Object Management Group

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Image Access Service (IAS)

Request For Proposals

OMG Document: corbamed/98-03-06

DRAFT version 0.2

Submissions due: Month, Day, 1998

Objective of this RFP

This RFP solicits proposals accessing (i.e. retrieving) medical images and related information. Medical images are a subset of clinical observations and the Image Access Service (IAS) must therefore be a proper subclass of the CORBAmed Clinical Observations Access Service (COAS). The IAS is intended to be a retrieve-only service. There does not appear to be a need for a CORBA image storage service, based on the prominence of the DICOM standard in this area.

The most prominent standard for image interchange in medicine is the Digital Imaging and COmmunications in Medicine (DICOM) standard of the National Electrical Manufacturers Association (NEMA). DICOM provides a robust standard for transmission, storage, query, printing, and management of medical images and related information (overlays, reports, demographics, etc.). The DICOM standard is based on the DICOM information model which helps to clarify the semantics of the standard.

The DICOM standard is very complex and is not widely used outside of its core clinical constituency. The CORBA Image Access Service (IAS) is intended to provide a "wrapper" around the DICOM standard (specifically, the Query/Retrieve and Storage SOP classes) which provides retrieval of medical images (DICOM or non-DICOM formats) to non-DICOM users. The service provides a simplified view of the DICOM information model which supplies images and limited meta-data to users in formats which are compatible with better known image standards and with office type computing equipment and networks. The IAS provides automatic image scaling and windowing to meet the needs of non-image specialists and general clinicians for the non-diagnostic viewing of medical images. The IAS hides the complexities of DICOM while providing the basic services needed to support Computer-based patient records over low and moderate speed networks.

For further details see Chapter 6 of this document.

1. Introduction

1.1 Goals of OMG

The Object Management Group (OMG) is the world's largest software consortium with a membership of over 700 vendors, developers, and end users. Established in 1989, its mission is to promote the theory and practice of Object Technology (OT) for the development of distributed computing systems.

A key goal of OMG is create a standardized object-oriented architectural framework for distributed applications based on specifications that enable and support distributed objects. Objectives include the *reusability*, *portability*, and *interoperability* of object-oriented software components in heterogeneous environments. To this end, the OMG adopts interface and protocol specifications, based on commercially available object technology, that together define an Object Management Architecture (OMA).

1.2 Organization of this document

The remainder of this document is organized as follows:

Chapter 2 - *Architectural Context* - background information on OMG's Object Management Architecture.

Chapter 3 - *Adoption Process* - background information on the OMG specification adoption process.

Chapter 4 - *Instructions for Submitters* - explanation of how to make a submission to this RFP.

Chapter 5 - *General Requirements on Proposals* - requirements and evaluation criteria that apply to all proposals submitted to OMG.

Chapter 6 - *Specific Requirements on Proposals* - problem statement, scope of proposals sought, mandatory and optional requirements, issues to be discussed, evaluation criteria, and timetable that apply specifically to this RFP.

Additional RFP-specific chapters may also be included following Chapter 6.

1.3 References

The following documents are referenced in this document:

Richard Soley (ed.), *Object Management Architecture Guide*, Third Edition, Wiley, June 1995. OMG Document ab/97-05-05.

The Common Object Request Broker: Architecture and Specification, Revision 2.0, July 1996. OMG Document ptc/96-08-04.

CORBAservices: Common Object Services Specification, Revised Edition, March 1995. OMG Document formal/97-05-03.

CORBAfacilities Architecture, Revision 4.0, November 1995.

Business Committee RFP Attachment, OMG Document omg/96-01-01.

Policies and Procedures of the OMG Technical Process, OMG Document pp/97-01-01 or successor.

These documents can be obtained by contacting OMG at document@omg.org. Many OMG documents, including this document, are available electronically from OMG's document server. Send a message containing the single line "help" to server@omg.org for more information.

For more information about OMG visit OMG's Web page (URL http://www.omg.org/). If you have general questions about this RFP send email to responses@omg.org.

Digital Imaging and Communications in Medicine (DICOM); National Electrical Manufacturers Association; 1300 N. 17th Street, Suite 1847, Rosslyn, Virginia 22209, USA.; http://www.nema.org

6.0 Specific Requirements on Proposals

This RFP solicits proposals accessing (i.e. retrieving) medical images and related information. Medical images are a subset of clinical observations and the Image Access Service (IAS) must therefore be a proper subclass of the CORBAmed Clinical Observations Access Service (COAS). The IAS is a retrieve-only service. There does not appear to be a need for a CORBA image storage service, based on the prominence of the DICOM standard in this area.

6. Problem Statement

The most prominent standard for image interchange in medicine is the Digital Imaging and COmmunications in Medicine (DICOM) standard of the National Electrical Manufacturers Association (NEMA). DICOM provides a robust standard for transmission, storage, query, printing, and management of medical images and related information (overlays, reports, demographics, etc.). The DICOM standard is based on the DICOM information model which helps to clarify the semantics of the standard.

On the other hand, the DICOM standard is very complex. It is designed to handle a wide variety of services (defined as Service-Object-Pairs, or SOP classes, in the Standard), to describe a broad class of specialized image formats found in different clinical sub-specialties, and to support the specialized information needs of radiology, cardiology, pathology, gastroenterology, OB/GYN, etc. DICOM is based on relational technology and is not object oriented (although it is object-based). It attempts to describe different types and variants of medical image formats rather than normalize them. DICOM uses complex "associations" to negotiate compatible transfer syntaxes between a SOP class provider and SOP class user; specifically, DICOM does not attempt to provide images to a user in the format in which a user might want to receive them. DICOM image formats do not conform to more popular image standards (except that JPEG compression is allowed as an option). Lastly, DICOM defines it own, interoperable, file format for stored images.

DICOM image sets, particularly those produced in radiology and cardiology, are very large. Generally speaking, the large pixel matrix sizes are needed for primary diagnosis only, and are unnecessarily large for general consultative use and non-diagnostic clinical viewing. These large data sets are time consuming to transmit and difficult to handle within general office PCs. Furthermore, DICOM images must

often be manipulated for proper viewing, requiring specialty skills which are not part of general physician training.

For all of these reasons, the DICOM standard is not well known, and not at all used, outside of the clinical specialties which are represented on its Board. Furthermore, many image types in medicine, outside of radiology, still exist in other, more popular, formats (e.g. TIFF, GIF, JIF, JPG, BMP, PNG, etc.).

The Image Access Service (IAS) is intended to provide a "wrapper" around the DICOM standard (the Query/Retrieve and Storage SOP classes, in particular) which provides access to medical images (DICOM or non-DICOM formats) outside of the DICOM clinical specialities. The service provides a simplified view of the DICOM information model which supplies images and limited meta-data to users in formats which are compatible with better known image standards and with office type computing equipment and networks. The IAS provides automatic image scaling and windowing to meet the needs of non-image specialists and general clinicians for the non-diagnostic viewing of medical images. The IAS hides the complexities of DICOM while providing the basic services needed to support Computer-based patient records over low and moderate speed networks.

6.2 Scope of Proposals Sought

Proposals are sought that provide clear, unambiguous, mechanisms to access medical image information and related meta-data in a manner which is useful to general practitioners and clinical specialists in situations where diagnostic quality is not a consideration. For the purposes of this RFP, medical images are sets of two dimensional arrays of picture elements (pixels) which may be related by anatomy or time series, or both. Continuous or streaming video information are specifically excluded from this RFP; albeit these data types may be the subject of other RFPs.

All proposals must be compatible with the CORBAmed Clinical Observation Access Service (COAS). The ability to normalize image formats to meet user specific requirements in both pixel matrix size and bit depth is mandatory. Proposals must also relate images to studies (and series and series components, as necessary) and to patients and should optionally provide a means to address image compression for transmission over low speed networks. Proposals must be compatible with the DICOM standard and all proposals should contain an object model which is consistant with the DICOM

information model (i.e. can relate to a proper subst of the latter). Proposals must provide a means for users to find studies (study components, series, as appropriate) and images of interest without the need to understand the DICOM standard. The means to support graphical navigation of complex image sets (e.g. "thumbnails") is highly desireable.

6.3 Relationship to Existing OMG Specifications

Technology submissions should take advantage of existing OMG specifications where appropriate. The following services are anticipated to be appropriate for use by this facility:

CORBA Services:

Security - It is expected that the OMG Security Service will be utilized for security capabilities.

Secured Time - It is expected that responses will use CORBA Time services for time continuity.

Objects by Value - Work in progress on the OMG Objects by Value RFP may prove useful in responses to this submission.

In addition, submitters should be aware that RPF's are currently outstanding for technology adoption in the following areas. Submitters are encouraged to follow this work, because technology may be adopted in this space before submissions are due for this RFP.

Other relevant OMG Work in progress:

- Electronic Healthcare Claims Facility
- Electronic Payment Facility
- Insurance Party Management
- Messaging
- Patient Identification Services
- Lexicon Query Services
- Clinical Observation Access Service (COAS)

6.4 Related Documents and Standards

Some groundwork in this area has already been laid by other standards organizations, particularly:

Digital Imaging and Communications in Medicine (DICOM); National Electrical Manufacturers Association; 1300 N. 17th Street, Suite 1847, Rosslyn, Virginia 22209, USA.; http://www.nema.org

Join Photographic Experts Group (JPEG); JPEG FAQ: http://www.cis.ohio-state.edu/hypertext/faq/usenet/jpeg-faq/top.html

The purpose of the IAS is offer standard IDL-based services to access DICOM and non-DICOM medical images.

6.5 Mandatory Requirements

This RFP solicits proposals for OMG IDL specifications of an Image Access Service (IAS) that will facilitate access to medical images.

The following are the mandatory requirements for IAS:

- The IAS shall provide access to uncompressed, monochromatic images.
- The IAS shall provide access to images based upon a study identifier or ascession number.
- The IAS shall provide information about a study hierarchy (meta-data), based upon a study identifier or ascession number, including (but not limited to) the number and type of DICOM series within each study (as applicable), and the number and size of images within each series.
- The IAS shall provide information about multi-frame and/or multi-planar image sets which is sufficient for the user to navigate though the image sets.
- The IAS shall provide a means to access specific images, each image as a two dimensional array of pixels, in a size and pixel depth specified by the user (independent of the original image matrix size). Note that consideration must be given to preservation of the original image aspect ratio and to use of DICOM window/level settings, as appropriate. At least one

mandatory format shall be specified, for interoperability purposes.

- The IAS shall provide a means for the user to determine which specific images to access out of a specified study.

- The IAS access mechanism shall be compatible with COAS. {discussion item: COAS is not yet a standard – does this mean that this must be an optional requirement? Is there a "legal" way to write this as a mandatory requirement? If not, how do we maintain compatibility between IAS and COAS?}

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6.6 Optional Requirements

- The IAS may provide a list of studies (with study ID or ascession number) for a patient, given a patient identifier and/or a set of patient identifying information (e.g. name, sex, DOB, etc.).

- The IAS may provide access to "raw" DICOM image objects, in DICOM format, compressed or otherwise.

- The IAS may provide access to images in standard file formats such as JPEG/JIF, JPG/JPG, TIFF, PNG, GIF. BMP, etc.

- The IAS may provide access to image overlays, either standalone or "burned" into the image(s).

- The IAS may provide a means to access color image information.

- The IAS may provide a means to handle image compression; i.e. to uncompress compressed images and to compress uncompressed images. Note: images should not be compressed with a lossy compression algorithm more than once.

- The IAS may provide a means for the user to graphically navigate through the DICOM hierarchy of study, study components, and series (e.g. via "thumbnails") in order to determine which specific images of a study may be of interest.

- The IAS may provide access to DICOM meta-data, such as patient demographic data, report data, study data, equipment data, slice thickness, frame rate, etc.

- The IAS may provide notification when new images are available for access [memo: this requirement is application specific].

- The IAS may provide the user with a means to determine the approximate time required to access a specific image(s) [memo: this requirement is application specific].

- The IAS shall provide a means for the user to cancel lengthy image transfers.

- Proposals may provide an object model for image transfers and related information. In this event, proposals should reference the DICOM information model and describe correspondence of the proposal thereto.

6.8 Evaluation Criteria

The proposals will be evaluated on their completeness and their ability to address the mandatory requirements. A submitter should give justification for any mandatory requirements not met.

The proposals will be evaluated on their ability to address practical problems involving image access and transfers, including the handling of large data sets, navigation through complex hierarchical data sets, the handling of compression (lossy compression in particular), and the handling of indefinite access and transfer times {memo: the DICOM query/retrieve SOP class does not provide a means for the user to limit or specify access time. Access time for images within a PACS may be indefinite, particularly for images residing in off-line storage}.

6.9 RFP Timetable

The timetable for this RFP is given below. Note that the TF 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 in the Member Services section of OMG's Web page (URL http://www.omg.org/).

Approx Day	**Event or** *Activity*	**Actual Date**
0	TC votes to issue RFP	
160	LOI to submit to RFP due	
	Voter registration closes	
220	Initial submissions due	
	Revised submissions due	
	TF votes to select specifications	
330	TC votes to recommend specifications	
360	BOD votes to adopt specifications	