

Workshop on Evaluating Software Architectural Solutions (WESAS) 2000

Architectural Challenges in Developing a Web Based Public Health Reporting System

by

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This position paper describes a challenge problem to assist in the comparison of alternative technical approaches for a software architectural solution.

I am assigned to a project gathering requirements for an Internet solution to collect and to deliver specific medical records from health care providers to local county public health departments and to the California Department of Health Services. Additionally the project will propose a system architecture and a project plan for developing a pilot system. As the project will formally kick-off in early April, participation in the workshop would be ideal from both a timing and a content perspective.

Background Information on Existing System

There is a standard form used to capture the specific medical data to be collected. There are several primary data sources:

- Report is manually filled out and faxed to local county public health department
- Report data is manually derived from the many different medical office information systems.
- Report data is derived from legacy information processing systems.

Independent of the data source, the process is labor intensive and often requires multiple steps of data entry. The process is prone to errors, making the quality of the data suspect.

Once the data has been collected at the county level, most of the data is electronically submitted to the state level. Currently this is accomplished using a distributed network system to upload data via modem to the state level. The data that is not uploaded is received as paper reports, which are then entered into the state database system. The reporting process is slow and typically reaches the state level after its point of optimal use, thus significantly reducing its value. Timely reporting of data with a new system would allow data analysis at the state level across county lines to detect patterns not discernible when restricted to just a county view.

General Requirements for the New System

There is general stakeholder agreement on requiring that any new automated system of data collection and reporting rely on the Internet as the basic communication component. This will provide a free WAN, provide easy system access via WWW browsers, and provide platform independence. There is strong stakeholder desire that new system must be architected, designed, and implemented to support flexibility and adaptability to changing requirements and expanding functionality. Additionally, there are several efforts within the health care industry, state and national, to automate various functions. Any new system must allow for integration with these other efforts to share data as appropriate between enterprise applications.

Other requirement constraints include the following:

- **Easy to Use.** The system must be relatively simple to use, particularly for individual doctor's offices and for less electronically sophisticated public health departments. The system must be relatively transparent and non-invasive to both the producers and the consumers of the data.
- **Security and Data Protection.** The information is extremely sensitive medical data and must be protected as such. This protection is mandated by law. The system solution should support a graded approach to providing the security. Standard computer security measures such as user

authentication, maintaining login audit files, network firewalls, strong encryption, and security plans should be used.

- **Control of Access to Data and Workflow.** Ownership of the data must be defined by agreement between the users and stakeholders. Counties must be able to control access to their data until they decide to release it to the State. Access to data will be contingent on the business processes that define the workflow the system will support.

Parties outside the normal reporting process may need limited access to the data and provision must be available for the creation of limited data views based on need to know. Patient confidentiality must be protected at all times, and data usage requirements need to be carefully defined and approved.

- **Standards Based.** The use of standards and open products is critical to gaining broad user acceptance, and to supporting enterprise integration with existing and future systems.
- **Disaster Response and Crisis Management.** One of the requirements for the new reporting system is to support the Department of Health Services and counties to their response to disasters and health crisis situations. The new computer system must be reliable and able to survive disasters. Reliance on the Internet normally means access to the telephone system, which is often lost in disaster situations. Other back up options for Internet connection, such as the fielding cell-phone modem capabilities, need to be researched.
- **Support Phased Deployment.** Since not all health care providers will be able to convert to the new system immediately, any system solution must handle phased deployment as well as the case that some providers will never convert.
- **Modem Upload System.** The role of the current modem upload system in the new Internet based solution must be reviewed and defined.

Objectives of the New Internet Based System

Potential objectives for the new Internet based system include:

- Application solutions that are architecture neutral. The California health care computing environment is not a homogenized computing environment
- Zero —maintenance clients to minimize maintenance and support.
- Component-based architecture.
- Robustness.
- Secure computing environment
- Re-use of application components.

Key enterprise technologies and standards need to be identified, researched, and selection criteria determined. This list includes Java applets, Java servlets, CORBA, CGI, PERL, and XML. As the project is health care related, the HL7 standard needs to be researched.

The requirements gathering process will provide input for the system architecture proposal. Some industry analysts are advocating messaging technology to integrate multiple enterprises in an Internet context, maintaining that it is necessary for this type of integration to be loosely coupled. These analysts regard COM and CORBA as technologies supporting tightly coupled integration. Whether the architecture is message based or CORBA based, other analysts assert that the next generation architecture will be a distributed, threaded, fault-tolerant architecture.

Before proposing a system architecture, the project will first explore several architecture alternatives. These alternatives will be compared and a final architecture recommended. Selection criteria for the final architecture need to be established.