

Healthcare Decision Support Requirements for CORBA Interfaces

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Biography

Mr Kilman participates on the TeleMed¹ project at Los Alamos National Laboratory. Before working at Los Alamos he collaborated with an emergency room physician for 4 years to develop an object-oriented DSS architecture for healthcare. He now serves as the leader of a CORBAmed² breakout group focusing on DSS interfaces.

Abstract

The Object Management Group (OMG)³ has launched an effort to adopt CORBA⁴ specifications for object interfaces in the vertical domain of healthcare. A number of existing OMG efforts already aim to provide interface specifications that will satisfy some of the requirements for decision support systems in healthcare. For example, the recent OMG Request for Proposals (RFP) on Lexicon Query Services⁵ explicitly mentions the need to satisfy requirements for decision support systems. This paper discusses other possible requirements of decision support systems and other OMG efforts related to decision support.

Decision Support Systems (DSS) and object technology

DSS serves as a general rubric for a large category of different types of systems. DSS typically combines advanced computational techniques with sophisticated human-computer interaction schemes to provide integrated assistance in decision making. DSS designs explicitly seek to incorporate knowledge about decision processes to improve the quality of decision outcomes for the decision-making user. Commercial developers have successfully applied DSS technology to a number of different domains in healthcare as well as to many domains outside of healthcare.

The OMG has a primary interest in interface specifications related to technologies that have existing commercial products in the marketplace. The OMG also has an interest in technologies from R&D that have reached a stage of maturity, so that commercial products based on the technology will likely become available within less than two years. One of the goals of the object-oriented paradigm has to do with increasing the reusability of developed technology. Reusable interfaces, such as those adopted by the OMG, allow different types of systems to implement the same object interface specification in different ways. Thus, two different DSS components might share the same interface, but implement it in different ways; one component might use statistical algorithms; another might use neural networks, yet both could accomplish the same task for a given application.

Design Context and Form

The Design problem for healthcare related CORBA interfaces for DSS demands an acutely contextual approach. The context constrains the design requiring that it accommodate the interests of a large number of widely varied users. Such a problem has much in common with the sorts of design problems faced by the architects of public buildings. Some object-oriented designers find the design ideas of architect Christopher Alexander useful when facing this sort of large scale design problem. Alexander notes that understanding the requirements of a design has to do with hunting for a proper fit between a design form and its context. "We are searching for some kind of harmony between two intangibles: a form which we have not yet designed, and a context which we cannot properly describe."⁶

Describing the context for a design problem like general purpose DSS interfaces means deciding between all of the many possible solutions without definitive guidance to tell us which requirements to focus on first. The further along we get in the CORBA technology adoption process, the more our ideas about the interfaces we adopt early and implement into products will turn rigid. While our ideas still remain malleable, we need to ferret out potential requirements conflicts for DSS interfaces. The longer we wait, the more difficult we will find the task of integrating DSS interfaces together with other interfaces for healthcare architecture.⁷

Several task forces within the OMG have already officially adopted technologies⁸ relevant to DSS. Work underway on other technologies include a data interchange facility and a mobile agent facility,⁹ common business objects and a common business object facility,¹⁰ patient identification services,¹¹ lexicon query services,¹² an event-condition-action rules management facility,¹³ event-condition-action rules services,¹⁴ and other healthcare related efforts.¹⁵ Most of the work in process does not have an explicit healthcare focus. Even within the DSS working group of CORBAmed we have participants who would like to keep the specifications open as much as possible to allow the same DSS interfaces we use in healthcare to serve as general purpose DSS interfaces.

General requirements for DSS in healthcare:

- Reusable clinical components
- Distributed access to data and knowledge
- Shared clinical vocabularies
- Shared practice guidelines
- Cross-disciplinary interactions
- Interoperable modules
- Variations in applications that share the same interface(s)

Application areas:

- Data-warehousing/data-mining
- Retrospective analysis
- Diagnostics
- Classification/clustering
- Eligibility assessment

Potential kinds of interfaces:

- Domain-specific objects
- Problem-solvers
- Problem-oriented tasks
- Reusable medical knowledge modules
- Ontologies
- Vocabularies
- Knowledge representation forms
- Knowledge acquisition tools

Technologies to support:

- Rule-based systems
- Neural networks
- Statistical algorithms
- Fuzzy logic
- Genetic algorithms

- Intelligent agents

Relevant Standards:

- Arden Syntax
- HL7
- Knowledge Query and Manipulation Language (KQML)
- Knowledge Interchange Format (KIF)
- Ontolingua
- Standard for the Exchange of Product Data (STEP) (ISO TC 184, SC 4)

¹ TeleMed, <http://www.acl.lanl.gov/TeleMed>

² CORBAmed, <http://www.omg.org/corbamed>

³ Object Management Group, <http://www.omg.org>

⁴ Common Object Request Brokering Architecture, <http://www.acl.lanl.gov/CORBA>

⁵ OMG Lexicon Query Service RFP, <http://www.omg.org/corbamed/lex.htm>

⁶ Alexander, Christopher, Notes on the Synthesis of Form, Harvard University Press, 1964, p. 26.

⁷ Ibid., p. 123.

⁸ OMG Adopted Technologies, http://www.omg.org/library/schedule/Technology_Adoption.htm

⁹ Data Interchange Facility and Mobile Agent Facility RFP,
http://www.omg.org/library/schedules/CF_RFP3.htm

¹⁰ Common Business Object and Business Object Facility RFP,
http://www.omg.org/library/schedule/CF_RFP4.htm

¹¹ Patient Identification Services RFP, <http://www.omg.org/corbamed/mpi.htm>

¹² Lexicon Query Services RFP, <http://www.omg.org/corbamed/lex.htm>

¹³ Event-Condition-Action Rules Management Facility RFP draft,
<http://www.omg.org/docs/cf/97-01-10.doc> (.pdf, .ps)

¹⁴ Event-Condition-Action Rules Services in CORBA - White Paper,
<http://www.omg.org/docs/cf/97-01-09.doc> (.pdf, .ps, .rtf)

¹⁵ OMG CORBAmed working groups, <http://www.omg.org/corbamed/wg.htm>