

***The Amtex DAMA Project:
The Brookhaven Contribution***

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1.0 Introduction

The Amtex Partnership organized in 1993 as a Technology Transfer Collaboration among members of the integrated textile industry, the DOE National Laboratories, a number of universities, and several research/education/technology transfer organizations (RETTs). Under the Amtex umbrella organization, a number of technology areas were defined and individual projects were launched addressing various aspects of improving the health and competitiveness of the American textile industry. The first and, to date, the largest of these has been the computer-based Demand Activated Manufacturing Architecture (DAMA) project.

Brookhaven National Laboratory became involved in DAMA beginning in March of 1993 and remained an active participant through January of 1995. It was staffed almost exclusively with personnel of the Computing and Communications Division. Participants who were involved with the project are listed below:

B. Arbeit	R. Peierls
H. Berry	A. Peskin
P. Kessler	A. Tilp
M. Losquadro	M. Weisenberg
S. Morris	M. Oros

This document summarizes the activities and accomplishments of the Brookhaven team in working with the larger collaboration. Detailed information about the Amtex Partnership, the DAMA Project, and specific BNL contributions are documented elsewhere.

2.0 Objectives

From the earliest drafts of the BNL DAMA CRADA Statement of Work, three themes were sounded as the ones where Brookhaven would expect to make a significant contribution. These are Internet Navigation, Linkage Tools and Cultivation of Area Businesses. The text of the appropriate portions of the Statement of Work appear in Appendix A.

2.1 Internet Navigation

Since the National Laboratories have had far more familiarity with computer networking than their industrial collaborators, it was recognized from the outset that there would be a need for educational and access tools for using the Internet. We expected that such tools would have to be written from scratch, or perhaps adapted from other work such as The Key, a highly regarded tutorial internet navigator developed by NYSERNet Inc. for the library community. Indeed, discussions along these lines were held with NYSERNet, but rapidly changing technology events overtook this effort, and it soon became clear that World Wide Web and Mosaic offered a preferred path.

2.2 Linkage Tools

Electronic Commerce would clearly have, not only a networking aspect, but a graphics aspect as well. It was proposed that we construct a prototype graphical front end business-to-business linkage tool by leveraging work already done by the apparel design community. The product was to be called the Electronic Showcase. Early in the project, the help of faculty at Parsons School of Design was enlisted to bring this project to fruition.

2.3 Cultivation of Area Businesses

BNL also recognized a unique geographical obligation to Amtex and DAMA, in that it is located next to the greatest concentration of garment industries in the nation, and perhaps the world. The New York City garment district contains thousands of textile related industries, large and small, including many small and minority owned business. If DAMA was to become accepted by a critical portion of the industry, New York City businesses would have to be a strategic component. BNL staff therefore took responsibility for attracting area businesses to the collaboration.

3.0 Deliverables

DAMA was organized into a number of tasks, with each National Laboratory team being assigned to one or two of them. Brookhaven was placed in the Communications and Infrastructure Task, also called Task 2, along with Lawrence Livermore National Laboratory under the direction of Lansing Hatfield of LLNL. For the duration of its time in the project, Brookhaven engaged in several distinct activities, some of them anticipated as initial objectives, and some of them tasked by DAMA or Task 2 management. Many of these were carried to completion as Deliverables listed below. Others remain unfinished and are described in Section 4.

3.1 Industrial Partner Assistance

One of the early start-up problems was that not all the Laboratories were ready to begin at the same time, with BNL being the earliest and LLNL the last to begin. This meant that BNL was alone for several months in the critical early stages of the project. One of the first goals in Task 2 was to get all the industrial partner DAMA participants "on-line" to the Internet. Of the three dozen industrial participants in the project, roughly one third of them had Internet capability at the start, many through the help of the DAMA Education and Outreach Task. When BNL staff became involved, it initiated a telephoning campaign to contacts at all unconnected partners to identify a focal point and offer technical assistance in getting connected. After approximately three months, LLNL staff took over this work under its newly established ACIS Help Desk. In the time that BNL had this responsibility, approximately a dozen new industrial partners were connected.

3.2 Internet Navigation

While surveying the industrial participants, it became obvious that the platform of choice in that community was the IBM-compatible PC. Accordingly, efforts were focused on users of that platform. The primacy of the World-Wide Web and Mosaic viewers also became apparent. Accordingly, an Internet Navigator kit was assembled for PCs with Microsoft Windows using the Web and Mosaic. A demonstrable Web session was captured by LLNL personnel and shipped to BNL for inclusion. We also added a Serial Line Internet Protocol (SLIP) driver and a number of SLIP dialup lines for demonstration purposes. Users of the kit would therefore be able to see both an internal "canned" Web demonstration or have genuine Internet access.

Written instructions for use including an installation script was produced as part of the distribution. A first version of this kit was distributed to interested industrial participants in the summer of 1994. An improved and updated version was distributed through Livermore starting in December. BNL staff was available to answer user questions until the termination of its involvement, at which time the guest accounts for SLIP were also terminated. Overall, approximately 50 copies of the kit were distributed.

3.3 Electronic Showcase

As mentioned in Section 2 above, the Electronic Showcase was the graphics based, business-to-business linkage tool developed to demonstrate the possibilities for electronic commerce in the textile industry. It was developed with Sven Travis of Parsons School of Design, based on that institution's experience using low-cost systems to render and display fashion designs in its student laboratories.

The Electronic Showcase demo presents a menu of fictitious textile companies, allowing the user to select one such "supplier". A sub-menu of pattern types appears, and a selection here brings up a scan of textile patterns. The user then selects a pattern and is given a choice of seeing it rendered on one of several items of apparel or home furnishings. This final selection gives the rendered image. In a more developed version, there might also be a choice of color and, after the final selection is made, an EDI template might appear to make further business inquiries (such as availability and cost) and complete the purchase transaction. A more complete version would also be network-based rather than a self-contained catalog. A production version would also have to give more thought to the most flattering presentation of products, incorporating better techniques for color fidelity and draping properties, but those who witnessed the initial demonstrations were nonetheless impressed with the graphics quality.

The Electronics Showcase was considered for demonstration at the 1994 Bobbin Show, but the DAMA management decided rather to ask the developers to get assessments from industry experts in this area. The demo was accordingly presented to staff at Cotton Inc. and Gerber Micrographics where it was well received, with a number of good suggestions for improvement which were incorporated into the finished version.

3.4 Spreading the Word

Brookhaven staff contributed heavily to meeting the DAMA objective of informing the wider community of the project. The specific Brookhaven goal of cultivating area businesses to join was centered around two institutions. As mentioned above, Parsons School of Design was enlisted early and Parsons staff made a major contribution. This institution has considerable expertise in textile and finished goods design and a very strong relationship with the fashion industry. They have indicated that they are eager to continue working with Amtex.

The Garment Industry Development Corporation is an advocacy group representing the New York City garment industry through affiliations with the companies and their unions. Staff of BNL and Kurt Salmon Associates met with GIDC staff and made a DAMA presentation which seemed to be well received. Since that time, the organization has begun to work with DAMA in the area of Enterprise Understanding.

A DAMA presentation was made to the Textile Department at Cornell University. Faculty at Cornell have particular interest in both business issues and the modeling and presentation. They also seemed very interested in an affiliation with DAMA.

A paper describing the DAMA project was written by Arnie Peskin of BNL in collaboration with Lee Cheatham of PNL and L. J. Anderson of Auburn University for presentation at the 1994 Annual Meeting of the American Society for Engineering Education. The paper was presented at the meeting in June of 1994 and appear in the Proceedings of that meeting. The presentation generated favorable comments from those in attendance and expressions of interest from several universities.

3.5 Simulation Studies

One of the original DAMA Tasks was Simulation. There is a BNL group that has extensive experience in whole-industry simulations performed for the energy sector. An individual from that group proposed a linear programming project applicable to the textile industry. This proposal was given serious consideration but eventually was abandoned when that particular DAMA task was combined with the Enterprise Understanding effort.

3.6 Hosting Activities

The Laboratory played host to several significant DAMA activities. In the summer of 1994 two visiting scientist appointments were made for DAMA researchers. One was for Sven Travis of Parsons School of Design, who performed the Electronic Showcase work previously described. Another was Homer Carlisle, a Professor of Computer Science at Auburn University. Prof. Carlisle attacked the problem of format compatibility across the collaboration, and in the process, helped introduce the LINUX operating system to BNL. These individuals were part of the larger, traditional BNL Summer Program, which attracts distinguished researchers and students from all over the world, and creates a particularly stimulating work environment of mutual benefit to all.

During that same summer, BNL hosted a quarterly DAMA Steering Committee meeting. This meeting was attended by approximately fifty individuals, and spawned a number of ad-hoc adjacent meetings, including a convocation of the Laboratory members of the Steering Committee, and a meeting to discuss use and embellishment of the Auburn sourcing data base.

3.7 Management Activities

BNL Staff contributed to the management of DAMA over the reporting period by providing delegates to the Steering Committee and the Core Management Team. The latter, in particular, was extremely taxing during the organizational and start-up phases of the project and very travel intensive.

4.0 Unfinished Business

4.1 Front-end Sourcing Data Base

From the earliest phases of the DAMA project, it seemed likely that the ultimate manifestation of DAMA would include a sourcing data base, that is, a repository of products and services offered by sources that could be queried by others. A project at Auburn University had previously developed just such a system, initially for textile companies in Alabama, but with plans to extend the domain. Since Auburn is a DAMA participant, it seemed only natural to try to use this development as part of the DAMA infrastructure. But, even in its expanded form, it was obvious that enhancements would have to be added before the sourcing data base would be a useful product.

One such need was for a graphical "front end", an interface that depicted the products and allowed for some degree of customized ordering. The Electronic Showcase was conceived partly with that application in mind. And, although a couple of meetings were held to discuss this possibility, no substantial progress was made before the end of Brookhaven's involvement. The need for a graphical front-end continues to exist.

4.2 Garment Industry Testbed

Another idea that was advanced for the future was the establishment of a Garment Industry Testbed. It was noted that the New York City garment district contains a large number and rich variety of textile related companies within a relatively small area. As such, it represents a remarkable opportunity to create a meaningful testbed for prototypes of DAMA systems and tools, made facile by the short distance between enterprises. Such a testbed would also ensure good representation from apparel and retail firms and good visibility which should subsequently lead to acceptance by the industry as a whole. This idea has so far gone unfulfilled, while the need continues to exist.

4.3 Communications Architecture Document/ Users' Handbook

In May of 1994, DAMA Project Management requested that Task 2 develop a DAMA Communications Architecture document. This write-up was to provide a blueprint of standards, conventions, and operating principles and procedures for email, document storage, videoconferencing and other means of interaction within the project. To attempt to satisfy this request, Brookhaven staff drafted such a document and passed it on to its partners at LLNL for comments, embellishment, and eventual dissemination. There was some discussion of it at subsequent Task 2 meetings, but it has never been put forward in a final form.

At a subsequent Task 2 meeting, Brookhaven staff were tasked to develop a Users' Handbook. This document was to have pertinent information, again primarily for industrial partners, for interacting with the team. It was to include overview information on the partnership, the project, and the task as well as instructions for using the various modes of interaction, such as email, document control, videoconferencing, security considerations and the like. Several copies of a prototype of such a manual were presented at the following Task 2 meeting for comments, additions, editing and other improvements toward a final version.

4.4 Videoconferencing

In an attempt to improve the interaction of this geographically dispersed project while reducing the already oppressive amount of travel, a number of videoconferencing experiments were performed. They varied from the linking of conference rooms among virtually all the participating Laboratories, to intra-task meetings, to desktop videoconferences. Brookhaven was most intimately involved in promoting the desktop videoconference approach, which appears most satisfactory for those who have it, but is not available to several of the Laboratories and not yet at all to the industrial partners. It is gratifying to note that the current project management seems committed to a greater role for videoconferencing.

5.0 Lessons Learned

5.1 Compatibility Problems

One of the most vexing problems plaguing the DAMA project was one of compatibility. Certainly, all computing practitioners are aware of the incompatibilities of document and other media formats, but in a large and far-flung effort such as this, the problems were compounded to a severe degree. Even documents produced by a single word processor often proved incompatible over different platforms and versions. A number of approaches were used to try to overcome the problem, among them the imposition of naming conventions, the recommendation of certain products and versions, and the use of translation and encapsulation tools. None of these approaches were entirely successful.

5.2 Security and Sensitivity

Similarly, we were quite aware of the problems of data sensitivity and security on the systems used by DAMA, for example, the Internet. Yet, Laboratory staff were surprised at the intensity of concern demonstrated by the industrial partners. Often, one would find an enterprise with a very robust internal local area network, but with great trepidation about opening it up to wide-area access for even the most mundane applications. At times it seemed that the commercial firm's concern for guarding their sensitive data exceeded that of national security institutions. Given recent security lapses on the Internet, these concerns are well placed, but the reluctance to use wide-area networking must be overcome if DAMA and projects like it are to succeed. Therefore, earning and instilling users' confidence in the ultimate architecture would appear to be a prime objective for the future.

5.3 "Cultural" Problems

One of the most difficult problems encountered by DAMA in its first year were those of institutional "culture" in the way the different partners conduct their business. In a project that has such diverse partners as industries, National Laboratories, and universities, each with its own traditions and ways of approaching large projects, there are bound to be profound differences. And these differences do lead to misunderstandings which impact progress. Even within the DOE Laboratories, there were differences perceived between the "weapons labs" and the Energy Research labs. These differences could be overcome with strong management action, but the multilaboratory structure does not readily lend itself to such assertiveness.

5.4 Dual Use

One of the obligations of a Technology Transfer project is to identify spin-off technologies and benefits that might be of use in the Laboratory's regular programmatic mission. The BNL DAMA team identified three such areas. The first was Electronic Data Interchange; in the course of this project, the team's familiarity with EDI techniques has been strongly enhanced, and should prove relevant to a pilot EDI project that BNL has underway. A second was the network navigation tool that was developed for DAMA, which could be modified to be more generally useful to novice computer users. And third were the lessons learned with regard to document compatibility mentioned above.

Appendix A

Excerpts from the BNL Statement of Work

November 1993

Brookhaven has a particularly vital role to play in the infrastructure developments of Task 2, both because of its capability and its geography. As one of the pioneering installations in computer networking, computer aided design, and client-server computing, BNL will provide staff to help establish like facilities as needed within the textile industry. These staff will pay particular attention to provision of these facilities to smaller enterprises which have limited data processing experience and resources. This "tutorial access" to the DAMA system will include automated help, educational and network navigational facilities, as well as backup, security, permission control and other aspects of a trusted clearinghouse. It should be noted that as the only participating Laboratory in the northeastern United States, BNL is in close proximity to the center of the retail and fashion industries, and as such, will be expected to exercise particular responsibilities in integrating those segments of the industry. This will involve on-line access to the design computers at prominent studios, including access to visual libraries and design software.

The team will initially survey the status of existing computing platforms, connectivity, and access tools generic to the textile industry. It will subsequently recommend a suite of such systems as an architecture upon which it would be appropriate to build the textile specific products of DAMA's tasks 3 and 4. It will then assist industry with the pilot deployment of those systems. The survey, recommendation, and deployment are the three major milestones of this effort.

Industry representatives will have the particular responsibility of gathering industry technology baseline information and they will have the lead role in developing the future infrastructure requirements. They will also share their experiences to date and develop a statement of needs with respect to industry specific Electronic Data Exchange and Electronic Commerce requirements. Finally, they will serve as the arbiters of the usefulness and efficacy of the prototypes and demonstrations that are developed on their behalf. Personnel at Spartan Mills are expected to lead this

effort. Brookhaven in particular has developed a particularly close relationship with Auburn University in pursuit of this task.

Brookhaven's involvement in Task 5, while not explicit in the 14 month time frame covered by this proposal, is expected to be significant in subsequent years. This effort will involve participation in the development of a whole-industry model. Such a model will depict the interaction among the relevant forces within the textile industry to simulate its behavior with sufficient accuracy to be used as a predictive tool. Some years ago, BNL staff developed a linear programming econometric model for the US energy industry and a more detailed one for the New York region. That work has been very well received, both for its scientific content and its usefulness to that industry. This model, called Marcal, deals with the flow of commodities through an industry, where those commodities might be materials, resources or even information. With such a model, it should be possible, for example, to study minimization of time-to-market under cost constraints. Recent work has emphasized porting this system to microcomputers, graphical interfaces, context-sensitive help, and dynamic database cross-referencing. Within the DAMA project, our goal is to initially investigate what aspects of that work would be applicable to modeling the textile industry, and to incorporate them in some form to the whole industry model of ASI-5, with new developments as necessary. Staff experienced in event-based stochastic queuing models will also be deployed where those techniques are relevant to parts of the overall effort. It is expected that the first fruits of this effort would be a demonstration prototype, with follow on activity toward producing a robust production model in subsequent years.

Appendix B

Amtex DAMA Participants - 1994

Fiber

Amoco Fabrics & Fibers
DuPont
Hoechst Celanese
Wellman

Textile

Burlington Industries
Cone Mills
Fieldcrest Cannon
Glen Raven Mills
Greenwood Mills
Harriet & Henderson Yarns
Milliken and Co.
The New Cherokee Corp.
Spartan Mills
Springs Industries
Fabricated Products
Charland Sportswear
Haggar Apparel
Russell Corp.
Sara Lee Knit Products
Tultex Corporation
VF Corporation

Retail

Dayton Hudson/Target
J. C. Penney
L.L. Bean
Lands' End
Mercantile Stores
WalMart Stores

Suppliers

Anderson Consulting
Ciba-Geigy
Digital Equipment Corp.
EDS
Kurt Salmon Associates

DOE Laboratories

Argonne National Laboratory
Brookhaven National Laboratory
Idaho National Engineering Lab.
Lawrence Berkeley Laboratory
Lawrence Livermore National Lab.
Los Alamos National Laboratory
Oak Ridge National Laboratory
Pacific Northwest Laboratory
Sandia National Laboratory

RETTS

Textile/Clothing Technology Corp.
Institute of Textile Technology
Textile Research Institute
Cotton, Incorporated

National Textile Center

Auburn University
Clemson University
Georgia Institute of Technol.
North Carolina State U.