

Title: **Distributed Telemedicine for the National Information Infrastructure**

Author(s): David W. Forslund, Seong H. Lee, Francisco C. Reverbel, James E. George, and David G. Kilman, CIC-ACL; Sally F. Wilkins, CIC-12; Robert D. Tomlinson, Bonnie C. Yantis, Mohamad Ijadi, and Allen L. McPherson, CIC-8.

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Distributed Telemedicine for the National Information Infrastructure

David W. Forslund*, Seong H. Lee, Francisco C. Reverbel,
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Abstract

This is the final report of a one-year, Laboratory-Directed Research and Development (LDRD) project at the Los Alamos National Laboratory (LANL). TeleMed is an advanced data management tool that uses object-based computing, distributed data repositories, advanced graphical user interfaces, and visualization tools along with innovative concept extraction of image information for storing and accessing medical records developed in a separate project from 1994-1995. In 1996, we began the transition from a Gain Momentum-based client to Java, extended the infrastructure to support relational databases and worked with industry to begin the process of deploying TeleMed-like technologies throughout the nation. A major step here was the coordination of several organizations to collaboratively sponsor two workshops on the Master Patient Index. The system was also deployed and tested at National Jewish Center for Immunology and Respiratory Medicine in Denver, Colorado and at the National Institutes of Health in Bethesda, Maryland. We have attracted interest from a commercial partner as well as funding from the Army to deploy TeleMed into various testbeds. In addition we worked with Northern New Mexico Community College to seek ways of making TeleMed available in rural healthcare.

1. Background and Research Objectives

Distributed database technology is very important in advanced information systems being deployed in industry today. TeleMed is an advanced system that provides a distributed multimedia electronic medical record available over a wide area network. One of the major impediments to this type of technology becoming of wider use is the standardization of both the low-level technology and the domain knowledge so that information can be exchanged. We set about this year in this project to attempt to resolve these problems. First we have worked with the Object Management Group to ensure that the technology we are using would be used in a more widespread manner and secondly, we

*Principal Investigator, e-mail: dwf@lanl.gov

have worked with a broad base of industry to help define the fundamental data and information that must be shared. In addition, we worked with end-user physicians and medical institutions to determine their requirements and ensure the usefulness of this advanced technology. We did not develop the image analysis capabilities this year because of the enormous need just to enable data to be readily exchanged and manipulated. Instead, we focused on making this technology more usable in a wide area environment.

2. Importance to LANL's Science and Technology Base and National R&D Needs

The ability to share information between disparate but related parts of the weapons program is of fundamental importance to the enhancement of our science and technology base. The object database adapter component of TeleMed has been incorporated into the global weapons information system (GWIS) project, which is separately funded. It has already proven to be of great value in enabling physicists and engineers to exchange important design information in a new way. The ability to securely exchange medical information over a wide area is of great value to the nation and to the entire population. Within the Laboratory, it would be of value for use in managing the employees' medical information as well as providing a powerful proving ground for advanced information technology. The technology we have developed is of great potential use in managing the entire weapons complex including methods of managing secure access with minimal potential problems.

3. Scientific Approach and Accomplishments

There were several important project accomplishments. First, the object database adapter was extended to work with the CORBA 2.0 standard and was modified to allow it to be used with relational databases, not just object databases. Secondly, the system design was modified to enable the client interface to be launched from a web browser such as Netscape rather than having to support a standalone client built from Gain Momentum. This use of Java and its virtual machine enables the application to be accessible from almost any machine with a network connection without our having to provide support for the client ourselves. This now enables the development of a truly "virtual" patient record over a wide area [1]. Thirdly, we gained experience in the use of TeleMed by its deployment at National Jewish Center for Immunology and Respiratory Medicine in Denver, Colorado, and at the National Institutes of Health in Bethesda, Maryland. A number of requirements

were fed back into the system for enhancements. Fourth, we submitted the TeleMed technology to the Object Management Group's request for information developed by the Healthcare taskforce (CORBmed) in order for people to understand how important this technology was. In addition, in cooperation with the Healthcare Open Systems and Trials organization, the Healthcare Finance Agency and the Computerized Patient Record Institute, we sponsored two workshops that defined a strategy for a master patient index mediator for use throughout the nation. With this technology, we now have the possibility of actually deploying TeleMed throughout the nation once the implementation is complete. Finally, we worked with Los Alamos Medical Center, Health Centers of Northern New Mexico, Espanola Hospital, Presbyterian Health Services, and Northern New Mexico Community College to develop a strategy for making TeleMed available in the rural communities of New Mexico. Follow-on funding for this activity has been obtained from the Department of Commerce National Telecommunications Infrastructure Agency. The initial efforts to work with the National Information Infrastructure Testbed (NIIT) failed when their interests moved in another direction and they, in fact, changed the name of the organization to InfoTest.

In the process of completing these objectives, we also demonstrated the use of the electronic medical record as a collaborative tool using CORBA and Java. We created a small application in which one person can manipulate the screen on one or more desktops to show the features of interest including the ability to annotate the image. We also worked with the Dept of Health of the State of New Mexico to explore the use of TeleMed in managing the TB cases within the entire state. In addition, a large telecommunications company has expressed interest in licensing TeleMed for commercial use throughout the world.

Publications

1. Forslund, D.W., Phillips, R. L., Kilman, D.G., and Cook, J.L., "Experiences with a Distributed Virtual Patient Record System" Journal of the American Medical Informatics Association, Symposium Supplement, (p. 483) 1996.
2. Forslund, D. W., "Telemed: A Graphical Corba-based, Virtual Patient Record System for Clinical Use", First Class Magazine, Object Management Group, June 1996.
3. Forslund, D. S. "What CORBA can do: an Example of a New System Developed with Object Technology", Proceedings of 'Toward an Electronic Patient Record '96', San Diego, Medical Records Institute, 1996.

References

- [1] Forslund, D.W., Phillips, R. L., Kilman, D.G., and Cook, J.L., "Experiences with a Distributed Virtual Patient Record System" Journal of the American Medical Informatics Association, December 1996.