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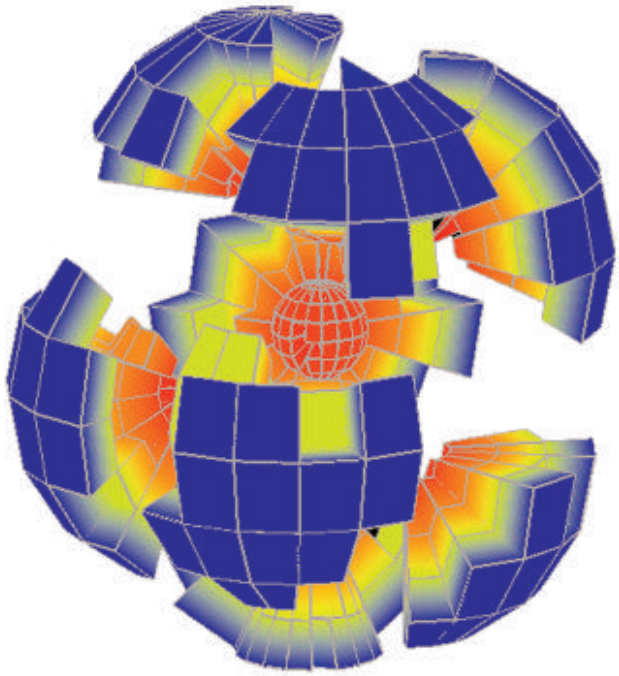
COMPUTING, INFORMATION, AND COMMUNICATIONS (CIC) DIVISION • LOS ALAMOS NATIONAL LABORATORY

Over the last five years the Radiation Transport Team (RTT) in Group XTM has led the scientific community in the development of numerical method and parallel computing techniques for radiation transport calculations on unstructured-meshes. The Team's DANTE project focuses on the development of deterministic solution techniques for arbitrary finite element meshes. This month's cover image depicts a solution from one such problem. The calculation was performed in parallel on the LANL IBM Cluster using eight RS6000 processors. The mesh has been exploded based on the cell processor number. Cell faces are colored in proportion to the magnitude of the radiation flux solution in each cell.See the article on page 1



Inside this issue

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Unstructured-Mesh Radiation Transport

The Boltzmann transport equation describes the propagation or transport of radiation through matter. The Radiation Transport Group (XTM) is chartered with the development of new numerical methods and computer codes for performing radiation transport calculations. This includes the transport of neutrons, gamma rays, thermal radiation (photons), and charged-particles such as ions and electrons. Numerical radiation transport calculations have traditionally been performed on rectangular meshes. Complex 2-D and 3-D geometries are difficult to model using such meshes because of the necessity of squaring-off or "stair-stepping" the surfaces of objects. Unstructured meshes are far more efficient for modeling complex geometries, but applying traditional numerical transport methods on such meshes is difficult for a variety of reasons.

In the early 1990s, members of the XTM Unstructured-Mesh Team were the first researchers to perform radiation transport calculations on 3-D unstructured meshes. They initially used non-standard formulations of the transport equation known as self-adjoint formulations, which were known to be more amenable to unstructured mesh calculations than the standard first-order transport formulation. Members of the Team were also the first researchers to perform massively-parallel 3-D radiation transport calculations. This was done using the CM-2 computer at the Advanced Computing Laboratory. Members of the Team later developed unstructured-mesh transport methods using the standard first-order formulation of the Boltzmann transport equation. Although it was originally thought that severe difficulties would result from the use of this formulation, it was discovered that the difficulties could be overcome with the use of certain surface-averaged geometric quantities in conjunction with graph-theory techniques. The self-adjoint and first-order formulations have been found to be complimentary. Each is best for certain types of problems.

The XTM Unstructured-Mesh Team is currently developing methods for hybrid meshes consisting of arbitrary combinations of hexahedra and degenerate hexahedra (wedges, pyramids, and tetrahedra). Such meshes are more versatile than the pure tetrahedral meshes that were first investigated. There are three major unstructured-mesh research computer codes being developed by XTM: ATTILA, DANTE, and PERICLES. ATTILA is a 3-D tetrahedral-mesh code based upon the standard first-order transport formulation. It was originally developed as part of a CRADA with the oil industry. ATTILA has proven to be both fast and accurate for modeling neutron-based oil-well logging tools. The techniques in ATTILA are now being further improved in an effort to model gamma-ray-based oil-well logging tools. Gamma-ray tools are very difficult to model because they contain highly collimated sources and detectors. DANTE is a 3-D hybrid-mesh code based upon the self-adjoint formulation of the transport equation. It was designed to perform thermal radiation calculations, and is now being tested on a variety of problems. PERICLES is a 3-D hybrid mesh follow-on to ATTILA. It is currently limited to neutron and gamma-ray transport, but will soon have a capability for thermal radiation transport.

Anyone having questions about XTM's unstructured-mesh radiation transport technologies should contact the Team Leader, John McGhee. The Team's Web site is at http://www-xdiv.lanl.gov/XTM/radtran.

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Radiation Transport Group (XTM)

CIC-12 Moves Into Software Quality Assurance, Needs Scientific Programmers

This article is one in a series of interviews BITS is conducting with CIC managers to get their views of the "big picture" as it relates to their work and the Laboratory mission. These people have also been asked to do a little forecasting as it applies to their business. BITS invites readers to join in the spirit of these interviews, treating the forecasts as a sort of informed speculation without holding anyone's "feet to the fire" to make the predictions come true.

Since last September, when the division underwent a reorganization of applications development, and part of CIC-12 went to CIC-15, CIC-12 has concentrated its expertise on scientific and technical applications only. The reorganization was largely in response to the needs of the Advanced Strategic Computing Initiative (ASCI). Group Leader Gary Clark says, "ASCI presents many of the technical challenges on the leading edge of computing for the foreseeable future, and CIC-12 has been identified as the organization to apply its computer science expertise to the ASCI codes including software quality assurance." Soon Clark intends to reorganize the group so that one section will be devoted to this effort, but more personnel with the appropriate skills must be hired or trained.

Formal software quality assurance (QA) for weapon design codes is a new effort for the Laboratory because codes developed here were considered to be experimental. However, since the ASCI program must replace underground testing as the verification mechanism for nuclear weapon designs, the ASCI codes must be validated. Clark says, "We need to be ahead of an expected DOE requirement to do software QA for ASCI."

CIC-12 will study industry standard procedures for testing, documentation, development, and validation of computer codes. It will be an interesting problem to adapt industry's procedures, which normally apply to things like accounting, for use in something as fundamentally different as physics codes. As the group gains expertise, it will document its plans and then build a test program to evaluate its procedures. CIC-12 intends to work in partnership with CIC-1 to write test plans and software documentation and to build a Web site for the development team. The physically scattered team members will be able to keep up with the status of projects and codes by using this Web site.

CIC-12 programmer Thomas Kelly programmed this robot in the ARIES materials disposition line at TA-55.

Clark says, “As we gain experience in the process, we will be able to make the QA service available to all of our customers. We can work for them as consultants, or we can do QA for them.” This marks a change in direction for CIC-12 in response to its customers’ needs. Although CIC-12 used to write code almost exclusively, now it can also do the QA for the code it writes and for others’ codes as well.

“Closer collaboration with customers is especially true of the groups’ work with X-Division, now clearly the dominant customer for our group,” Clark adds. “ We have a better working relationship with them than ever before. He meets frequently with X-Division’s leadership and with the Code Integration Group (XCI) Leader weekly.

Presently CIC-12 work is one third ASCI, one-third other weapons work, and one-third science and technology applications in the open computing environment. Six group members are on the “Tecolote” team supporting ASCI. Tecolote, which started out as an end-user code, is an object-oriented framework overlying “Pooma” and is used to write hydrodynamic codes more easily. Group members are also involved in moving legacy codes into the ASCI computing environment.

As ASCI work, budgets, and needs increase, Clark is challenged to keep enough people on his staff. The group presently has 36, needs 40 this year, and expects to grow to 50 by the end of FY99. Most CIC-12 personnel need “Q” clearances. Competition for computer scientists is great, but Clark feels that CIC-12 provides an environment where programmers can be happy. He says, “People are usually happiest in a group of their peers. We understand their needs for professional development, to be evaluated compared to their peers, and to have peer support.”

“Having programming support all in one group is beneficial to the customer too,” he adds. “We can do a better job of hiring, and we can leverage the strengths of the group. When a problem comes up, someone else in the group has probably encountered it, is working on it, or has solved it. Livermore has used the centralized programming support model for many years, and we can learn from that.” He says CIC-12 can prove the model works by doing a good job of providing customer service.

Clark invites programmers to join CIC-12, “If you’re computationally oriented, like developing code, and like doing software QA, this is the group to be in.” He goes on to say that CIC-12 programmers also have a lot of flexibility, can work for a number of projects, can move around in the Lab, and do not have to worry about their host group’s funding. Group members choose their own assignments from programming in FORTRAN to programming in C++. “Your success will be measured in how well you please the customer,” he concludes.

Clark has been at LANL for 13 years; previously he worked at Sandia Livermore and spent a few years teaching. His academic background is in engineering design, and he has spent almost all of his career in software development. Clark spends as much time as he can in outdoor activities, such as bicycling, climbing, rafting, and observing and photographing nature. All these interests he shares with his wife Lynn.

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Communications Arts and Services (CIC-1)

Detecting Tax and Medicare Fraud

Finding fraudulent claims by detecting suspicious anomalies and patterns in mountains of data is somewhat like trying to find and extract a few ounces of gold from tons of ore. Fortunately, computer scientists at Los Alamos National Laboratory have significant experience with data mining. Our experience originated with nuclear weapons data, satellite imagery, and computer security; our expertise was honed on fraud detection projects for the Social Security Administration, Citicorp, and MasterCard International. Two of our current projects are detecting fraud for the Internal Revenue Service (IRS) and for the Health Care Financing Administration (HCFA) of the U.S. Health and Human Services Department.

Tax Fraud

Each year the IRS is deluged with more than 200 million tax returns. Ferreting out the fraudulent ones is no easy task. But a set of software tools that we developed over the past 4 years is making tax examiners' jobs easier. By improving the preidentification of possibly fraudulent claims, by aggregating returns with common suspicious characteristics, and by providing interactive tools such as on-line search and query capabilities, tax examiners no longer need to rely purely on their recall and on luck.

Our CIC employees are working jointly with colleagues in the Laboratory's Applied Theoretical and Computational Physics Division on this project. During the first year, we developed an electronic fraud detection system for the IRS. The system enabled electronic returns to be viewed and analyzed on-line, instead of just on paper. Since then we have added more sophisticated interactive tools (Profiler, Filter, and Link Inspector) and automatic tools (FRED and Y score) that have increased the system's functionality and success rate. These tools all analyze aggregated data, such as returns from a particular tax preparer, ZIP code, or employer.

Our tools have already been so successful at surfacing fraudulent claims that the IRS has implemented the software at all ten service centers nationwide and has hired a software contractor to support and maintain it. The system uses an Oracle database and runs on high-end workstations; it does not require a supercomputer.

Our scope is currently limited to electronically filed returns and to criminal fraud by organized groups, such as a small business of tax preparers. As the IRS gears up to digitize more tax returns, we hope to enlarge our scope of inquiry by applying these tools to paper tax returns and to fraudulent returns from individuals.

Medicare Fraud

HCFA handles more than 800 million Medicare claims each year totaling about $180 billion. The administration maintains numerous databases containing billions of claims stored as trillions of bits of data. Unfortunately, the data are stored on multiple computer systems in many different formats because 80 independent contractors are involved in processing and paying the claims, and no common system was established.

We are helping the administration and independent contractors develop new computerized fraud detection technology so that suspicious claims can be more readily spotted. Our initial goal was to develop a systematic method for identifying patterns of illicit behavior in the claim data. We have now developed a process that can evaluate claims in real time and identify suspicious ones (those that are part of a pattern of fraud or abuse) so that those claims can be suspended before payment is made. In 1996, using purely data-driven techniques, we detected egregious activities; HCFA verified our results, including some that were not detected by traditional HCFA methods. The algorithms developed for the HCFA project have been tested in two different regions of the country and have produced similar results in each region. Stringent verification of the methods are still in progress.

Our fraud detection techniques have the potential to save taxpayers millions of dollars by both detecting and deterring fraud. For more information on Tax Fraud, contact Chris Barnes (505-667-5048 cwb@lanl.gov) or Sue Mniszewski (505-667-0790 smm@lanl.gov). For more information on Medicare Fraud, contact Marianna Kantor (505-665-8310 mkantor@lanl.gov).

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Library Without Walls Anticipates Its Next Generations

This article is one in a series of interviews BITS is conducting with CIC managers to get their views of the "big picture" as it relates to their work and the Laboratory mission. These people have also been asked to do a little forecasting as it applies to their business. BITS invites readers to join in the spirit of these interviews, treating the forecasts as a sort of informed speculation without holding anyone's "feet to the fire" to make the predictions come true.

The Library Without Walls (LWW) of the future may enable researchers to search across databases, manipulate computer models from remote locations and archive the results, search indexed television news coverage, and model and simulate language and ideas as they do now with mathematical problems. These capabilities will be extensions of the ways researchers presently use the LWW.

The First Generation

In the March issue of BITS, Research Library Group Leader Rick Luce stated that enabling scientific collaboration is a prime focus of the project. The LWW is a framework connecting a number of powerful tools that make such collaboration more convenient for users. "In the first generation of LWW," Luce explains, "we delivered science citation databases on-line through the Web, we digitized LA reports (http://lib-www.lanl.gov /pubs/la-pubs.htm) and made them available in PDF form, and we established a Web interface to our on-line catalog (http://lib-www.lanl.gov/edata/catalog.htm). By the end of this fiscal year we will be able to deliver about 900 of our 1,600 scientific journals to our customers' desktops (http://lib-www.lanl.gov/cgi-bin/ejrnlsrch.cgi). By the end of the calendar year the LWW will have roughly 42 million scientific citation records (with duplicates in different databases)."

The first generation of the LWW has taken about three years to establish. It includes four citation databases:

- SciSearch at LANL (http://scisearch.lanl.gov/lanl/) contains 16 million citations and links to selected journal articles.

- BIOSIS at LANL (http://lib-www.lanl.gov/edata/edata.htm) contains 11 million records and links to selected journal articles.

- INSPEC at LANL (http://lib-www.lanl.gov/cgi-bin/edbsrch.cgi) covers physics, computer science, and engineering, with 6 million records and journal links.

- Energy Database (http://lib-www.lanl.gov/cgi-bin/edbsrch.cgi) contains 3.6 million records with selected links.

As a SciSearch subscriber, a researcher can create an individual profile that, in turn, initiates customized search strategies for checking the 18,000 new weekly citations added to the database. E-mail notification then alerts the researcher to items of pertinent interest: new papers, citations of the researcher's papers, or citations of other important papers in his/her field.

The Laboratory's expertise and reputation in computer security underlies agreements with these major database publishers to license their data on-line through the Web under licenses with the Laboratory. Leveraging this technology, the Research Library now has 8 external institutions that subscribe to LWW databases. Some journals allow researchers to follow Web links from the database to an on-line copy of the article. In the future, however, the researcher should not have to guess which database to search, nor should he/she have to take the extra steps of going to the journal publisher, the journal, and the table of contents before going to the article.

> *"The frontiers of new science are in the intersections between the disciplines."*
> *—Rick Luce*

The Second Generation

The LWW plans to make the database search path more useful by combining databases so the researcher begins a database search in only one place. In addition, the researcher should find that some half a million articles are linked directly to this megadatabase. The Laboratory is negotiating with publishers to obtain licenses to link additional electronic journal articles. Of course, the Laboratory has to pay for the privilege.

In addition to these copyright negotiations, the LWW is challenged with technical problems in integrating the databases. Every publisher handles communication algorithms differently. Luce says, "Even though there is supposed to be a standard across databases for the terms and protocols used in making entries, it is rarely followed." In addition, there are semantic difficulties; databases may not use the same term for a given concept. A further challenge is the size of the integrated databases, which will create huge files. SciSearch alone comprises over 90 gigabytes of data to manage. Today the digital library data represent roughly 1.75 terabytes, and

this is expected to double in the next 18 months. Even given these issues, Luce says, "'They' say it can't be done, but we are confident we will be able to integrate these databases in stages over the next two years or so."

Over the coming months, the LWW will increase the opportunities to browse electronic journals. From citation databases, the researcher will find some half million articles on-line. Articles will also be available electronically through the library's on-line catalog and its traditional paths: author, title, subject, date, and so on. The LWW aims to maintain a rich browsing environment, i.e., as many pathways as possible from researcher to data.

In the more immediate time frame, weekly alerting services will be added to BIOSIS at LANL and INSPEC at LANL. Recently electronic customers have been required to submit Z number data. Library personnel now use this data to plan future customer services. Requiring users to submit personal information raises issues of privacy and confidentiality, and customers are assured that the Research Library will not share this information with anyone, neither internal nor external to the Laboratory.

Also in the second generation, the LWW hopes to expand the collection of digitized LA reports and brochures. Researchers are encouraged to add to this database by submitting the articles they have published in journals, papers presented to conferences, and materials written for the public.

The Third Generation

"It's very clear to us in the library world that science is becoming more cross-disciplinary, so we need to look for relevant connections with a wider lens," Luce says. "Look how physics interrelates with bioscience, creating biophysics; people are moving between disciplines. The frontiers of new science are in the intersections between the disciplines." Over the next 10–20 years we should be able to visualize language, ideas, and concepts, to model these as mathematical constructs are modeled now. Then, when someone moves from one discipline to another, he/she can look at the models and see how the specialized terms map over from one discipline to another.

Picture, if you will, a three-dimensional computer graphic showing mountains rising up on an island. The statistical algorithm used to create the mountains represents the citations found for given terms (the Y axis), and the height of the mountains represents the frequency of citations for each one (the X axis). The next sequence of the visualization tool names the concepts or terms of interest and maps them onto the graphic as labels on the mountains. The user can then select one of the mountains, say the one labeled "physics," and zoom into it with a few key strokes to see a graphical representation of related terms overlying another set of mountains. The user can zoom in again on one of these, say the one labeled "biophysics," and so on. Users will then have the choice of going directly to a citation or list of citations.

But we're probably closer to achieving another multimedia model, that of having remote users access information on different servers, combine it, and create a new document. (See Figure 1.) In this model users can access a code for a simulation on one server anywhere in the world, combine it with an explanation of the experiment found on a document server somewhere else (technical report or journal article), and manipulate the code to create a new simulation. You then have, in two different places, two versions of the code, and other researchers can manipulate either one. Librarians are asking themselves, "How can we archive something like this that's dynamic?" And of course, there are computer hardware and software problems such as the amount of bandwidth used when these files are shipped from one remote server to another.

Also under the category of "blue sky" ideas, Luce muses on what it would be like to be able to search an indexed file of all the CNN footage of one day during the Gulf War without "fast forwarding" through an entire six hours of footage. He says that even without such multimedia, the physical and electronic space that science literature takes up doubles every five to six years. "It's due both to the 'publish-or-perish' mandate in the academic world, coupled with the fact that scientific communication is happening faster, and the fact that science itself is happening faster," he concludes.

Any advances made in the management of knowledge will simply be tools to enable collaboration among researchers. The LWW will apply these tools in the management of its data to better serve its Laboratory customers and their collaborators around the world.

Richard Luce is the Research Library Director at Los Alamos National Laboratory and the Project Leader of the Library Without Walls. Before to coming to LANL, he was known nationally for his pioneering work in linking heterogeneous library systems in Colorado and Florida. Today, the Library Without Walls project is noted as one of the more pioneering and successful digital library efforts to date.

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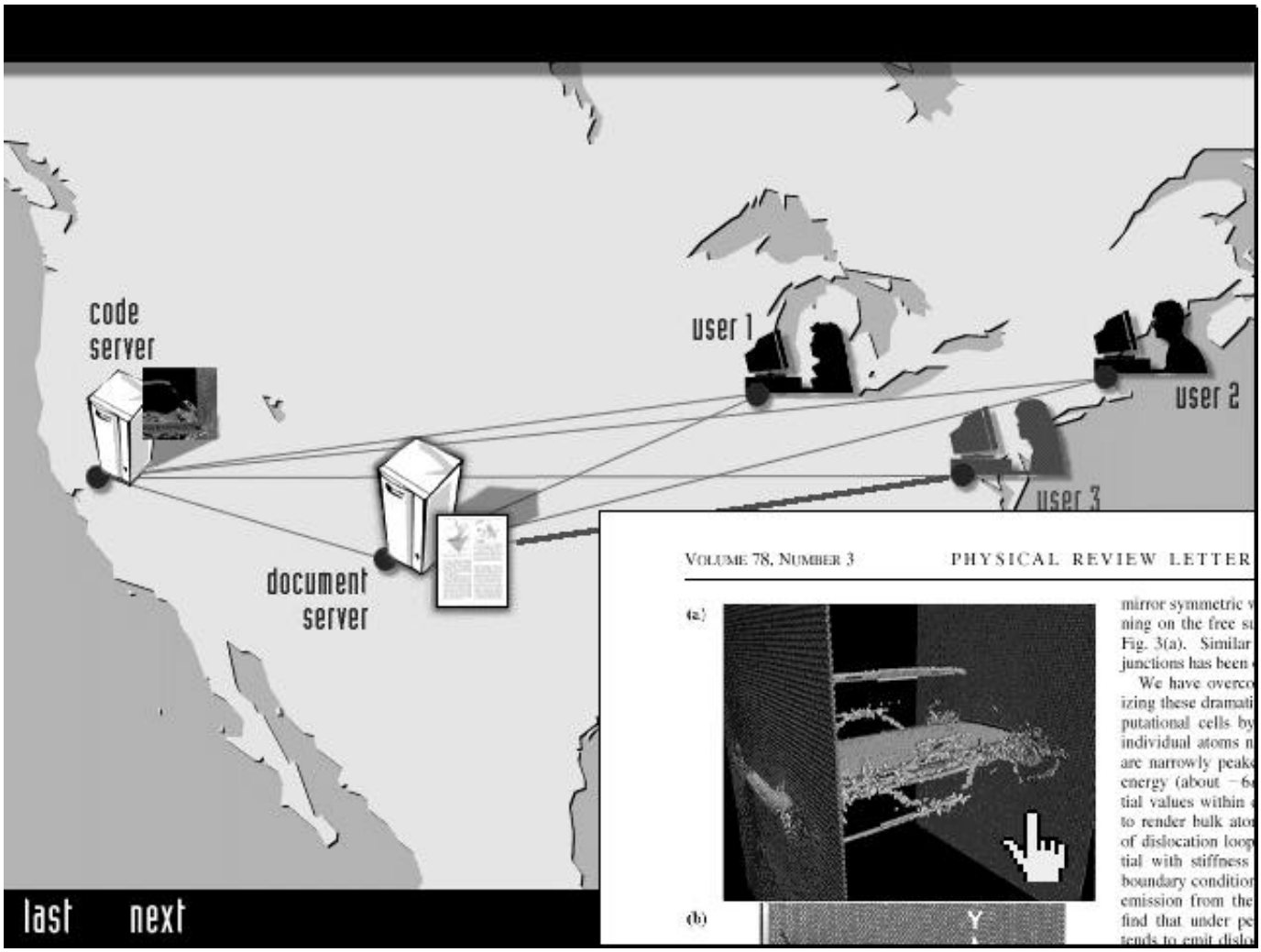
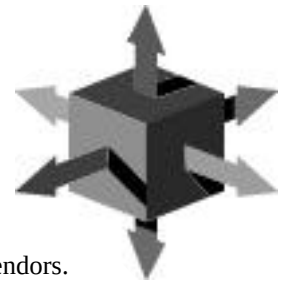


Figure 1: Users will be able to access simulation code remotely, manipulate it, and create new simulations to be placed on widely distributed servers. Other researchers can access either the old or the new code remotely and manipulate it to new simulations. Accessing dynamic forward and backward links and figuring out how to archive these different versions of a simulation, all in different places, are problems to be worked through.

Enterprise Information Applications Available on the Web



The Business Information Systems group (CIC-13) recently launched the Enterprise Information Applications (EIA) Web pages to provide a directory of enterprise information systems (http://enterprise.lanl.gov). The applications are arranged by categories such as Facility Management, Financial, Personnel, and Property. Users can find out the basic purpose of each system, the platform it is on, and the hardware and software needed to run it. By going to the Documents page, users can view and print user guides, reference cards, or development documents associated with the applications. "This is the first time that all this information has been available in one place," says CIC-13 Group Leader Gary Rich. "But the potential of the Web is even greater. From the EIA pages, users can also launch our Web-based applications."

Web Applications

"We're really excited about putting applications on the Web," says Rich. "Using the Web greatly enhances our ability to provide cross-platform applications. For the first time our applications are available to UNIX users as well to those with Macs and PCs."

The first and still the most popular Web application is the Data Warehouse. With it users can generate a wide variety of quick reports (those meant to be viewed on the screen rather than printed formally). Many of these reports have drill-down features that allow users to click on a table cell and get more detailed information. With the appropriate authorities, users can find information on a wide variety of topics including:

- Facility Management—Look up metrics data, equipment, and facility costs.
- Financial (current and historical)—Find out the cost of travel, labor, purchases, projects, etc.
- Personnel—Check employee details, training, and ES&H information.
- Property—Find out who is accountable for property by person, group, or barcode.
- Recharge—Review charges for CIC telecommunications and computing services.

While the Data Warehouse allows users to mine enterprise information for data they need, the other Web applications make it easy for users to enter information in the performance of everyday tasks. Some of the things users can do include the following applications and tasks:

- Invoice Approval System—View invoices before approving them for payment.
- Just-in-Time (JIT)—Search for and order items (anything from wrenches to computers to pens) from the JIT vendors.
- Online Forms—Order keys, apply for enrollment in Training and Development courses, and request library materials.
- Property Accounting, Inventory, and Reporting System (PAIRS)—Review and update assigned property.
- Recharge System—Review and update charge codes for CIC recharge services (computing and telecommunications).
- Training Questionnaire (TQ)—Identify and approve required job training.

The newest addition to the Web applications is Online Forms. "We're using a new technology for the forms," says Rich. "To provide better cross-platform support, we've converted all existing forms to Portable Document Format (PDF). Users can fill out the forms using Acrobat Reader and then save them to their disks if they have Acrobat Exchange. Reader and Exchange are available via the Electronic Software Distribution (ESD) system." The forms serve a wide variety of purposes such as requesting badges for visitors, applying for tuition assistance, setting up consulting agreements, requesting reimbursement for small purchases, and even ordering cakes or catering from Aramak.

When asked how CIC-13 decided which applications to put on the Web, Rich said the group selected applications that would be used by the entire Laboratory community, not just by a small group of users. "Anyone with an ICN password or smartcard and Netscape 4.0 or higher can access our Web applications," says Rich.

The Future

What's in store for CIC-13 and its Web pages? "We'll keep expanding on all fronts. We're adding more reports to the Data Warehouse and more forms to Online Forms all the time. In the near future, we expect to launch new Web applications that let users fill in travel expense worksheets and get reimbursed, take training tests, and update their Laboratory Directory information. We will be enhancing the existing applications as well."

"For the EIA pages, I see a wider future," says Rich. "The applications that CIC-13 develops are not the only ones in the Laboratory that can make peoples' lives easier and more productive. Other groups are moving along the same path. Recognizing this and taking advantage of one of the Web's great features, we've recently added links to the ICN Registry, which CIC-5 developed, because that's where users can change their ICN password and set up e-mail addresses. Similarly, we've included a link to the Library's home page so that users can find the publications they need to do their work. Our goal is to be inclusive rather than exclusive. We want to give people at the Lab the power to do everyday tasks for themselves."

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Research Library Now Offering INSPEC Database

Need access to the literature in physics? Electrical and electronics engineering? Computer and control? All this is now available electronically from the Research Library through the INSPEC database. INSPEC is the premier database to worldwide literature in these areas. It corresponds to the three print abstract titles Physics Abstracts, Electrical and Electronics Abstracts, and Computer and Control Abstracts, and it is produced by the Institution of Electrical Engineers. INSPEC not only provides access to journals from around the world, it also indexes conferences, books, dissertations, patents, and reports.

INSPEC indexes approximately 4000 journals and over 2000 conferences that currently create over 300,000 abstracts each year. The database coverage begins in 1969 and contains almost six million references. The database is searchable by author, title, subject, journal, and many specialized indexes including chemical, classification, astronomical, and numerical. Hyperlinks are available when the article or journal is provided in full-text on the World Wide Web.

INSPEC is accessible via the Web or Telnet. The Web version can be reached by entering the URL (http://lib-www.lanl.gov/cgi-bin/edbaccess.cgi?inspec) or by selecting Electronic Databases from the Research Library home page and then selecting INSPEC. If you have any questions about using this product please call the reference desk at 667-5809. Check the training schedule (http://lib-www.lanl.gov /libinfo/training.htm) for upcoming classes on INSPEC.

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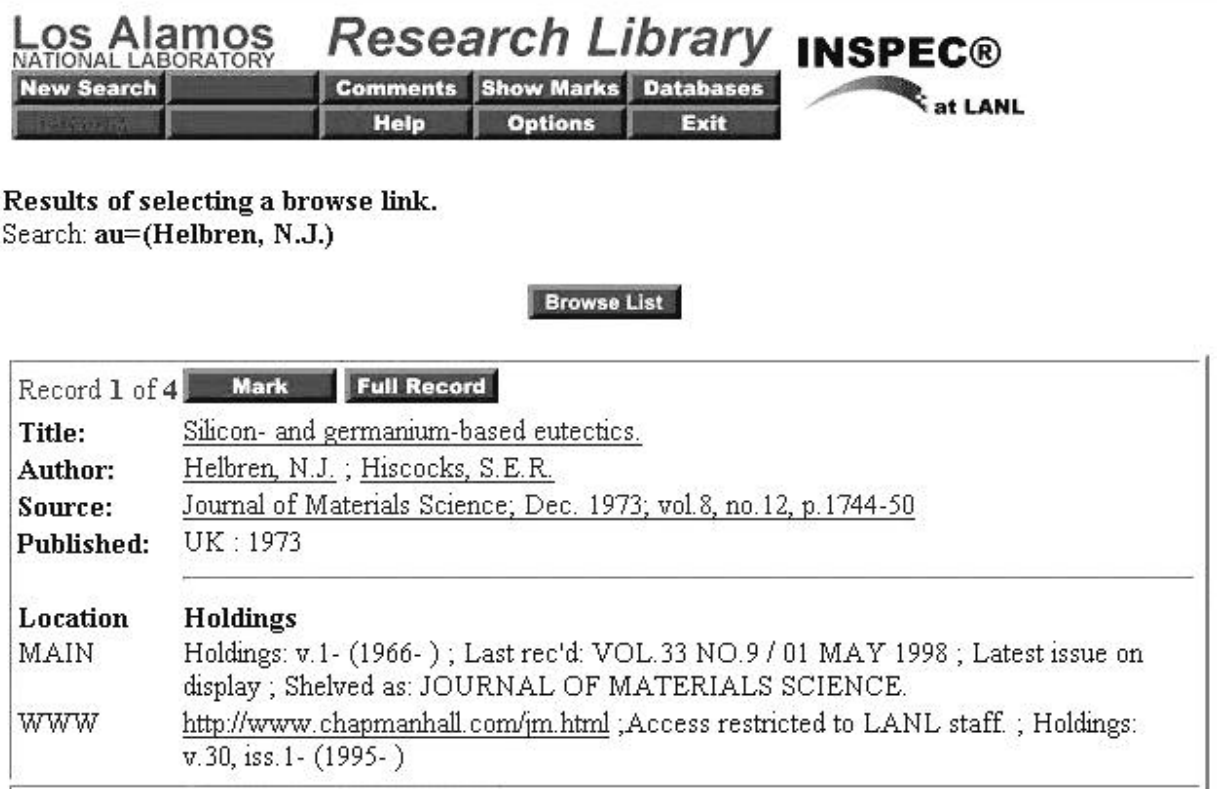
Research Library (CIC-14)



Eye-Opening Reports about Desktop-Computing Costs

How much does each Laboratory desktop computer cost per year?

a. $3,500 b. $6,000 c. $10,200

Answer: c—$10,200

According to research by GartnerGroup, Inc., each corporate desktop computer costs about $10,200 annually—far more than the price of basic hardware and software. What accounts for the high costs? One manufacturer says that the computer price tag isn't a worry. It's everything else that happens after you get the computer out of the box.

The combined expenses for buying, using, and maintaining a desktop computer are referred to as the Total Cost of Ownership, TCO—a hot acronym in the desktop-computer industry and on the corporate scene. Today, savvy enterprise managers are learning about TCO and implementing practices that significantly reduce the rapidly escalating computer-operating costs.

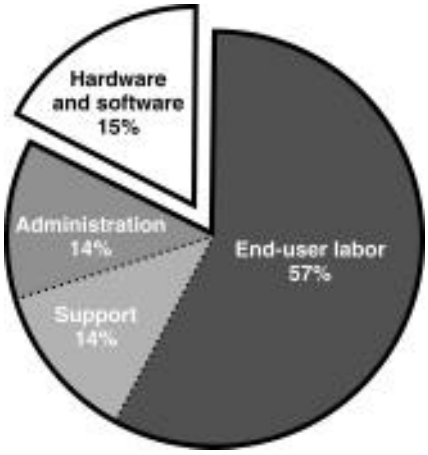


Figure 1. Total Cost of Ownership Percentage Analysis

How Desktop-Computing Costs Break Down

Hardware and software—15% The cost of basic hardware and software needed to operate the computer makes up a small piece of the pie; yet typical business strategies focus more attention on reducing these costs than on lowering the largest piece of the pie, which is end-user labor.

Administration—14% Computer-resource management includes such things as purchasing, property accountability, and security.

Support—14% Assistance from technically qualified personnel includes the following:

- Software upgrade installation,
- Help-desk operation,
- Operating-system set up (system configuration),
- Hardware repair,
- Network and server administration, and
- Training.

Installing a software upgrade on one computer can take about 15 minutes. Installing one such upgrade on each Laboratory computer would consume a total of 50 weeks—one person-year of productivity.

End-user labor—57% Time and effort an employee spends doing computer related work, much of which is wasted on nonjob-related tasks. The following familiar examples illustrate end-user labor.

- Inefficient file back up or lack of file back up—No reliable process exists to preserve documents in the event of a computer-system crash.

  In 1992, 3M Corp. estimated that 24 million work days per year were wasted in the US trying to recreate data that was not backed up.

- Self-support—Users rely on themselves for troubleshooting, repair, upgrades, software installation, training, and/or back up management.

  What is the cost of a highly paid scientist maintaining a computer and, in addition, NOT doing scientific work? Perhaps further problems develop that require even more work from the user, colleague, help desk, or technician.

- Peer support—A coworker gives informal assistance to resolve technical problems.

  "Hey, Joe! Can you give me a hand?" Support can be particularly expensive, because if Joe does not know the answer, other coworkers could be drawn into the discussion making three or four people unproductive.

- Futz factor—(Futz is a Yiddish word that means wasting time.) The user changes settings or rearranges software and file locations—especially if the files are important to operating the computer (system configuration).

  Moving a software application may cause files to not open properly.

- Downtime—Planned and unplanned periods when a user's computer is not available.

  How long does a user wait while a technician is parked in front of the computer to install software? (Two people involved double the lost time/money.)

- Casual learning—Employees use self-training in lieu of traditional and formal instruction.

  Using a new state-of-the-art software requires much on-line help or phone calls to the help desk. An imminent deadline forces the user to work overtime, which creates frustration, anxiety, and additional costs.

Figure 1 shows that end-user labor creates the largest piece of the TCO pie. Enterprises have accepted computer futz and downtime, aspects of end-user labor, as part of the cost of doing business. However, Interpose, Inc. and GartnerGroup research identified cost-saving mechanisms for addressing other aspects of end-user labor.

How Other Organizations Tackled Total Cost of Ownership

Today, more and more enterprises need to control costs and redirect money to mission-critical goals. Therefore, managers tackle the basic TCO components and manage them as business issues. Following are examples of widely used cost-cutting measures.

Hallmark Cards, Inc. slashed TCO per user by 20 percent over the past 30 months for 8,000 Macintoshes and PCs. When James C. Miller joined Hallmark in 1993,

- Information Services (IS) departments were fragmented,

- 12 desktop-computing service shops lived independently in various business units, and

- The company had no standards for hardware or software.

Hallmark cut costs by

- Consolidating all the independent functions,

- Standardizing the procurement process, and

- Creating a menu of standard hardware and software options.

Harris Corporation will soon achieve $15 million savings per year on over 15,000 PCs and 3,000 Unix servers and workstations. Harris reduced TCO with an enterprise-wide plan rather than a piecemeal approach.

- The Chief Information Officer formed a partnership with the business-sector vice presidents of IS departments to extend standardization plans already enacted in some divisions and reduce desktop-computing complexity enterprise-wide.

- Executive management implemented a centralized IS department policy to decrease enterprise-wide costs and ensure satisfactory service.

Deutsche Telekom estimated that each site visit cost $800 with 230,000 users running a mishmash of old computers. Deutsche Telekom reports lowering TCO with the following management practices:

- Invoking standards for software and hardware configurations,

- Planning Information Technology (IT) integration, and

- Minimizing the need for on-site service calls.

Effective Ways to Reduce Total Cost of Ownership

Other case studies* and research elicit common solutions for reducing TCO.

- Use standards to manage hardware, software, and hardware-configuration options.

- Better coordinate IS departments.

- Manage IT components as business assets.

- Use automated services such as desktop management software to provide more efficient support and reduce end-user labor.

- Ensure an efficient help desk.

- Implement software volume-purchase and site license agreements.

• Lease rather than buy equipment.

*GartnerGroup Best Practices Case Summary 1, *Total Cost of Ownership: Reducing PC/LAN Costs in the Enterprise, Strategic Analysis Report;* February 2, 1996 (Research conducted May-December 1995).

Benefits for the Laboratory

Understanding and reducing TCO will provide the Laboratory with opportunities to

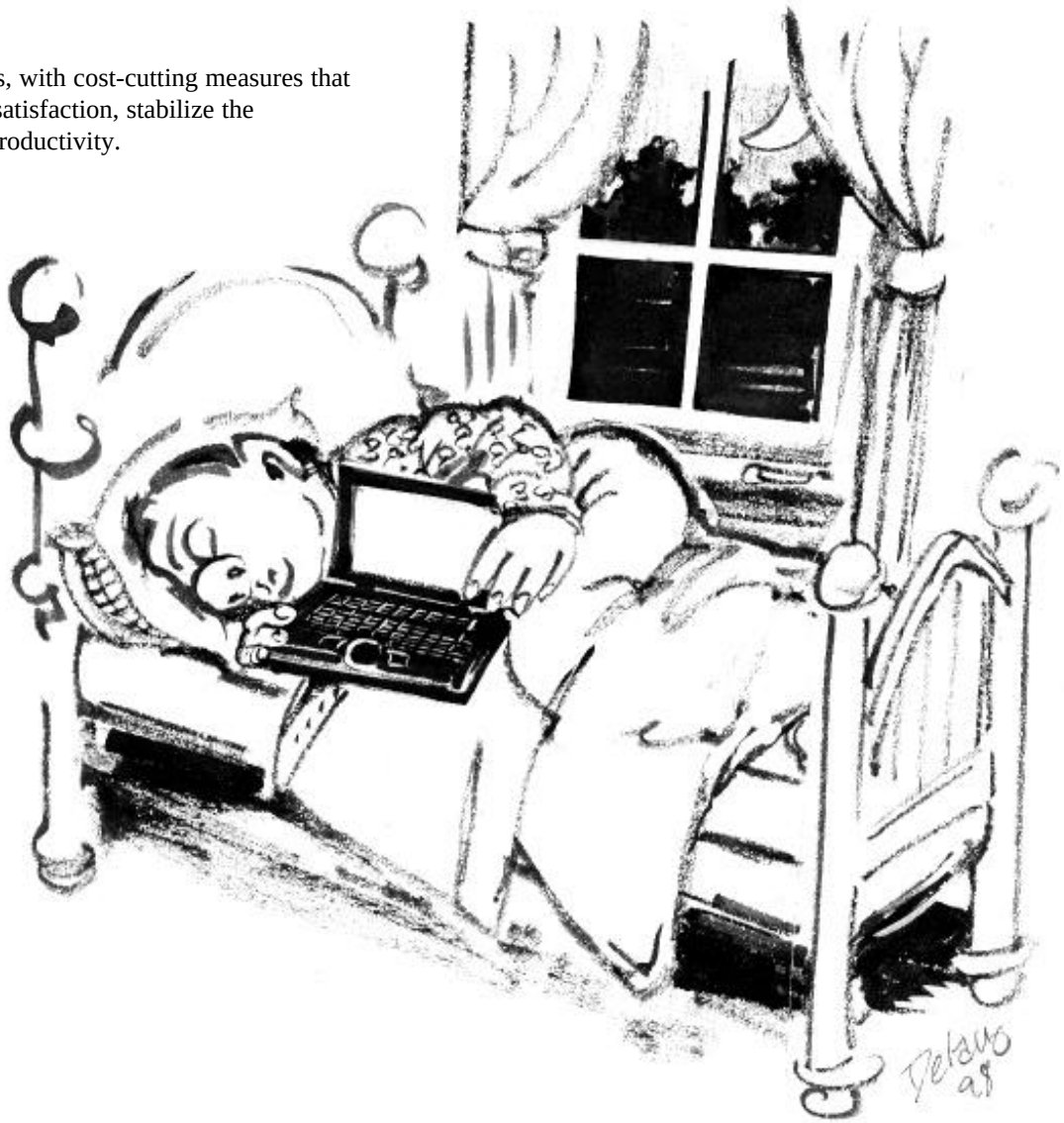
• Redirect the moneys saved into "doing science,"

• Increase desktop-computing productivity and competitive value, and

• Make life easier for users, with cost-cutting measures that save time, increase user satisfaction, stabilize the computer, and increase productivity.

Today, leading industry headlines reveal that managers look beyond hardware and software costs to understand and address TCO as a business issue and thereby provide greater productivity and satisfaction at lower costs. Even though the strategic value of desktop-computing technology is increasing rapidly, the operational costs may become prohibitive unless enterprises take aggressive action to reduce TCO.

For more information, contact the REDI Team, redi@lanl.gov.



Research Library Training

The LANL Research Library provides training for using its specialized databases. Training sessions begin and end at times indicated below. Classes are free but you must preregister by calling the Research Desk at 7-5809 or sending e-mail to library@lanl.gov. Special classes and orientations can also be arranged.

Date	Time	Subject Matter
7/7/98	1:00–1:30 p.m.	INSPEC at LANL—New Product
7/14/98	1:00–1:30 p.m.	Introduction to Electronic Library Resources
7/16/98	11:00–11:30 a.m.	Earth Sciences Web Resources
7/22/98	1:00–1:30 p.m.	Finding Addresses and Phone Numbers on the WWW
7/23/98	2:00–4:00 p.m.	InfoSurfing: Basic Web Searching Strategies
7/28/98	1:00–1:30 p.m.	Environmental Web Resources
7/30/98	1:00–1:30 p.m.	SciSearch Alerting Service
8/4/98	1:00–1:30 p.m.	BIOSIS at LANL
8/12/98	1:00–1:30 p.m.	INSPEC at LANL—New Product
8/19/98	1:00–1:30 p.m.	Finding Addresses and Phone Numbers on the WWW
8/20/98	2:00–4:00 p.m.	InfoSurfing: Basic Web Searching Strategies
8/25/98	1:00 - 1:30 p.m.	Grants & Funding

Computer Training

The Customer Service Group (CIC-6) offers technical computer training (Enterprise Information Applications, communications, office administration, and Web authoring) and advanced technical computer training (programming languages, system administration, and advanced applications). To register for a course access our Web page at

http://www.lanl.gov/cic/cic6/training.html

Or from the LANL home page select the links Training, Computer. For further information about technical computer training call (505) 667-9559 and for advanced technical computer training call (505) 667-9399.

Communications
- Eudora 4.01
- Lotus Notes 4.5x
- Meeting Maker 5.0.3

Office Skills 2000
- Office Skills 2000: Part 1
- Office Skills 2000: Part 2

Web Authoring and Browsing
- FrontPage 98
- HTML Basics
- HTML Intermediate
- Netscape 4.0

Coming This Summer!
- Directory Information System (DIS)—Web
- Procurement Desktop
- Recharge

Enterprise Information Applications (EIA)
- Data Warehouse—Basics
- Data Warehouse—EDS Reports
- EDS—Basics
- EDS—Training Plans
- Foreign Travel GUI
- Infomaker
- Invoice Approval System
- Purchase Card System
- Time & Effort GUI
- Travel GUI
- Web JIT

Other EIA Courses
- Financial Management Information System (FMIS)
- Property Accounting, Inventory and Reporting System (PAIRS)
- Signature Authority System (SAS)
- Secretarial/Contract Services (SE)
- Salary Review System (SRS)
- Directory Information System (DIS)
- Automated Chemical Information System (ACIS)

Application Training
- Advanced WWW Development
- FrameMaker Basic & Advanced
- Foundations of IDL Programming
- IDL 5.0 Graphic Object Workshop
- Netscape Servers for Intranet Development
- Origin2000 Applications Programming and Optimization
- Running on the ASCI Blue Mountain Systems
- Sendmail—Managing Internet Mail
- SGI Origin2000 for ASCI/ACL Programmers
- Sybase Performance and Tuning for System 11
- Sybase SQL Server Administration
- UNIX (Beginning)
- UNIX (Advanced)
- Visual Basic 5.0 Fundamentals
- Visual C++ Windows Programming

Programming Training
- C Programming (Beginning)
- C Programming (Advanced)
- C++ for Experienced C Programmers
- Java Programming
- Java Programming Workshop
- Distributed Programming With Java
- Object Technology—A Management Overview
- Object-Oriented Analysis and Design
- Perl Programming
- C-Shell Programming

System Administration Training
- SGI System Administration (Beginning)
- SGI System Administration (Advanced)
- SGI Network Administration
- SGI Performance Evaluation and System Tuning for Origin2000 and Onyx2
- Solaris 2.X System Administration
- Solaris 2.X Network Administration
- Solaris 2.X Server Administration
- UNIX and Windows NT Integration
- Windows NT Workstation and Server
- Windows NT Optimization and Troubleshooting
- Windows NT Security

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INTEGRATED COMPUTING NETWORK (ICN) VALIDATION REQUEST

Instructions:

(1) Complete all parts of this form that apply to you. Please take note of the "Special Requirements" section and complete any applicable parts.
(2) Manager (Group Leader or above) authorization and signature are required for all validation requests.
(3) Before submitting this request, ensure that your Employee Information System (EIS) information is current.
(4) Once completed, either mail this request to the Password Office at MS-B251, fax it to (505) 667-9617, or, if you are cleared, handcarry it to TA-3, SM-200, Room 257.

If you have **questions** call (505) 665-1805 or send e-mail to validate@lanl.gov

Owner Information

Z-Number (if you have one)			Name (last, first, middle initial)
LANL Group	Phone Number	LANL Mail Stop	Citizenship (Foreign National see "Special Requirements-Foreign National")

Check LANL affiliation:

- ☐ LANL employee
- ☐ Contractor _____ (specify contract company)
- ☐ External user_____ (specify employer)
- ☐ Other (specify)_____

Send password / smartcard to:

☐ Mail Stop or ☐ Mail to address indicated below

Name / Organization
Address
City, State, Zip Code

Access

Check access method and needed partitions:

Access method: ☐ ICN Password ☐ Smartcard ☐ Both

☐ **Open** partition (e.g., open machines, or for dial up access)

☐ **Administrative** partition (e.g., Travel, Data Warehouse, IA [BUCS, Stores], IB [EIS, FMIS, PAIRS])
If you are not a cleared LANL employee, see required steps in section "Special Requirements-Administrative Partition".

☐ **Secure** partition (i.e., secure machines)
A Q-clearance is required for secure access. After obtaining Manager signature for Secure access, handcarry this form to the Password Office to obtain your Secure account.

I certify this person does require **secure** access:

_____ _____
Manager Signature (Group Leader or above) Date

Password Office Use Only

New ☐ Change ☐	Clearance Status	Processed	Lv	Smartcard Serial #
Comments:				

Form 1646 (3/95) Supersedes previous versions (rev. 4/97).

Continue

Special Requirements

Administrative Partition

Lab-Wide Systems (e.g., Travel, Data Warehouse, IA [BUCS, Stores], IB [EIS, FMIS, PAIRS])

☐ Under 18 years of age

If you need to access Administrative systems, your Group Leader must provide a memo accepting responsibility for your actions and justifying your need for access. This memo is to accompany all forms taken to the security briefing (see "Contractor or Non-Cleared") section below. You may not access the Secure Partition.

☐ Contractor or Non-Cleared

Phone (505) 665-4444 (option #2) to obtain Access Authorization packet.

Phone (505) 667-9153 to schedule a security briefing.

Bring all forms including this ICN Validation Request to the security briefing for approval.

CIC-6 Security Briefing Approval Signature	Date

☐ Foreign National

Attach a copy of Form 982 (REQUEST FOR UNCLASSIFIED VISIT OR ASSIGNMENT BY A FOREIGN NATIONAL) with all approval signatures. Be sure Box #11 of Form 982 is completed. If you are not a visitor/assignee under a LANL/DOE approved Visit / Assignment Request, attach written justification from your host Group Leader or Division Director describing your need to access the ICN.

Authorization (required)

Print Manager Name (Group Leader or above)	Manager Z-Number	Group
Manager Signature (Group Leader or above)	**Mail Stop**	**Date**

If you are NOT a LANL employee you must have a LANL contact and obtain the contact's signature in addition to the contact's manager's signature.

LANL contact: Read the following and sign below.

By signing this form I affirm that I understand and accept the following:

a. I am a regular Laboratory employee.

b. I am responsible for forwarding password reauthorizations and verifying annual account reauthorizations for this user.

c. I am responsible for notifying the Password Office within 10 days of changes in my status.

d. I am responsible for notifying the Password Office immediately of changes in this user's status (termination, end of contract, etc.).

Print LANL Contact Name	Contact Z-Number	Phone Number	Group
LANL Contact Signature		Mail Stop	Date

NOTE: All Laboratory computers, computing systems, and their associated communication systems are for official business only. By completing this validation request and signing for a password and/or smartcard, you agree not to misuse the ICN. The Laboratory has the responsibility and authority to perodically audit user files.

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