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From: Jack Harrington

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To: CORBAmed Technology Desk
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Subject: Hewlett-Packard Response to CORBAmed RFI 4- OMG Document # corbamed/97-09-15

Cc: AWG-HL7Sig

Hewlett-Packard is pleased to submit the following information in response to the CORBAmed RFI - OMG Document # corbamed/97-09-15. In keeping with the request to limit the size of the response, reference will be made to information which is readily available from public sources such as the web.

The attached response provides information in the areas of :

- Mappings which have been used to implement CORBA based HL7 solutions (could be in the form of IDL with textual explanation).
- Automated approaches to transformation of HL7 ASCII encoded messages to CORBA 'objects' (for example, use of interface engine technology to manage transformation).
- Any object model examples which make use of the HL7 2.X specification or V3 model.
- Benefits and drawbacks (pros and cons) to implementation of CORBA based HL7 implementations (why would someone want to build or buy a CORBA based HL7 implementation over a message based 'traditional' implementation).
- Performance experiences in using CORBA based HL7 implementations (what has worked well, what has not?).
- Discussion of how greater interoperability was achieved through the approaches described.
- Other information which responders to this RFI believe might be useful to CORBAmed.

Please send information regarding this RFI and subsequent information regarding forthcoming RFPs to :

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Regards,
Jack Harrington

In 1996 Hewlett-Packard established the Andover Working Group (AWG), which now comprises over 275 organizations worldwide. The AWG is focused on delivering standards based data

interchange, utilizing component software, and supporting plug-and-play interoperability. The initial focus of the AWG has been on specification and implementation of the HL7 Enterprise Communication Framework (ECF) comprising information models, message profiles, and component software supporting plug-and-play HL7 messaging. Recently the AWG has expanded its focus to include the IEEE P1073 Medical Information Bus (MIB) and the DICOM standards.

The AWG HL7 Special Interest Group Core membership agreed unanimously that a response to the CORBAmed RFI4 should be submitted, and that Hewlett-Packard would draft this response. This document has been reviewed and approved by the following AWG Core Members:

George W. Beeler Jr., Ph.D. - Mayo Foundation
Jack Harrington - Hewlett Packard
Ken McCaslin - SmithKline Beecham Healthcare Service
Alan Stone - Duke University Medical Center

Mappings which have been used to implement CORBA based HL7 solutions

The AWG mappings for HL7 messages implement the recommendations of the HL7 SIGOBT. Information on the HL7 SIGOBT can be obtained from :

http://www.mcis.duke.edu/standards/HL7/sigs/SIGOBT/obt.html

In particular, the AWG supports mappings of HL7 messages to both OMG IDL and to Microsoft MIDL.

The SIGOBT specification is not intended to fully specify an interoperability model. HL7 specifies an interoperability model based upon the message as the atomic unit of transfer. Experience in the AWG has demonstrated that basing the interoperability model on the use of CORBA to support the message as the atomic unit of transfer has significant advantages in terms of performance and adaptability. The ECF implements this architecture through two components, a message factory component and a message communicator component.

The message factory component is responsible for providing an application programming interface, mapping messages to different representations (e.g., objects), and message validation. The message factory component is intimately tied to the messaging standard and schema for which it was built, in this case the HL7 standard. Broadly speaking message factories come in two variations those which support conventional HL7 encoding rules mappings over TCP/IP (proxy message factories) and those which support the SIGOBT mappings (SIGOBT message factories).

The message communicator component is responsible for routing messages and is the locus for ECF system management and configuration. The message communicator component is independent of any messaging standard or schema. Although the message communicator supports any opaque byte stream, currently the streaming for HL7 messages is based on the HL7 encoding rules representation.

The interfaces for the message factory and message communicator are specified in OMG IDL and the current implementations of the message factory and message communicator are CORBA based.

Automated approaches to transformation of HL7 ASCII encoded messages to CORBA 'objects'

As described above, the message factory component is responsible for mapping messages to different representations including HL7 ASCII encoding and SIGOBT based object representations. Currently the messages are streamed using HL7 ASCII encoding. The AWG experience with federating loosely coupled systems has demonstrated that, for the domain covered by HL7, the use of ASCII based transfer simplifies interoperability. CORBA interfaces are used to pass messages between message factories.

Any object model examples which make use of the HL7 2.X specification or V3 model.

Interoperability in the ECF framework is based upon implementation of completely specified message profiles. The proposed method for message development for HL7 Version 3.0 is based on use case modeling, interaction modeling, domain information modeling, mapping of the object domain information model to an abstract message specification, and finally mapping to an implementable message specification expressed in a concrete syntax. Details of the proposed HL7 Version 3.0 message development method are provided at :

http://www.mcis.duke.edu/standards/HL7/pubs/version3/Version3.htm

The AWG has worked closely with HL7 in the development of the version 3.0 message development method, has validated the approach by applying the method to the specification of specific message profiles for HL7 version 2.2, and is in the process applying the method to developing message profiles for HL7 Version 2.3.

Each message profile represents a particular business case defined by a use case model and is supported by multiple vendors and healthcare providers. The message profiles are specializations of HL7 messages which completely define the static and dynamic interactions necessary to achieve plug-and play. Since it is possible to have more than one business case for a given HL7 message, multiple profiles are possible. Each profile is uniquely identified by an ASN.1 Object Identifier guaranteeing global uniqueness. Specialization involves removing all optionality from field definitions, specification of cardinality for segment and field repetitions, removing ambiguity from field definitions, and providing definitions for elements defined by HL7 as "user defined". Each message profile is currently supported by HL7 encoding rules, as well as IDL, and MIDL mappings. Other mappings are possible.

The initial implementation of the ECF was based on HL7 Version 2.2 and used the information models specified for the domains of Admission /Discharge/Transfer (http://dumccss.mc.duke.edu/standards/HL7/data-model/adt/modelpage.html [ADTC223]) and Orders/Results (http://www.mcis.duke.edu/standards/HL7/data-model/ord/modelpage.html [ORDC223]) as a basis for the message profiles. The AWG information model adds specificity to the HL7 information model as described earlier. The AWG has provided its specializations of the information models and message profiles to the HL7 committee for their use in evolving the HL7 standard.

Benefits and drawbacks (pros and cons) to implementation of CORBA based HL7 implementations

The AWG experience has demonstrated significant advantages to the implementation of CORBA based HL7 implementations. Based on the use of the message factory to provide mapping between different message representations the application developer is presented with a message representation in a familiar paradigm. The message communicator provides destination transparency, providing the systems integrator with flexibility in configuring the messaging topology for a system. The use of CORBA provides multi-platform support. The ECF is currently implemented in both NT and UNIX environments and, for the proxy approach using HL7 encoding rules over TCP/IP, provides a migration path from contemporary (non-ECF) implementations.

Performance experiences in using CORBA based HL7 implementations

Based on our experience the AWG believes that run-time performance characteristics of implementations that conform to OMG IDL and ActiveX Interface specification styles are highly implementation dependent and that implementations derived from the SIGOBT mapping rules can vary widely. In particular, local, in process implementations show no degradation in performance when compared to contemporary implementations of HL7 encoding rules over TCP/IP. As expected, implementation of HL7 messages as fine-grained distributed objects imposes the performance penalties one would expect, and is only recommended when other advantages outweigh the expected performance differences.

Discussion of how greater interoperability was achieved through the approaches described.

As mentioned previously the approach used by the ECF allows the application programmer to operate on HL7 messages in a familiar paradigm such as HL7 encoding rules, C++, ActiveX, or other bindings. Platform and destination transparency provides for significant flexibility in the integration of specific systems. Overall, the use of the component approach has reduced both development time and systems integration time significantly. Operational support is simplified by both support for evolution of a system based on transparency and selective validation of messaging.

Other information which responders to this RFI believe might be useful to CORBAmed.

Information on the Andover Working Group can be obtained from :

http://www.hp.com/mpg/newawgmain.html