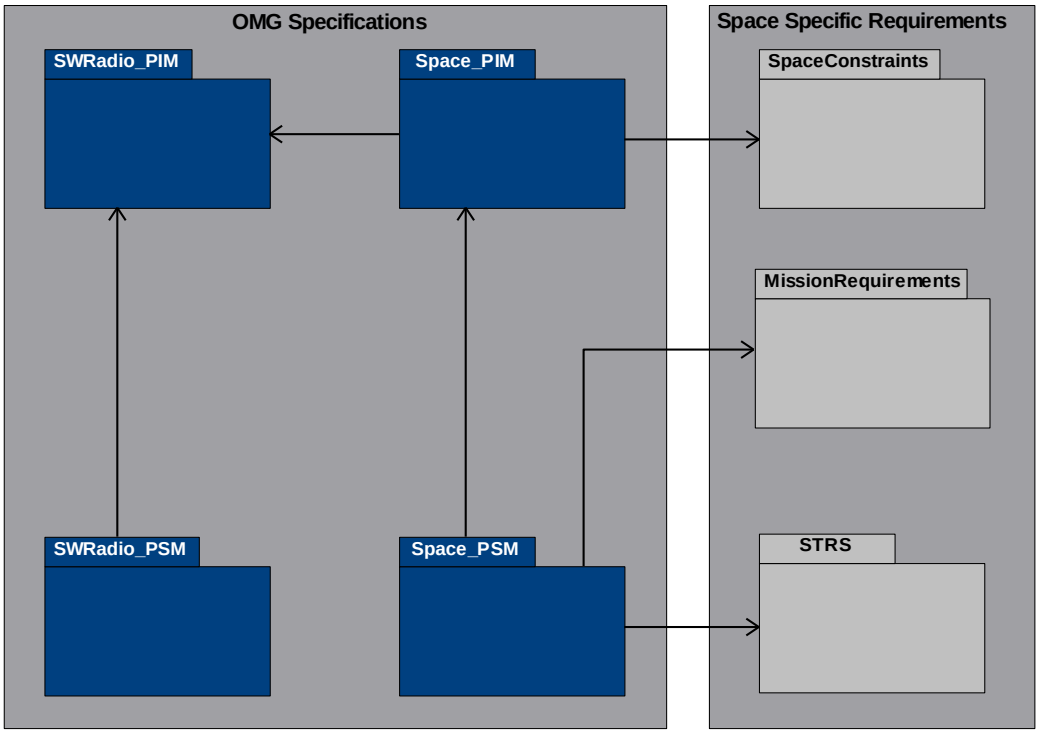

Figure 2 – STRS Relationship to OMG SWRADIO

There are three candidate MDA-based categories where space SDR components (waveform and platform) can be allocated (the SWRadio PSM is not included here as it would be a terrestrial sibling to the Space PSM – different platform and waveforms):

- SWRadio specification: Waveform and/or platform components that can be generalized to any device agnostic radio set (land/sea, air, space).
- Space PIM: Waveform and/or platform components that are specialized from the SWRadio PIM, device agnostic, and are space domain specific.
- Space PSM: This is the transformation of the PIM portions (SWRadio and Space) to a specific platform (including specified development languages, middleware, and physical devices).

The objective of this RFP is to allocate capabilities, identified in the STI response (and like documents) to one of these three categories, and subsequently define the PIM interfaces, definitions, connections, etc., and the PSM transformation for STI, and STI-like missions.

It is important to note that much of this STI RFP draws upon the STRS Open Architecture Standard [STRS] for requirements definition of space-based radio systems. Submitters shall provide responses that not only respond to STRS specific requirements, but also consider the general space domain requirements in other similar agencies, both local or international.

Examples of benefits provided by this profile are as follows:

- Provide flexibility with broad application through adaptability and evolution to many space mission types from 2015 to 2030 and beyond (scalability and flexibility).
- Increase the reliability and decrease the development time and cost of deployed SDR capabilities.
- Leverage existing or developing standards, resources, and experience.
- Enable waveform portability and reusability between compliant SDR platforms.
- Leverage software and firmware design and implementation processes and tools to lower risk and increase reliability.
- Accommodate technology advances with minimal rework (extensibility).
- Be adaptable to evolving requirements (adaptability).
- Allow software modification later in development cycle or post-deployment.
- Enable cognitive radio concepts.
- Allow vendors to work on different parts of the radio at once.
- Ensure updates to one part do not affect the other parts of the radio.
- Promote solutions from multiple vendors and vendor independence.
- Be interoperable with existing radios.

6.3 Relationship to other OMG Specifications and activities

6.3.1 Relationship to OMG specifications

Main relevant specifications:

[SWR] PIM and PSM for SWRadio Components Final Adopted Specification https://www.omg.org/spec/SDRP: This specification provides the core of software based communications specifications within the OMG. The SWRadio specification provides a UML Profile for SWRadio applications and elements, as well as, a PIM and PSM for specifying the application interfaces. The Space PIM specification shall make maximum use of the SWRadio specification where applicable. It is expected that the Space PIM modelling effort will inherit and specialize the communication equipment section of the UML Profile for SWRadio.

[MOF] Meta-Object Facility (MOF) Specification: The MOF Specification defines a set of modelling constructs that can be used to define and manipulate a set of interoperable metamodels and their corresponding models. These interoperable metamodels include the UML metamodel, the MOF meta-metamodel, as well as future OMG adopted technologies that will be specified using metamodels.

6.3.2 Relationship to other OMG Documents and work in progress

[SysML] OMG Systems Modelling Language, *http://www.omg.org/spec/SysML*

[UML] Unified Modelling Language Specification, *http://www.omg.org/spec/UML*

6.4 Related non-OMG Activities, Documents and Standards

[FIPS] *Guide for Applying the Risk Management Framework to Federal Information Systems: A Security Life Cycle Approach*, FIPS SP 800-37.

[NASA] *Reconfigurable Transceiver Architecture & Technology for NASA Space Communications Concept & Functions Document*: This document defines the concepts of operation and preliminary requirements for the next generation reconfigurable transceivers by giving sample application scenarios and representative transceiver functions. There are also references to existing NASA systems and services, as well as the waveforms to be supported.

[OSI] Open Systems Interconnection (OSI – ITU-T Reference Model X.200) – see https://www.itu.int/rec/T-REC-X.200-199407-I.

[POSIX] *Portable Operating System Interface*, IEEE Std 1003.1-2017 2017 and ISO/IEC 9945. https://standards.ieee.org/search-results.html?q=POSIX.

[SCA] *Software Communications Architecture Specification V2.2.2* (https://www.public.navy.mil/jtnc/SCA/SCAv2_2_2/SCA_version_2_2_2.pdf). Note that the support documents to the SCA are available here: https://www.public.navy.mil/jtnc/Pages/resources.aspx?filter=cat-sca.

[SSDR] Space Communication Architecture Working Group (SCAWG) NASA *Space Communication and Navigation Architecture Recommendations for 2005-2030*, 15 May 2006 Final Report (https://www.omg.org/cgi-bin/doc?sbc/06-12-08).

[STRS] Space Telecommunications Radio System (STRS) Architecture Goals/Objectives and Level 1 Requirements Document, NASA/TM-2007-215042, January 12, 2007: This document describes the requirements of the Space Telecommunication Radio System Architecture. The document includes goals and objectives derived from top-level NASA Headquarter guidelines, providing broad, fundamental direction and purpose. The document also includes Level 1 requirements derived from the goals and objectives.

6.5 Mandatory Requirements

This RFP solicits proposals for a PIM and PSM Profile expressed in some combination of UML and SysML representations supporting the software and system levels for SDRs. Section 6.5 describes the mandatory requirements for this profile.

6.5.1 General

1. Proposals shall reuse the UML Profile for SWRadio (PIM and PSM for SWRadio Components [SWR]) where appropriate to accommodate special space SDR constraints for communication equipment and physical layer facilities of the solicited PIM.
2. Proposals shall specify a PIM and at least one normative PSM for Space SDR interfaces.
3. The STI RFP requests an architecture level specification for hardware and software development to abstract the software waveforms from hardware platforms. This specification shall consist of at least two primary interface definitions, each with a control and data plane specification for interchanging configuration and run-time data: 1) the STI Application Programming Interface (API) and 2) the STI Hardware Interface Definition (HID) API. The STI APIs shall provide the interfaces that allow applications to be instantiated and use platform services.

Note: In the STRS, the STRS Device was the standard abstraction and the HID was a documentation-only requirement so that the hardware was understood such that the STRS Device could be written and modified if the hardware changed. The HID defines the physical and logical interfaces for inter-module and intra-module integration and shall be published so that specialized hardware made by one company may be integrated with an STI infrastructure made by a different company. As part of a radio delivery, the radio supplier is required to provide a HID, which defines the physical interfaces, functionality, and performance of each platform module for a delivered radio. Each module's HID abstracts and defines the module functionality and performance.

4. The STI APIs shall provide an open software specification for the application engineer to develop STI waveform application programs. *Note: The goal is to have standard APIs available to cover all application program requirements so that the waveform programs can be reused on other hardware systems with minimal porting effort and cost of the waveform software (and firmware).*
5. The STI response shall provide a space platform infrastructure to support waveform implementations. Additionally, the Space PIM/PSM shall identify services required for waveform deployment and management. *Note: Care must be taken to avoid tight coupling of services that prevents scalability. Whether a service becomes an application or an intrinsic component of the STI architecture should be driven by space constraints.*

6.5.2 Compliance Points

Proposals shall define compliance points to which COTS vendors must conform. The following is the minimum set of acceptable compliance points. Responses may include additional compliance points for specification clarification.

1. Standard interfaces for control, management and status retrieval of the subsystems.
2. Control interfaces with functionality to control the synchronization of subsystems.
3. Interfaces that allow setting and querying parameters defined in the hardware abstraction of subsystem elements.
4. Application interfaces and related metadata defined separately for each subsystem.

6.5.3 Networking

Proposals shall specify a profile that supports the following networking aspects and functionality of Space Telecommunications Interfaces:

1. Support different kinds of missions, such as legacy, new science, and new exploration.
2. Support IP routing and internet applications for space and ground elements.
3. Accommodate both scheduled and unscheduled communications.
4. Accommodate both continuous and intermittent connectivity.
5. Support space data links characterized by large and small signal propagation latencies; uni-directionality and bi-directionality; and both low and high bit error rates.
6. Support data flows that: originate at arbitrary user locations on Earth and in space, terminate at arbitrary user locations or sets of user locations (i.e., multi-point delivery) on Earth and in space, and traverse N-hop transmission paths where N > 1.
7. Support transmission of the following types of data: command, telemetry, files (including web pages), messages (e.g., electronic mail), voice, video, and range safety.
8. Provide the following qualities of data communication service (not necessarily in all combinations): isochrony, reliability, transmission order preservation, timeliness, and priority.
9. Provide data communication performance metrics and accountability.

6.5.4 Security

Proposals shall provide a profile that supports an implementation that includes the following security aspects of Space Telecommunications Interfaces:

1. End-to-end protection of the authenticity of C2 information, specifically the ability to prevent unauthorized commanding and alteration of data.
2. End-to-end protection of the confidentiality of sensitive C2 information, specifically the ability to prevent inappropriate disclosure of sensitive data.
3. Timely delivery of, and access to, critical C2 information with minimal delay caused by security services.
4. Bulk encryption for legacy assets.
5. The ability to manage and control security key material over-the-network using Federal Information Processing Standard (FIPS)-approved key generation and distribution.
6. The ability to conduct Certification and Accreditation of the security service end-to-end system according to FIPS SP 800-37 [FIPS], using FIPS-approved cryptographic modules and devices.

6.6 Non-mandatory features

6.6.1 Design Requirements

Proposals may support the following aspects that affect design requirements:

1. The ability to isolate waveform applications from hardware specific implementations.
2. The ability of a radio to maintain reliable operation during remote software and firmware uploads.
3. The ability of a radio to control external hardware in real-time.
4. The ability of a radio to operate legacy, current standard, and defined waveforms according to its hardware.
5. The ability of a radio to use both narrowband and wideband waveforms for voice, video, and data space communications.
6. The ability of a radio to use current, and be adaptable to new, networking protocols.
7. The ability of a radio to maintain compatibility with current, and be adaptable to new, security measures.
8. Views/viewpoints used to express the deployment side of the previously described HID, and patterns, e.g. application and resource factories to control application/resources, may be used to subdivide the STI profile for clarity and modularity.

6.6.2 Interface Requirements

Proposals may support the ability of a radio to use existing commercial off-the-shelf spacecraft interfaces.

6.6.3 Functional Requirements

Proposals may support the following functional requirements:

1. The ability of a radio to operate multiple waveforms simultaneously.
2. The ability of a radio to operate in several communication bands simultaneously.
3. The ability of a radio to operate multiple simultaneous channels in a single communication band.
4. The ability of a radio to autonomously monitor its communications environment and a) self-adapt in order to optimize its communications link and b) report on or respond to remote interrogations regarding its health and configuration status.
5. The ability of a radio to be reconfigurable and to provide additional computing resources at times when communications are low or zero.

6. The ability of radio to detect extended loss of operation either due to signal degradation or internal malfunction.
7. The ability of a radio to autonomously recover from fault conditions after a reboot or power cycle event.
8. The ability of a radio to use current and be adaptable to new radiometric tracking and navigation waveforms and services.
9. The ability of a radio to use secure transmissions.

6.7 Issues to be discussed

These issues will be considered during submission evaluation. They should not be part of the proposed normative specification. Place your responses to these Issues in Section 0 of your submission.

1. Proposals shall discuss how legacy systems are supported by an implementation of this specification.
2. Proposals shall discuss how it provides advantages for the space environment.
3. Proposals shall discuss an alternative to the Portable Operating System Interface (POSIX) [POSIX], or to a custom space adaptation layer, including issues like messages, threads, files, locks, timing, etc.
4. Proposals shall discuss how the proposed specification handles external commands.
5. Proposals shall discuss how interfaces from a HID to FPGAs and other signal-processing specific based platforms are specified, e.g., reuse of existing hardware abstraction layers or new design to satisfy modern signal processing hardware.

6.8 Evaluation Criteria

The STI specification response to this RFP will be a PIM and PSM Profile expressed in UML and SysML representation. The STI could be provided at 2 levels, with UML expressing software level and SysML expressing the system level. Listed in decreasing order of importance:

- Effectiveness as a solution to the problem statement and scope defined in Sections 6.1 and 6.2, respectively.
- Compatibility with existing OMG specifications.
- Consideration of performance issues in terms of timing, latency and bandwidth.
- Support of application portability and reusability.
- Support for legacy systems.

- Compatibility with existing products and technologies.
- Effectiveness of responses to issues to be discussed.
- Effectiveness of responses to optional requirements.

In addition, an example demonstrating the implementation of the Profile will help to provide clarity and understanding of the STI specification.

6.9 Other information unique to this RFP

There is no other information unique to this RFP.

6.10 IPR Mode

Every OMG Member that makes any written Submission in response to this RFP shall provide the Non-Assertion Covenant found in Appendix A of the OMG IPR Policy [IPR].

6.11 RFP Timetable

The timetable for this RFP is given below. Note that the TF or its parent TC may, in certain circumstances, extend deadlines while the RFP is running, or may elect to have more than one Revised Submission step. The latest timetable can always be found at the OMG *Work In Progress* page at http://www.omg.org/schedules under the item identified by the name of this RFP.

Event or Activity	Date
Letter of Intent (LOI) deadline	*26 December 2019*
Initial Submission deadline	*24 February 2020*
Voter registration closes	*16 March 2020*
Initial Submission presentations	*23 March 2020*
Revised Submission deadline	*18 May 2020*
Revised Submission presentations	*15 June 2020*

Appendix A References & Glossary Specific to this RFP

A.1 References Specific to this RFP

See Section 6.3.

A.2 Glossary Specific to this RFP

API - an application programming interface is a set of subroutine definitions, communication protocols, and tools for building software. In general terms, it is a set of clearly defined methods of communication among various components.

ASIC - a application-specific integrated circuit is customized for a particular use, rather than intended for general-purpose use.

DSP - a digital signal processor is a specialized microprocessor with its architecture optimized for the operational needs of digital signal processing

HID - a Hardware Interface Definition is an architecture used to interconnect two devices together. It includes the design of the plug and socket, the type, number and purpose of the wires and the electrical signals that are passed across them.

FPGA – a field programmable gate array is an integrated circuit designed to be configured by a customer or a designer after manufacturing – hence the term "field-programmable". The FPGA configuration is generally specified using a hardware description language (HDL), similar to that used for an Application-Specific Integrated Circuit (ASIC).

PIM – a Platform Independent Model exhibits a sufficient degree of independence so as to enable its mapping to one or more platforms. This is commonly achieved by defining a set of services in a way that abstracts out technical details. Other models then specify a realization of these services in a platform specific manner.

PSM – a Platform Specific Model combines the specifications in the PIM with the details required to stipulate how a system uses a particular type of platform. If the PSM does not include all of the details necessary to produce an implementation of that platform it is considered abstract (meaning that it relies on other explicit or implicit models which do contain the necessary details).

SDR – a software-defined radio is a radio communication system where components that have been typically implemented in hardware (e.g. mixers, filters, amplifiers, modulators/demodulators, detectors, etc.) are instead implemented by means of software on a personal computer or embedded system.

SCA Waveform - A waveform is the entire set of radio and/or communications functions that occur from the user input to the radio frequency output and vice versa. Joint Tactical Radio Systems (JTRS, aka JTNC) waveform implementation consists of a Waveform Application Code, Radio Set Devices and Radio System Applications.

STI – Space Telecommunications Interface renaming of STRS specification, see below.

STRS – Space Telecommunications Radio Service – NASA name for original specification that is being delivered to OMG for standardization.

Appendix B General Reference and Glossary

B.1 General References

The following documents are referenced in this document:

[BCQ] OMG Board of Directors Business Committee Questionnaire,
http://doc.omg.org/bcq

[CCM] CORBA Core Components Specification
http://www.omg.org/spec/CCM/

[CORBA] Common Object Request Broker Architecture (CORBA)
http://www.omg.org/spec/CORBA/

[CORP] UML Profile for CORBA,
http://www.omg.org/spec/CORP

[CWM] Common Warehouse Metamodel Specification
http://www.omg.org/spec/CWM

[EDOC] UML Profile for EDOC Specification
http://www.omg.org/spec/EDOC/

[Guide] The OMG Hitchhiker's Guide
http://doc.omg.org/hh

[IDL] Interface Definition Language Specification
http://www.omg.org/spec/IDL35

[INVENT] Inventory of Files for a Submission/Revision/Finalization
http://doc.omg.org/inventory

[IPR] IPR Policy
http://doc.omg.org/ipr

[ISO2] ISO/IEC Directives, Part 2 – Rules for the structure and drafting of International Standards
http://isotc.iso.org/livelink/livelink?func=ll&objId=4230456

[LOI] OMG RFP Letter of Intent template
http://doc.omg.org/loi

[MDAa] OMG Architecture Board, "Model Driven Architecture - A Technical Perspective"
http://www.omg.org/mda/papers.htm

[MDAb] Developing in OMG's Model Driven Architecture (MDA)
http://www.omg.org/mda/papers.htm

[MDAc] MDA Guide
http://www.omg.org/docs/omg/03-06-01.pdf

[MDAd] MDA "The Architecture of Choice for a Changing World
http://www.omg.org/mda

[MOF] Meta Object Facility Specification
http://www.omg.org/spec/MOF/

[NS] Naming Service
http://www.omg.org/spec/NAM

[OMA] Object Management Architecture
http://www.omg.org/oma/

[OTS] Transaction Service
http://www.omg.org/spec/OTS

[P&P] Policies and Procedures of the OMG Technical Process
http://doc.omg.org/pp

[RAD] Resource Access Decision Facility
http://www.omg.org/spec/RAD

[ISO2] ISO/IEC Directives, Part 2 – Rules for the structure and drafting of International Standards
http://isotc.iso.org/livelink/livelink?func=ll&objId=4230456

[RM-ODP]
ISO/IEC 10746

[SEC] CORBA Security Service
http://www.omg.org/spec/SEC

[TEMPL] Specification Template
http://doc.omg.org/submission-template

[TOS] Trading Object Service
hptp://www.omg.org/spec/TRADE

[XMI] XML Metadata Interchange Specification,
http://www.omg.org/spec/XMI

B.2 General Glossary

Architecture Board (AB) - The OMG plenary that is responsible for ensuring the technical merit and MDA-compliance of RFPs and their submissions.

Board of Directors (BoD) - The OMG body that is responsible for adopting technology.

Common Object Request Broker Architecture (CORBA) - An OMG distributed computing platform specification that is independent of implementation languages.

Common Warehouse Metamodel (CWM) - An OMG specification for data repository integration.

CORBA Component Model (CCM) - An OMG specification for an implementation language independent distributed component model.

Interface Definition Language (IDL) - An OMG and ISO standard language for specifying interfaces and associated data structures.

Letter of Intent (LOI) - A letter submitted to the OMG BoD's Business Committee signed by an officer of an organization signifying its intent to respond to the RFP and confirming the organization's willingness to comply with OMG's terms and conditions, and commercial availability requirements.

Mapping - Specification of a mechanism for transforming the elements of a model conforming to a particular metamodel into elements of another model that conforms to another (possibly the same) metamodel.

MDA – Model-Driven Architecture.

Metadata - Data that represents models. For example, a UML model; a CORBA object model expressed in IDL; and a relational database schema expressed using CWM.

Metamodel - A model of models.

Meta Object Facility (MOF) - An OMG standard, closely related to UML, that enables metadata management and language definition.

Model - A formal specification of the function, structure and/or behavior of an application or system.

Model Driven Architecture (MDA) - An approach to IT system specification that separates the specification of functionality from the specification of the implementation of that functionality on a specific technology platform.

Normative – Provisions to which an implementation shall conform to in order to claim compliance with the standard (as opposed to non-normative or informative material, included only to assist in understanding the standard).

Normative Reference – References to documents that contain provisions to which an implementation shall conform to in order to claim compliance with the standard.

Platform - A set of subsystems/technologies that provide a coherent set of functionality through interfaces and specified usage patterns that any subsystem that depends on the platform can use without concern for the details of how the functionality provided by the platform is implemented.

Platform Independent Model (PIM) - A model of a subsystem that contains no information specific to the platform, or the technology that is used to realize it.

Platform Specific Model (PSM) - A model of a subsystem that includes information about the specific technology that is used in the realization of it on a specific platform, and hence possibly contains elements that are specific to the platform.

Request for Information (RFI) - A general request to industry, academia, and any other interested parties to submit information about a particular technology area to one of the OMG's Technology Committee subgroups.

Request for Proposal (RFP) - A document requesting OMG members to submit proposals to an OMG Technology Committee.

Task Force (TF) - The OMG Technology Committee subgroup responsible for issuing a RFP and evaluating submission(s).

Technology Committee (TC) - The body responsible for recommending technologies for adoption to the BoD. There are two TCs in OMG – the *Platform TC* (PTC) focuses on IT and modelling infrastructure related standards; while the *Domain TC* (DTC) focuses on domain specific standards.

Unified Modelling Language (UML) - An OMG standard language for specifying the structure and behaviour of systems. The standard defines an abstract syntax and a graphical concrete syntax.

UML Profile - A standardized set of extensions and constraints that tailors UML to particular use.

XML Metadata Interchange (XMI) - An OMG standard that facilitates interchange of models via XML documents.