ATSIG: The Future Is Now

Presented at the eRA Project Team Meeting of September 9, 2003 by Dr. Steven J. Hausman

Department of Health and Human Services
National Institutes of Health

NIH eRA

Overview

- Some Quotes
- From Scanning to Advanced Technologies: the Progression
- Up and Coming
  - Nanotechnology
  - Grid Computing
  - DARPA and the “Grand Challenge”
  - Après XP

The Quotes

- "Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world. "
  - **Albert Einstein**
- "There is no reason anyone would want a computer in their home."
  - **Ken Olsen, Digital Equipment Corp, 1977**

The Progression

Scanning

Paperless Business Processes

Advanced Technologies

Scanning

Why Did We Start to Scan?

- **Each year:**
  - < ~50,000 applications
  - < ~3,200 review meetings
  - < ~80 National Advisory Council meetings
  - < >60,000 competing and non-competing awards
  - < >2,200 grantee institutions worldwide
  - < ~100,000 applicants
  - < ~200,000,000 pieces of paper
- **The Result of Scanning**
  - < All applications scanned upon receipt
  - < Images available on CDs and on-line

And Growing!

Paperless Business Processes

Paperless Business Processes

- Paperless business processes are designed to reduce the reliance on paper and improve the way we do business
- It is more than just converting a paper document into an image
- Examples include:
  - eRA transactions
  - Posting RFPs on-line instead of having a reading room
  - Using a Digital Sender instead of a fax to transmit documents
- A culture change is often needed along with the process change

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Print to Online: Making the Transition

The Library is committed to providing increased access to online journals. This web page has been developed to inform you of the issues we face in transitioning from a largely print collection to a largely online collection.

- **Journal Cost Trends**

  Journal print subscription costs have increased at a phenomenal rate between 1992 and 2002. For example, the cost of biology and medicine journals has increased 191% and 196% respectively over this time period. To subscribe to electronic and print versions of a journal puts added pressure on the budget. Electronic journals are in some cases very expensive. Online publications may in time be cheaper to produce, but they are not cheaper now. In fact, they often represent an additional expense for publishers, and this expense is passed along to libraries. The library must constantly evaluate its collections, both print and electronic, to ensure that the transformation from print to online is done in a cost-effective way.

- **Selection Criteria for Journal Subscriptions (print +online vs. online)**

  The library is committed to providing electronic access to its journal collection. All new titles added to the collection are purchased in online format only, if available. We are gradually adding online access to our current print titles or converting

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Click on the letter of the desired journal to access the full text of an article. This Online Journals list includes free trials.

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Electronic Journal Access: The NIH Library is having problems with our journal subscription agent (read full story on our news page at http://nihlibrary.nih.gov/News/feb03news.htm#journalsgone.) Until the problems are resolved, information about access to some journals is noted next to the journal on the online journals pages. If you encounter an access problem, please contact the Library through our Web Comments feature.

Other Sources for Online Journals

- **Biomed Central** Peer reviewed research across all areas of biology and medicine, with immediate, barrier-free access for all. You may search across all journals provided on the site, and access the full text. You may also access journal articles from NIH staff
- **BioOne** Full-text of over 60 journals in the biological, ecological and environmental sciences, including

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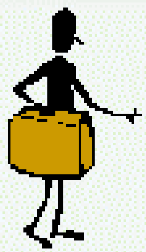

Traveler Help

Do You Travel As Part Of Your Job?
If you do, it is important for you to know that with the launch of the new web-based NBS Travel System on September 1, 2003, travelers will no longer review and sign hard copies of Sponsored Travel Orders (Authorizations) or any Travel Vouchers for trips beginning October 1st. Travel documents for trips that begin prior to October 1st will continue to be processed in the current (ADB) system.

How Will You Review and Sign Your Travel Documents?
Travelers will receive email notifications when travel documents require action, and will electronically review and sign the travel documents on-line.

Avenues of support to help you review and certify your travel documents on the web:

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Advanced Technologies

Advanced Technologies

- The purpose of Advanced Technologies, under the auspices of eRA, is to:
  - ferret out those aspects of advanced technologies that could become significant to NIH staff in the future (and also those aspects that are simply interesting to hear about); and
  - disseminate this information as widely as possible
- Dissemination will be conducted via:
  - The Advanced Technologies Special Interest Group (ATSIG)
  - The eRA Advanced Technologies website
  - Lectures and seminars

NIH: Special Interest Groups - Netscape

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Bookmarks Go to: http://www.nih.gov/sigs/ What's Related

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Back to: Scientific Resources

Special Interest Groups

NIH Inter-Institute Interest Groups are assemblies of scientists with common research interests. These groups are divided into seven broad, process oriented parent groups, or faculties, and more than 30 smaller, more focused groups centered on particular research models, subjects, or techniques. The latter groups are initiated and run by scientists in the Intramural and Extramural Research Programs at NIH. The interest groups sponsor symposia, poster sessions, and lectures; offer mentoring and career guidance for junior scientists; help researchers share the latest techniques and information, act as informal advisors to the Deputy Director of Intramural Research (DDIR); provide advice for the annual NIH Research Festival; and serve as hosts for the Wednesday Afternoon Lecture Series. Many of these groups are cosponsored by neighboring academic and government institutions and welcome interested non-NIH scientists. Information about group activities or new groups is published in The NIH Catalyst and The DDIR's Bulletin Board. Both of these publications are available electronically to NIH staff. Some central coordination for the groups is provided by the Office of Intramural Research.

Calendar of all Upcoming SIG Meetings

Use Keywords to Find the Corresponding SIGs

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NIH: Special Interest Groups - Netscape

Go to: http://www.nih.gov/sigs/

[Use Keywords to Find the Corresponding SIGs]

Major Faculties

- Cell Biology Interest Group
- Clinical Research
- Genetics Interest Group
- Immunology
- Molecular Biology/Biochemistry Interest Group
- Neurobiology
- Structural Biology Interest Group

Other Interest Groups

- 14-3-3 Protein Interest Group
- Acetyltransferase Interest Group
- Advanced Pharmaceutical Screening Interest Group
- Advanced Technologies Special Interest Group
- AIDS Interest Group
- Apoptosis Interest Group
- Behavioral and Social Science Research Interest Group
- BSSR Methodology and Measurement Interest Group
- Bioethics Interest Group
- Bioinstrumentation Interest Group
- Biomedical Computing Interest Group
- Biomedical Research History Interest Group

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SIGS: Advanced Technologies Special Interest Group - Netscape

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Advanced Technologies Special Interest Group

Mtgs/Seminars | Members | Join the SIG | Special Items | Archives | Related Links

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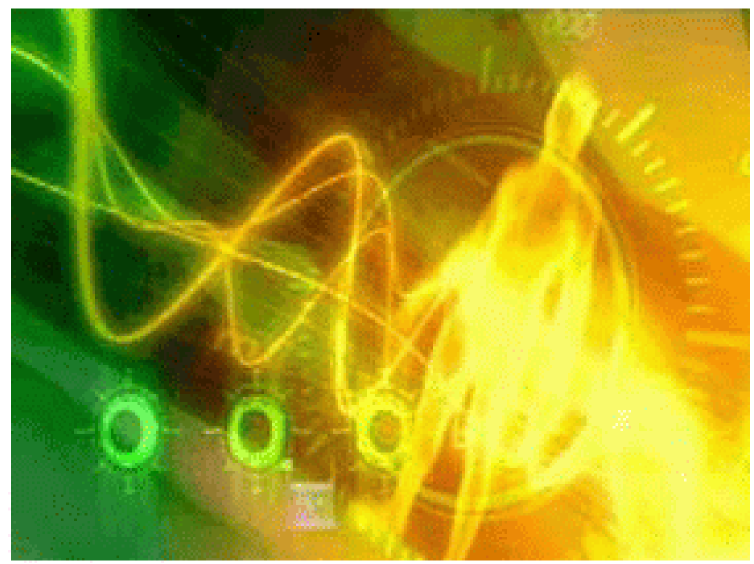
- Meetings & Seminars
  Schedule of upcoming meetings & seminars
- Members
  A listing of current membe
- Join the Group
  Register as a member, join the mailing list
- Special Items
  No items listed at this time
- Archives
  Listserv archives, past meetings & seminars
- Related Links
  Other related sites of interest

ATSIG



The A d Technologies Special Interest Group is being developed under the auspices of the electronic Research Administration (eRA) initiative and was initially intended to explore technologies that would aid in improving business practices at the NIH. The prime example of that was the use of imaging technology to convert paper applications to electronic format. Since that effort has been successfully accomplished the eRA Advanced Technologies effort has been broadened to include many more areas of emphasis that will certainly change the way that work is done in the future. Examples include all aspects of computer technology, the workplace of the future, biometrics, nanotechnology and disability-related technology, to name but a few. If you are interested in learning about

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Join the SIG

Mtgs/Seminars | Members | Join the SIG | Special Items | Archives | Related Links

If you would like to become a member of the Advanced Technologies Special Interest Group, please fill out the form shown below. Your name, institute, email address, and phone number will appear on the Members page of this website.

The fields marked with an asterisk are required fields. However, we would appreciate you filling out as many fields as possible. The more information we have about our member base, the more we can tailor our events to the proper audience.

Thanks for your help.

First Name: *

Last Name: *

Institution*: Pick Your Institution

If you are not at NIH, please select "Other" and fill in the name of your Institution here:

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eRA: Paperless Workplace (Scanning) - Netscape

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eRA
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Business Areas

- Budget Management
- Committee Management (CM)
- Data Integrity
- Electronic Council Book (ECB)
- eRA Interface to the Extramural Community (Commons)
- Grants Management (GM)
- IC Technical Perspective
- Infrastructure
- Paperless Business Practices (Scanning)
- Receipt, Referral, &

Advanced Technologies

The Advanced Technologies business area is building on the success of the scanning effort that began the conversion of paper grant applications to electronic images. It will bring information about advanced and emerging technologies to the NIH community that will certainly change the way that work is done in the future. A new Advanced Technologies Special Interest Group (ATSIG) website has been created for this purpose as well.

Advocate

Contact info, biosketch

Overview

Mission Statement, Minutes, Documents, Rosters

Paperless Business Practices (Scanning) Group

Goals and Accomplishments

2001 Accomplishments

2002 Goals

Schedules

Release Schedule

What's happening?

Videocast of eRA Symposium

Future Directions presented at the eRA Symposium by Dr. Steve Hausman

Bug Status

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Advanced Technology Categories

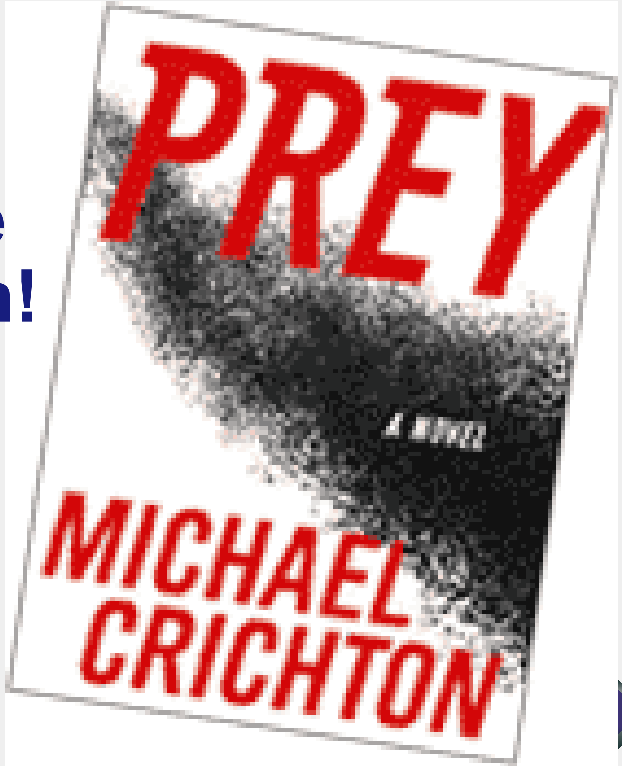
- Batteries and fuel cells
- Biometrics
- Browser technology
- Chip technology
- Collaborative technologies
- DARPA research
- Data storage and storage technology
- Disability-related computing
- Display technology
- Far Out technologies
- Gadgets
- Grid computing
- Haptic web
- Nanotechnology
- Office/Workplace of the future
- Quantum Computing
- Pervasive computing
- Public Key Infrastructure (PKI)
- Robotics
- Security information
- Semantic web
- Tablet, small PCs and mobile computing
- Voice technology
- Wireless

Some AT Examples

- Nanotechnology
- Grid Computing
- DARPA and the “Grand Challenge”
- Après XP

Nanotechnology

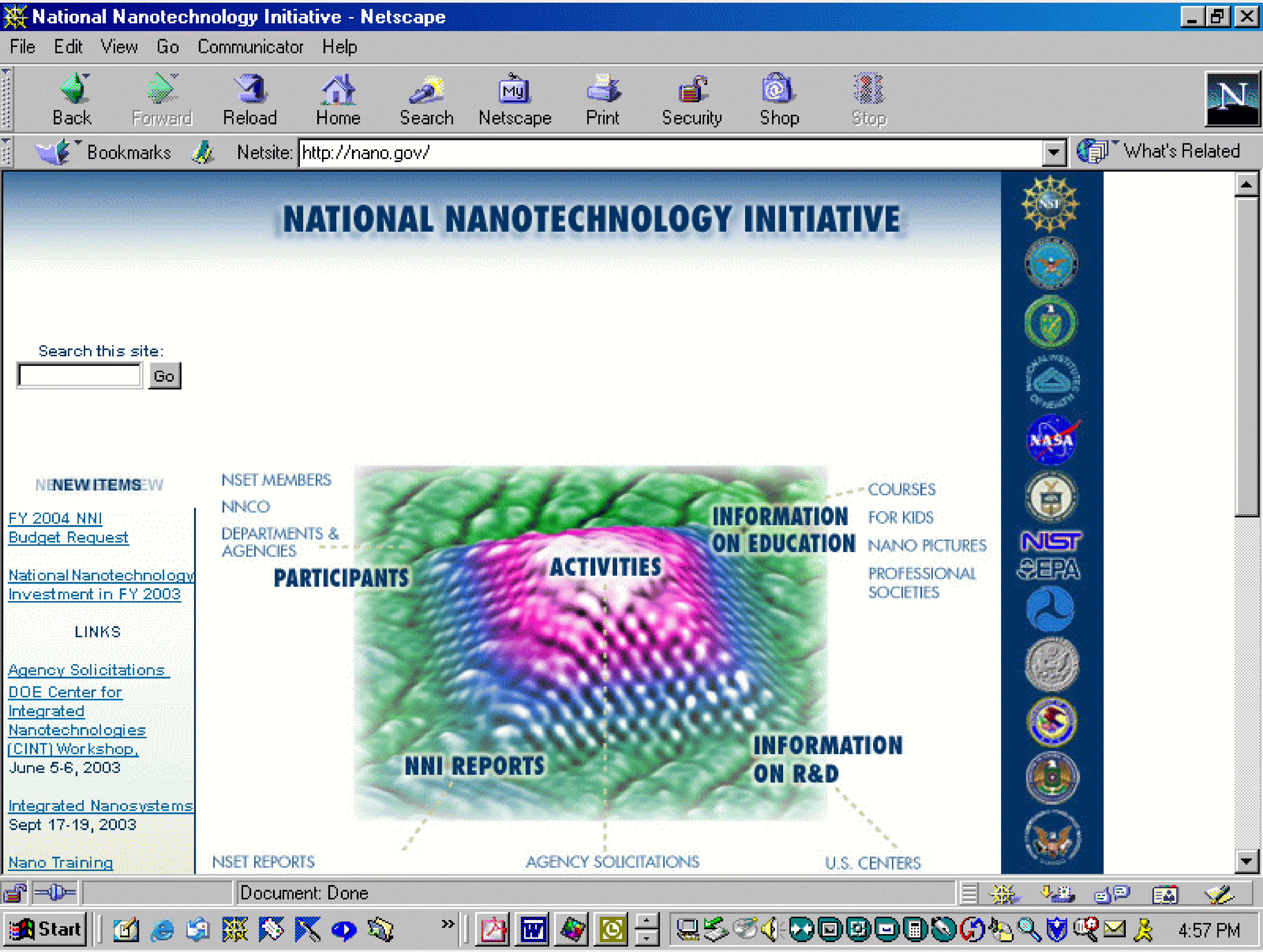
- **NanoQuote:**
  - < "L'essential est invisible pour les yeux"
    - – Saint-Exupery in The Little Prince. ("What is essential is invisible to the eye.")
- **NanoHype:**
  - < The nanobots are coming and will make life wonderful!
- **NanoFright:**
  - < Nanomachines will escape from the laboratories and destroy civilization!
- **NanoReality:**
  - < What will happen is that nanotechnology will certainly change our lives



What Is Nanotechnology?

The Future is Now

- Nanotechnology typically refers to working with materials in the one to 100-nanometer range
- Formulated in a seminal article written by Richard P. Feynman in 1959
- Originally applied to micro computer circuitry
- Today's uses range from Dockers brand khaki pants to battlefield armor for soldiers to computer memory using carbon nanotubes to drug delivery systems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Possible Nanocomputer Technologies

- Electronic
  - Most promising--builds upon existing infrastructure for microelectronics; some prototype devices exist
- Biochemical or Organic
  - Recent advances, i.e. DNA computation
- Mechanical
  - Ultra-miniature Babbage engines (mechanical programmable computer)
- Quantum
  - Technology of the far distant future; proposes a massively parallel computer that takes advantage of quantum interference--proven able to crack existing codes; subject of a recent Los Alamos Lab publication

Nano Examples

- **Nano-Storage**
  - < **IBM’s Millipede chip -25,000,000 bytes in a postage stamp size area**
- **Nanocomputing circuits**
  - < **IBM’s “molecule cascade” system -260,000 times smaller than present circuits**

EETIMES

NASA ramps nanotech to explore space

By Chappell Brown, EE Times
May 2, 2003 (1:48 p.m. EST)
URL: http://www.eetimes.com/story/OEG20030502S0045

Hancock, N.H. — Micro-rovers that hop, fly or burrow; networks of ultrasmall probes dropped on a remote body such as an asteroid or planet; swarms of micro-spacecraft taking in massive amounts of data. Those are just some of the systems and applications envisioned by the researchers working at NASA's Center for Nanotechnology.

At the NASA Ames Research Center (Moffet Field, Calif.), more than 50 scientists and technologists are working on broad fronts to develop the potential of nanotechnology for space exploration. The overall thrust of their work is to develop miniaturized, lightweight materials and electronics systems. Reducing the size of the payload while increasing the intelligence of space probes would help NASA to do more with less, the researchers said.

"Nanotechnology presents a whole new spectrum of opportunities to build device components and systems for entirely new, bold space architectures," lab director Meyya Meyyappan writes in a progress report on the group's research. To that end, projects are under way to build nanotube sensors, molecular electronics, nanotube-based materials, quantum-computing systems and compu- tational optoelectronics. The center's time line calls for putting systems in the field in 10 to 15 years.

Processing systems for nanomaterials are a key enabling technology. While visionaries expect the creation of nano- bots that could assemble materials and systems at the atomic and molecular scales, that approach is too far in the future for NASA's current needs. For now, the nanomaterials aspect of the lab's work is looking at conventional, top-down materials processes to glean clues to practical processing techniques.

A two-pronged attack combines computer simulation of basic processes, such as chemical vapor deposition or plasma processing, with data derived from gas-phase, plasma-phase and surface chemistry experiments. The researchers hope an understanding of those basic processes will lead them toward novel

More Examples

- Molecular Circuits
  - Based on a molecule called rotaxane to create a "molecular abacus"
- Quantum Computing
  - Science article

REPORTS

Coherent Quantum Dynamics of a Superconducting Flux Qubit

I. Chiorescu,[1*] Y. Nakamura,[1,2] C. J. P. M. Harmans,[1] J. E. Mooij[1]

We have observed coherent time evolution between two quantum states of a superconducting flux qubit comprising three Josephson junctions in a loop. The superposition of the two states carrying opposite macroscopic persistent currents is manipulated by resonant microwave pulses. Readout by means of switching-event measurement with an attached superconducting quantum interference device revealed quantum-state oscillations with high fidelity. Under strong microwave driving, it was possible to induce hundreds of coherent oscillations. Pulsed operations on this first sample yielded a relaxation time of 900 nanoseconds and a free-induction dephasing time of 20 nanoseconds. These results are promising for future solid-state quantum computing.

It is becoming clear that artificially fabricated solid-state devices of macroscopic size may, under certain conditions, behave as single quantum particles. We report on the controlled time-dependent quantum dynamics between two states of a micron-size superconducting ring containing billions of Cooper pairs (*1*). From a ground state in which all the Cooper pairs circulate in one direction, application of resonant microwave pulses can excite the system to a state where all pairs move oppositely, and make it oscillate coherently between these two states. Moreover, multiple pulses can be used to create quantum operation sequences. This is of strong fundamental interest because it allows experimental studies on decoherence mechanisms of the quantum behavior of a macroscopic-sized object. In addition, it is of great importance in the context of quantum computing (*2*) because these fabricated structures are attractive for a design that can be scaled up to large numbers of quantum bits or qubits (*3*).

Superconducting circuits with mesoscopic Josephson junctions are expected to behave according to the laws of quantum mechanics if they are separated sufficiently from external degrees of freedom, thereby reducing the decoherence. Quantum oscillations of a superconducting two-level system have been observed in the Cooper pair box qubit using the charge degree of freedom (*4*). An improved version of the Cooper pair box qubit showed that quantum oscillations with a high quality factor could be achieved (*5*). In addition, a qubit based on the phase degree of freedom in a Josephson junction was presented, consisting of a single, relatively large Josephson junction current-biased close to its critical current (*6, 7*).

Our flux qubit consists of three Josephson junctions arranged in a superconducting loop threaded by an externally applied magnetic flux near half a superconducting flux quantum $\Phi_0 = h/2e$ [(*8*); a one-junction flux qubit is described in (*9*)]. Varying the flux bias controls the energy level separation of this effectively two-level system. At half a flux quantum, the two lowest states are symmetric and antisymmetric superpositions of two classical states with clockwise and anticlockwise circulating currents. As shown by previous microwave spectroscopy studies, the qubit can be engineered such that the two lowest eigenstates are energetically well separated from the higher ones (*10*). Because the qubit is primarily biased by magnetic flux, it is relatively insensitive to the charge noise that is abundantly present in circuits of this kind.

The central part of the circuit, fabricated by electron beam lithography and shadow evaporation of Al, shows the three in-line Josephson junctions together with the small loop defining the qubit in which the persistent current can flow in two directions, as shown by arrows (Fig. 1A). The area of the middle junction of the qubit is $\alpha = 0.8$ times the area of the two outer ones. This ratio, together with the charging energy $E_C = e^2/2C$ and the Josephson energy $E_J = hI_C/4\pi e$ of the outer junctions (where I_C and C are their critical current and capacitance, respectively), determines the qubit energy levels (Fig. 2A) as a function of the superconductor phase γ_q across the junctions (Fig. 1B). Close to γ_q =

Fig. 1. (A) Scanning electron micrograph of a flux qubit (small loop with three Josephson junctions of critical current ~0.5 μA) and the attached SQUID (large loop with two big Josephson junctions of critical current ~2.2 μA). Evaporating Al from two different angles with an oxidation process between them gives the small overlapping regions (the Josephson junctions). The middle junction of the qubit is 0.8 times the area of the other two, and the ratio of qubit/SQUID areas is about 1:3. Arrows indicate the two directions of the persistent current in the qubit. The mutual qubit/SQUID inductance is $M \approx 9$ pH. (B) Schematic of the on-chip circuit; crosses represent the Josephson junctions. The SQUID is shunted by two capacitors (~5 pF each) to reduce the SQUID plasma frequency and biased through a resistor (~150 ohms) to avoid parasitic resonances in the leads. Symmetry of the circuit is introduced to suppress excitation of the SQUID from the qubit-control pulses. The MW line provides microwave current bursts inducing oscillating magnetic fields in the qubit loop. The current line provides the measuring pulse I_b and the voltage line allows the readout of the switching pulse V_{out}. The V_{out} signal is amplified, and a threshold discriminator (dashed line) detects the switching event at room temperature.

[1]Quantum Transport Group, Department of NanoScience, Delft University of Technology and Delft Institute for Micro Electronics and Submicron Technology (DIMES), Lorentzweg 1, 2628 CJ Delft, Netherlands. [2]NEC Fundamental Research Laboratories, 34 Miyukigaoka, Tsukuba, Ibaraki 305-8501, Japan.

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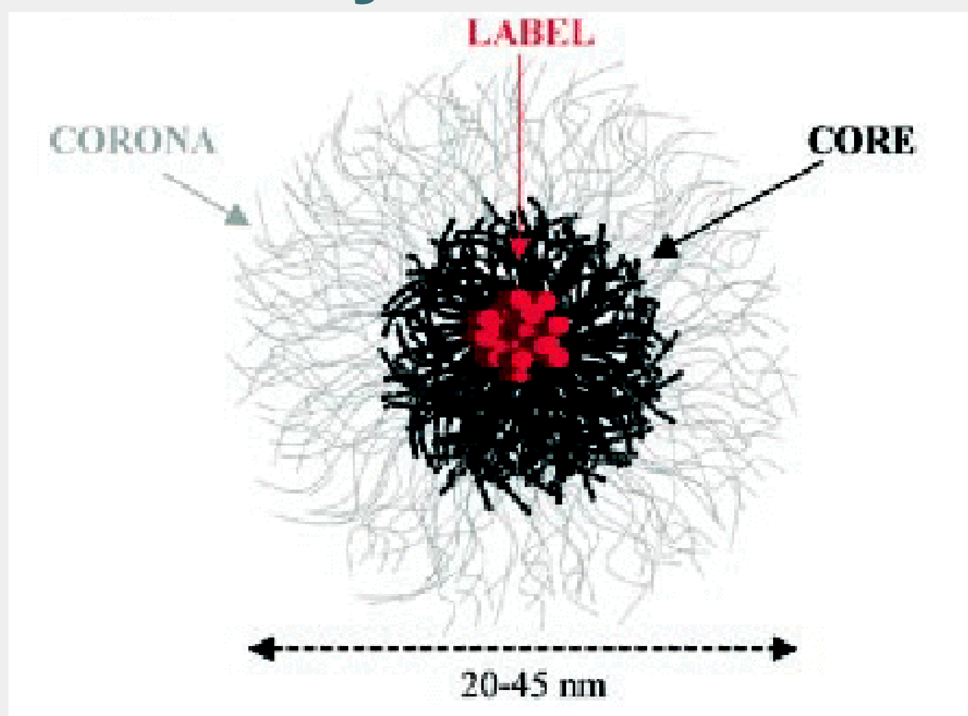
- Nanocontainers for Drug Delivery



Electronics times

IBM says nanotube transistor beats silicon

By R. Colin Johnson, EE Times
May 20, 2002 (8:14 AM)
URL: http://www.electronicstimes.com/story/OEG20020520S0020

YORKTOWN HEIGHTS, N.Y. — The next generation of semiconductors will be carbon-based if researchers at IBM's T.J. Watson Research Center here have their way. IBM revealed details Monday (May 20) about what it is calling "the world's best transistor," based on a single carbon nanotube measuring 1.4-nanometers in diameter. Fabricated with conventional MOSFET processing technology, IBM characterized both n-type and p-type FETs using carbon nanotubes as the channel. "It will be several years before CNFETs [carbon nanotube field-effect transistors] are ready for commercialization, but these results indicate that they will outperform even the most advanced silicon transistor designs," said Phaedon Avouris, manager of nanoscale science at IBM Research.

Avouris previously described plans for top-gate CNFETs last October at the Nanotube Symposium in Tsukuba, Japan. Monday's announcement reveals details about its implementation of top-gate CNFET prototypes from a paper Avouris published in Applied Physics Letters (APL). He collaborated on that paper with researchers Shalom Wind, Joerg Appenzeller, Richard Martel and Vincent Derycke at IBM's T.J. Watson Research Center here.

Avouris said that IBM had eliminated its previous use of a bottom gate that forced all CNFETs on a chip to switch simultaneously. Its current CNFETs instead utilize a conventional top-gate electrode above the conduction channel so that each transistor can be switched independently. Avouris also revealed that its gate dielectric had been slimmed down from 150 nm on the older bottom-gate design, to 15 nm on the newer top-gate. The thickness of a circuit's gate dielectric is inversely proportional to its switching speed.

Squeezing light from nanotubes

By Michael Kanellos
CNET News.com
May 1, 2003, 11:00 AM PT
URL: http://zdnet.com.com/2100-1103-999271.html

Researchers at IBM and the University of Toronto are squeezing light out of molecules.

THE BIG PICTURE
Read more about nanotech

Scientists at IBM Research have discovered a new way to get carbon nanotubes to emit light, a breakthrough that might one day lead to advances in fiber-optic technology.

At the University of Toronto, meanwhile, researchers have managed to produce light by injecting electrons into a polymer embedded with "quantum dots," microscopic crystals made of lead sulfide. Polymers--chemicals made of large molecules in repeated structural units--are being used in research into processor, display and other technologies.

Carbon nanotubes--long, thin strands of specialized carbon molecules--and, to a lesser degree, nanocrystals have become scientific celebrities in recent years because of their unusual electrical, thermal and mechanical properties. Both have emerged as candidates to replace silicon and metal in chip manufacturing a decade or two down the road. In the more immediate future, nanotubes could be employed to create corrosion-resistant paint or to improve fuel cells or batteries.

The research from the two institutions essentially points the way toward another potential application: generating light.

Generating light is not easy or cheap. Current optical equipment does the job, but optical components are difficult to manufacture and as a result expensive. By contrast, semiconductors can be mass-produced cheaply. Unfortunately, researchers have tried, and failed, to get silicon to generate light effectively.

SCIENCE & TECHNOLOGY

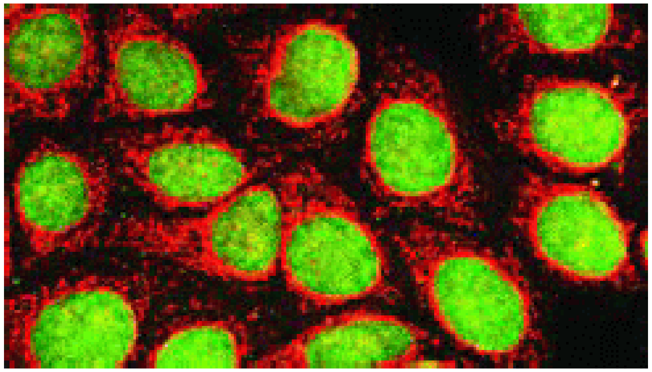
April 28, 2003
Volume 81, Number 17
CENEAR 81 17 pp. 30-33
ISSN 0009-2347

FROM THE ACS MEETING

NANOMATERIALS: SAFE OR UNSAFE?

Early results suggest that some nanoparticles, such as carbon nanotubes, may pose health risks

RON DAGANI, C&EN WASHINGTON



LITTLE ROCKS **Quantum dots are useful for imaging different parts of cells at the same time. Here, red- and green-emitting quantum dots highlight the mitochondria and nuclei, respectively, of human epithelial cells in culture. Although these colorful nanocrystals don't seem to harm the cells, could they pose unforeseen hazards to people or the environment?**

Vicki L. Colvin calls it "the wow-to-yuck trajectory": A new technology is heralded for its amazing benefits, but over time, its dark side emerges in the form of unintended negative effects on the environment or human health.

Colvin, an associate professor of chemistry at Rice University in Houston, cites a classic example: Halocarbon refrigerants were key to the spread of air-conditioning throughout the U.S., making sweltering parts of the country more comfortable. Wow. But their unanticipated consequence was the ozone hole. Yuck.

Now, with nanotechnology grabbing the public's attention and gearing up to be a major force in industry, Colvin hopes that it can avoid getting mired in the yuck. "The wow-to-yuck trajectory seems like it's embedded in the American fabric," she told attendees of the Nanotechnology & the Environment symposium at the recent American Chemical Society national meeting in New Orleans. "But I

Grid Computing

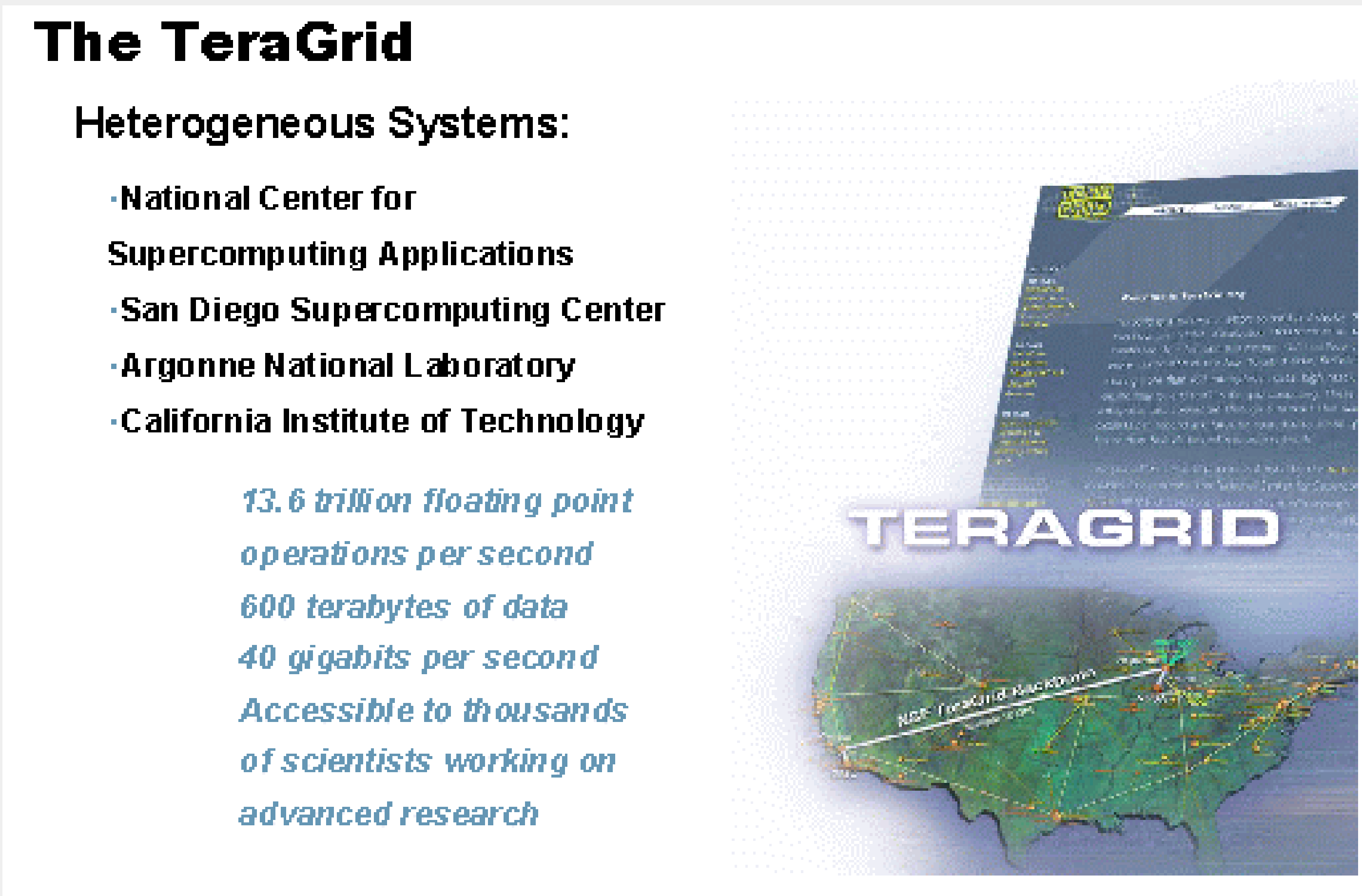
- Definition:
  - < The method of applying resources from many computers in a network, at the same time, to a single problem, usually a problem that requires a large number of processing cycles or access to large amounts of data
- Grid computing enables devices, regardless of their operating characteristics, to be virtually shared, managed and accessed across an enterprise, industry or workgroup
- Grid computing differs from the Web in that it enables collaboration of multiple resources toward a common goal, whereas the Web primarily enables communication

The Next Logical Step

- Grids will one day become the backbone of a worldwide infrastructure for communication, research education and commerce
- The Internet itself will become the computing platform
  - Instead of resources being located on files in your PC they will be distributed at sites (or grid nodes) all over the world
- In 10 years the question “Why be on the grid?” will be the same as now asking “Why be on the Internet?”

TeraGrid

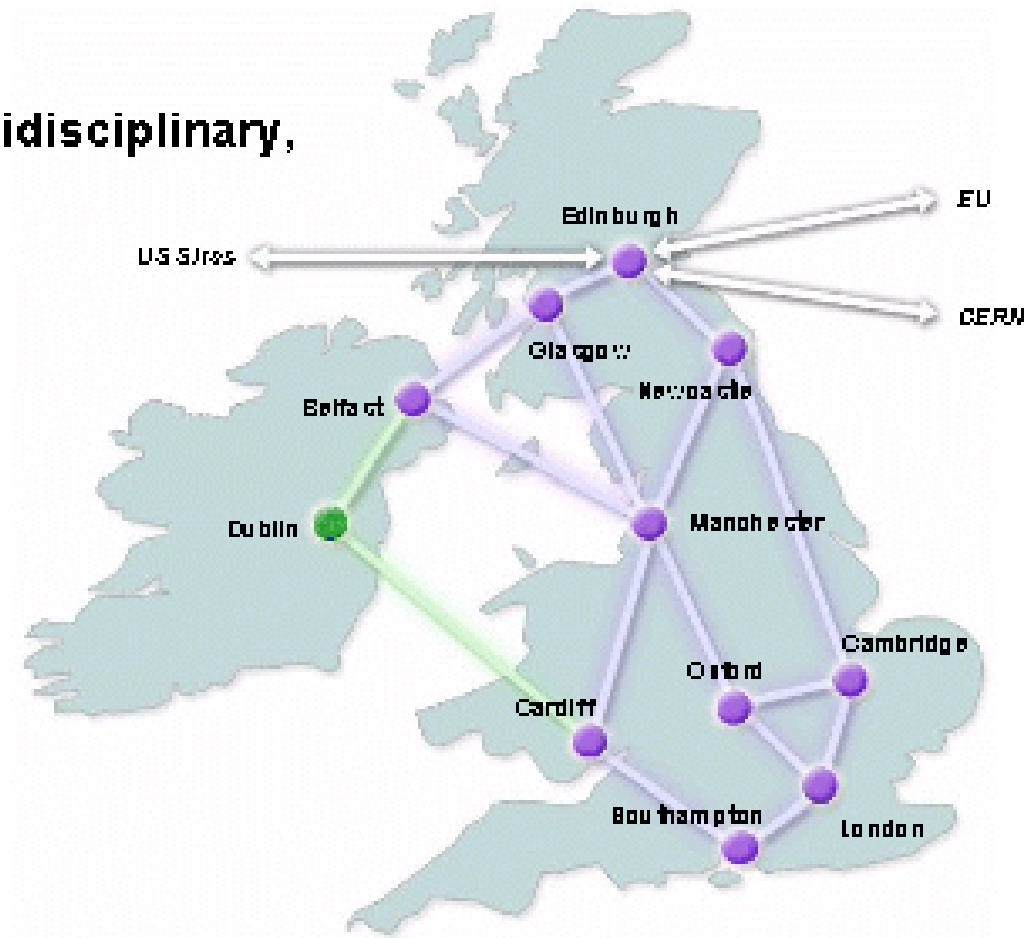
- 20+ teraflops of computing power
- 900+ terabytes of data storage
- Accessible to thousands of university researchers



United Kingdom (UK) Research Grid

UK Research Grid

- Collaborative, multidisciplinary, scientific research
- Test bed for utility computing
- Future commercial applications

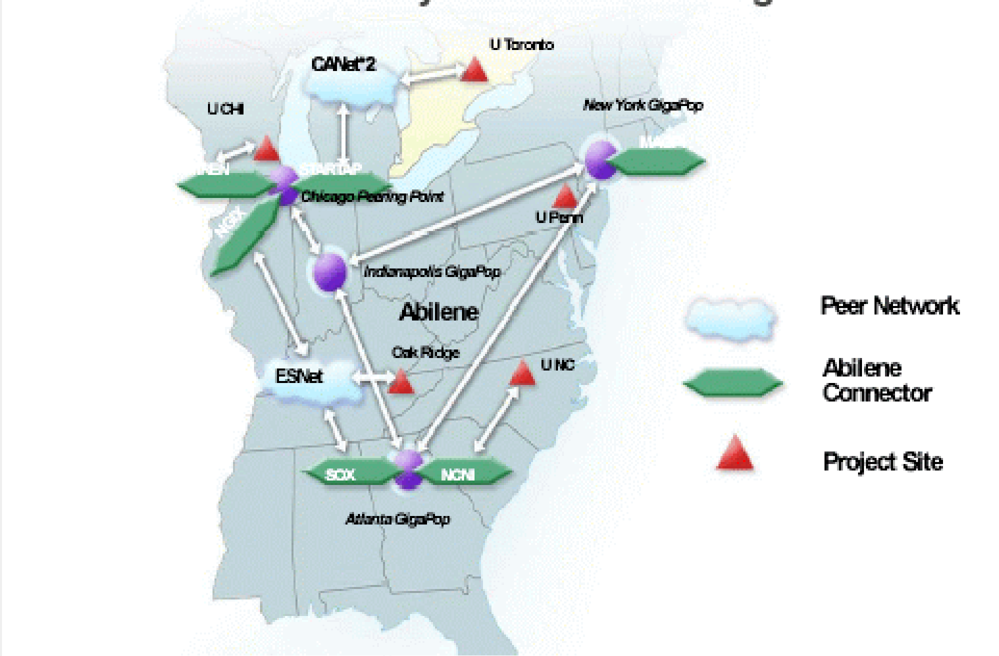


National Digital Mammographic Archive

- University of Pennsylvania
  - Archive, storage and retrieval of digital images of mammographies for clinicians
  - Training and teaching for radiology departments
  - Computer assisted diagnostics
- Recent FDA approval recognized advantages of digital devices and will encourage digital radiology conversion
  - 2000 Hospitals x 7 TB per yr x 2 = 28 PB per yr

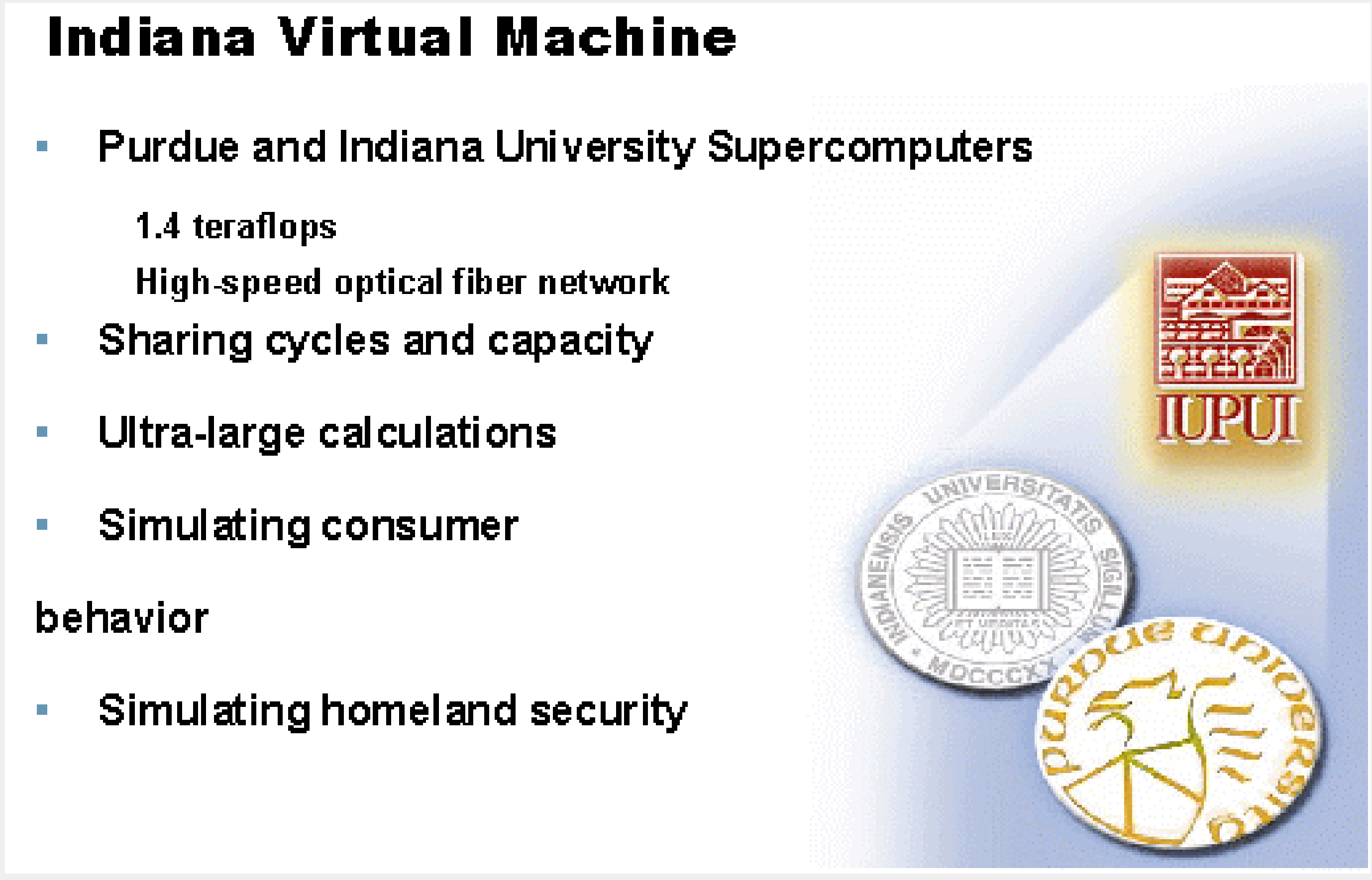
Analytical Grid: National Digital Mammographic Archive

An Archive and Data Utility for Medical and Diagnostic Content

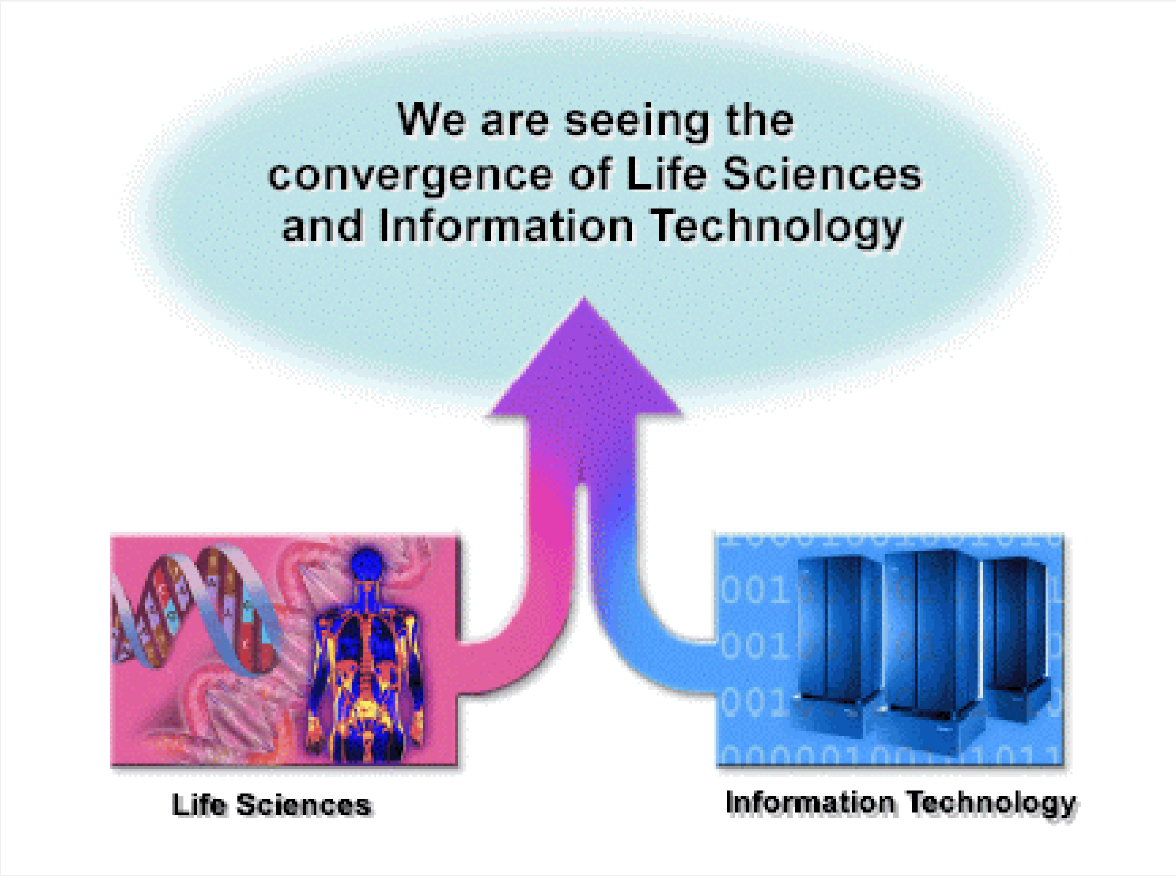


Indiana Virtual Machine

- Purdue and Indiana University Supercomputers
- 1.4 teraflops
- Ultra-large calculations
- Simulating homeland security



Significance of Grid Computing



DARPA

- **The Defense Advanced Research Projects Agency (DARPA) is the central research and development organization for the Department of Defense (DoD)**
- **It manages and directs selected basic and applied research and development projects for DoD, and pursues research and technology where risk and payoff are both very high and where success may provide dramatic advances for traditional military roles and missions**
- **It offices include those that deal with:**
  - **Advanced Technology**
  - **Defense Sciences**
  - **Information Awareness**
  - **Microsystems Technology**

The DARPA Grand Challenge

The DARPA Grand Challenge

- The goal is to build an autonomous robotic ground vehicle capable of negotiating 300 miles of rugged terrain (including roads, deserts, gullies and waterways) between Los Angeles and Las Vegas in a maximum of 10 hours
- No human intervention will be permitted
- Vehicles must demonstrate intelligent autonomous behavior
- Participants learn of the route only two hours before the race begins
- $1,000,000 prize

Après XP

Longhorn

- Longhorn is the next major Windows release from Microsoft and the successor to Windows XP
- It will include:
  - < Windows Longhorn
  - < Windows Server Longhorn
  - < Microsoft Office Longhorn
  - < Microsoft Visual Studio Longhorn, etc.


Platform Innovation & Quality
Microsoft
WinHEC
Recycle Bin
Help
longh
For Help, click Help Top
start
Untitled - Notepad
Untitled - Notepad
Untitled - Notepad
Calculator
Pioneer

Lots More, But Out of Time

- Robotics
- Autonomic Computing
- Pervasive Computing
- Haptics
- Biometrics
- Smart Dust
- Foveon Cameras
- Office of the Future......

Except for a few more quotes

- "Time's fun when you're having flies,"
  - < **Kermit the Frog**
- "You may delay, but time will not."
  - < **Benjamin Franklin**
- "It's good to shut up sometimes."
  - < **Marcel Marceau**