CRADA Title

LLNL-9900131

Final Report
CRADA No. TC-0496-93

Date: TACT: Revision:

A. Parties

The project is a relationship between the Lawrence Livermore National Laboratory (LLNL) and Citibank and Financial Services Technology Consortium.

University of California
Lawrence Livermore National Laboratory
7000 East Avenue, L-795
Livermore, CA 94550

Citibank
909 Third Avenue, 32nd Floor
New York, NY 10023

Financial Services Technology Consortium
55 Water Street, 38th Floor
New York, NY 10041

B. Project Scope

Trader's Workstation Interface Project

The project scope is to develop an advanced user interface utililizing speech and/or handwriting recognition technology that will improve the accuracy and speed of recording transactions in the dynamic environment of a foreign exchange (FX) trading floor. The project's desired result is to improve the base technology for trader's workstations on FX trading floors. Improved workstation effectiveness will allow vast amounts of complex information and events to be presented and analyzed, thus increasing the volume of money and other assets to be exchanged at an accelerated rate.

Interbank Check Imaging Project

The project scope is to develop and demonstrate technologies that advance interbank check imaging and paper check truncation. The following describes the tasks to be completed:

1. Identify the economics value case, the legal and regulatory issues, the business pratices that are effected, and the effects upon settlement.
2. Familiarization with existing imaging technology. Develop rquirements for image qulaity, security, and interoperability. Adapt existing technologies to meet requirements.
3. Define requirements for the imagling laboratory and design its architecture. Integrate and test technology from task 2 with equipment in the laboraty.
4. Develop and/or integrate and test remaining components; includes security, storage, and communications.
5. Build a prototype system and test in a laboratory. Install and run in two or more banks. Develop documentation. Conduct training.

The project's desired result is to enable a proof-of-concept trial in which multiple banks will exchange check images, exhibiting operating conditions which a check experiences as it travels through the payments/clearing system. The trial should demonstrate the adequacy of digital check images instead of paper checks.

DISCLAIMER

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Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

C. Technical

Trader's Workstation Interface Project

For phase 1, a real-time capture system using pen and/or speech input was developed for FX traders to record and transmit deals to Citibank's front office system. A deal is an official agreement between a trader and a customer to exchange a specified amount of one currency for another currency at a specified rate. The deliverable was a prototype deal capture system developed by LLNL that was to be integrated into Citibank's FX computer systems and tested on Citibank's FX trading floor. The planned schedule was October 1993 through June 1995 and milestones were:

1. Proof of Concept FY94, Qtr3
2. Prototype Development FY95, Qtr1
3. Alpha Test FY95, Qtr3
4. Beta Test FY96, Qtr1

The LLNL prototype development was completed on schedule, however Citibank chose to discontinue their efforts in December 1994. Integration and test by Citibank was not completed.

For phase 2, a real-time capture system using speech recognition was to be developed to record broker quotes transmitted over phone lines and to provide accurate currency pricing to the foreign exchange trading floor. The broker market consists of bid/ask quotes based on internal trading by the broker and is a very good indication of the size and true volatility of FX trading. The deliverable was to be a prototype quote capture system developed by LLNL that was to be integrated into Citibank's FX computer systems and tested on Citibank's FX trading floow. The planned schedule was August 1994 through June 1995 and milestones were:

1. Proof of Concept FY95, Qtr1
2. Prototype Development FY95, Qtr2
3. Alpha Test FY95, Qtr3
4. Beta Test FY96, Qtr1

The first proof of concept milestone was completed on schedule by LLNL in November 1994, however Citibank chose to discontinue any further efforts on this task.

Interbank Check Imaging Project

The technical objectives are as follows:

1. Prove the technical viability of check image interchange across multiple institutions.
2. Explore the political, legal and regulatory issues of interbank check exchange.
3. Demonstrate clearly the advantages of elecgronic check imaging.
4. Determine the systems, storage and communications costs of electronic check imaging.

The planned schedule was January 1994 through September 1996 and milestones were:

1. Project Feasilibility/Planning 6/94
2. Technology Research 12/94
3. Systems Engineering 12/95

D. Partner Contribution

Trader's Workstation Interface Project

Citibank's FX business and technical personnel contributed the technical requirements and domain knowledge relevant to Citibank's FX business. They also provided review and evaluation of technical work completed by LLNL.

Interbank Check Imaging Project
Project participant banks (Citibank, Chase/Chemical, Bank of Boston, Huntington, New York Clearing House) and vendors (IBM, Unisys) contributed technical requirements and domain knowledge relevant to interbank check imaging. Participating vendors developed pilot software and provided computer systems to participating banks. Participating banks integrated the pilot systems into their respective bank's workflow and conducted the pilot tests.

E. Documents/Reference List

Trader's Workstation Interface Project
Project Plan - 10/94
Deal Capture Prototype Software (unfinished) - 11/94

Interbank Check Imaging Project
*Project Plan - 6/94
*Economic Advantage Case - 6/94
*Technology White Papers - 6/94
*Image Capture Workstation Software Requirements Specification - 6/95
*Information Security Analysis, Evaluation, and Recommendations - 9/96
*The Application of Digital Signatures to Digitized Check Images - 9/96
*A White Paper on Cryptographic Key Management for ICI - 9/96
FSTC Check Imaging Patent Application (USSN 08/571,099) - 12/95 amended 7/96
No Intellectual Property was developed during this CRADA.

F. Acknowledgment

Participant's signature of the final report indicates the following:
1) The Participant has reviewed the final report and concurs with the statements made therein.
2) The Participant agrees that any modifications or changes from the initial proposal were discussed and agreed to during the term of the project.
3) The Participant certifies that all reports either completed or in process are listed and all subject inventions and the associated intellectual property protection measures attributable to the project have been disclosed or are included on a list attached to this report.
4) The Participant certifies that if real property was exchanged during the agreement, all has either been returned to the initial custodian or transferred permanently.
5) The Participant certifies that proprietary information has been returned or destroyed by LLNL.

Daniel Schutzer	Date	J. E. Sander 11/25/96	Date
Citibank		LLNL	
Vice-President		Principal Investigator	

Attachment I – Final Abstract
Attachment II – Project Accomplishments Summary
Attachment III – Final Quarterly Report

TC-496-93

Citibank, N. A.
Los Alamos National Laboratory (LANL)
Oak Ridge National Laboratory (ORNL)
Sandia National Laboratories (SNL)

Citibank is a global financial services organization with 3,300 locations, including branch banks, representative offices and subsidiary and affiliated offices in 92 countries throughout the world. LANL, ORNL AND SNL are major DOE Laboratories.

Title of Project Advanced Information Technologies for Financial Services Industry

Purpose Develop advanced computational technologies for the financial services industries, which increasingly includes telecommunications, publishing and information services industries.

Benefit to Industry Ensure vitality and global competitiveness of the U.S. financial and information service industries.

Benefit to DOE/LLNL Project will expand, develop and extend the technologies necessary to deploy high availability (24 hour x 7 day) systems at an acceptable cost.

Time Period Thirty months, starting July 19, 1993

LLNL Contact Fred Strange, (510) 423-8332

Title of Project
Advanced Information Technologies for Financial Services Industry

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Thirty months, starting July 19, 1993

LLNL Contact
Fred Strange, (510) 423-8332

Brief Description

Lawrence Livermore National Laboratory, three other DOE laboratories and Citibank are developing new computational architectures to meet future targets for cost, reliability, flexibility, performance, functionality and maintainability. Use of sophisticated DOE laboratory resources and computer technology has the potential to significantly improve U.S. competitiveness in the financial services industry. Advanced technologies specifically will address such techniques as probabilistic risk analysis, simulation and rapid prototyping to analyze and improve the reliability and maintainability of integrity of critical 24 hour x 7 day operations.

CRADA Title

Project Accomplishments Summary (Attachment II)
CRADA No. TC-0496-93

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A. Parties

The project is a relationship between the Lawrence Livermore National Laboratory (LLNL) and Citibank and Financial Services Technology Consortium.

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B. Background

Trader's Workstation Interface Project

The use of advanced computational workstation interfaces may strengthen Citibank's posture in the emerging global fincancial economy.

Citibank brings to the project an extensive knowledge and experience of financial and business computational issues on an intense scale (eg. transaction speed) with demands for high reliability.

LLNL's strength in sophisticated and advanced workstation interfaces will enable technology transfer to the private sector to manage their phycial data for logical market anlaysis.

Interbank Check Imaging Project

One of the greatest problems facing the financial services industry today is the requirements to provide increasingly faster check clearing, settlement, and verification services within a predominantly paper-based check payment processing system. The current paper-based system is stretched to its maximum efficiency and potential. During the last several years technology has made great strides in electronic check imaging, truncation and electronica settlement technologies. These are regarded as very promising techniques for improving check processing by reducing paper-check handling. In order to achieve successful implementation of interbank check imaging, standardized check image representations of acceptable quality levels must be exchanged electronically between financial institutions.

FSTC brings to the project an extensive knowledge and experience of financial and business computational issues on an intense scale (eg. transaction speed) with demands for high reliability. Their systems may provide a benchmark for federal electronic commerce.

LLNL's strength in high speed imaging and image processing, information security, and storage and retrieval of large data sets will provide rigorous and innovative methods to evaluate and

improve electronic check imaging and image exchange. Use of sophisticated DOE laboratory resources and technology has the potential to significantly improve the U.S. competitiveness in the financial services industry.

C. Description

Trader's Workstation Interface Project

The objective of this project was to develop new user interfaces to help traders react more competitively to the interrelated information streams and events they monitor. Improved workstation effectiveness will allow vast amounts of complex information and events to be presented and anlyzed, thus increasing the volume of money and ohter assets to be schanged at an accelerated rate. LLNL's role was to provide technical expertise in the area of systems engineering, user interface design, and speech and handwriting recognition.

The project's desired result was to improve the base technology for trader's workstations on the foreign exchange trading floor. A prototype pen-based system with a customized handwriting recognition capability was developed by LLNL; however, the system was not deployed to the trading floor for testing as originally planned.

Interbank Check Imaging Project

The objective of this project is to develop and demonstrate technologies that advance check imaging and paper check truncation. LLNL's role was to provide technical expertise in the areas of systems engineering, image quality, information security, and storage systems.

The project's desired result was to complete a proof-of-concept pilot in which multiple banks exchange check images, exhibiting operating conditions which a check experiences as it travels through the payments/clearing system and to demonstrate the adquacy of digital check images instead of paper checks. This was achieved by the project.

D. Expected Economic Impact

The successful completion of this project will demonstrate the re-engineering of the U.S. payment system from a manual, paper-based system to an electronic settlement process. The technology enhancements and innovations developed during the course of the project will be used by each FSTC member bank to improve their product offering to their customers. This project represents a significant first stage in realizing electronic commerce.

All U.S. financial services companies can take advantage of this new technology to market product, reduce fraud losses, and reduce delivery expenses while providing quicker response rates to customer inquiries and retrieval of information. The market impact on the U.S. economy will be new and improved electronic-enabled commerce to consumers utilizing emerging technologies to offer new products and services.

E. Benefits to DOE

This project utilized and further enhanced LLNL's expertise in computer security and large scale storage, retrieval, and data mangement technologies. These are computational core competencies essential to LLNL's Stockpile Stewardship mission.

F. Industry Area

Financial Services.

G. LLNL Point of Contact for Project Information
Jo Sander
423-2832

Fred Strange
423-8332

Dick Watson
422-9216

H. Company Size and Point(s) of Contact
Trader's Workstation Interface Project
Dan Schutzer
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212-558-1876

Interbank Check Imaging Project
Dan Schutzer
Citibank
212-558-1876

Bill Krajewski
Citibank

Dan Vermeire
Huntington
614-480-8075

Chris Dowdell
Chase/Chemical
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Usha Vakil
Bank of Boston
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Al Wood
New York Clearing House
212-613-0143

Peter Hanna
RDM Corporation
519-746-8483

Bob Brown
IBM
704-594-4121

Tom Hayosh
Unisys
313-451-4505

I. Project Examples
Press release planned for January 1997.

J. Release of Information
Jo E. Sander
Principal Investigator
Computation
423-2832

RELEASE OF INFORMATION

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

_____ _____
Daniel Schutzer Date
Citibank
Vice-President

RELEASE OF INFORMATION

I certify that all information contained in this report is accurate and releasable to the best of my knowledge.

Karena McKinley, Director
Industrial Partnerships
and Commercialization

12/15/98
Date