

Information Technology and National Security

Gary W. Strong
National Science Foundation

NSF has a broad, cross-cutting research agenda that includes national security.

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Information Technology Research

Software & Hardware Systems

Augmenting Individuals & Transforming Society

Scientific Frontiers & Information Technology

Program Announcement NSF 01-149 FY 2002

FY 2001 Awards

FY 2000 Awards

News & Media

Participating NSF Directorates & Programs

FAQs

ITR: Division and Program Selection

NSF Interest in ITR Projects Related to National Security

STIMULATE: Speech, Text, Image, and Multimedia Advanced Technology Effort

Program Solicitation

A JOINT INITIATIVE OF:

NSF NATIONAL SCIENCE FOUNDATION
COMPUTER AND INFORMATION SCIENCE AND ENGINEERING DIRECTORATE

NSA NATIONAL SECURITY AGENCY
OFFICE OF RESEARCH AND SIGHT TECHNOLOGY

OIRA OFFICE OF RESEARCH AND DEVELOPMENT
CENTRAL INTELLIGENCE AGENCY

DARPA DEFENSE ADVANCED RESEARCH PROJECTS AGENCY
INFORMATION TECHNOLOGY OFFICE

DEADLINE: SEPTEMBER 1, 1996

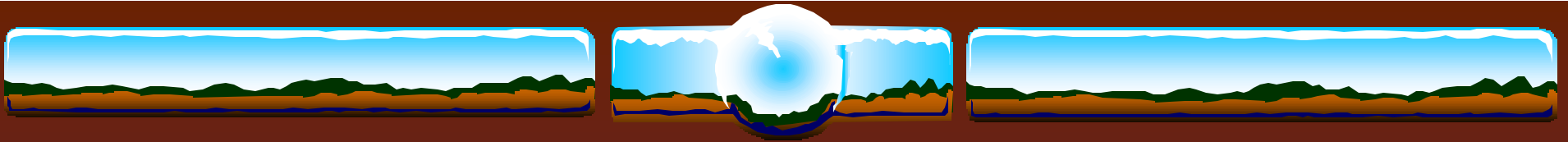
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The National Science Foundation
4201 Wilson Boulevard

last modified 11/01/2001

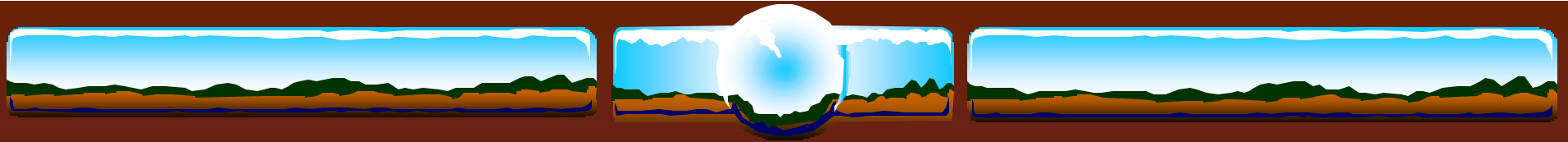
NSF's mission, set out in the NSF Act of 1950 (Public Law 810507) is:

To promote the progress of sciences; to advance the National health, prosperity, and welfare; to secure the National defense; and for other purposes.



Interagency Cooperation on National Security Research

- Culture of academia changed on Sept. 11th
 - Researchers want to help
 - Need to know what the problems are
 - Workshops meet part of this need
- NSF is engaged
 - There is a large base of peer-reviewed grantees
 - A workshop-based process has been invented
 - It was used once in KDD and will be used in other domains
 - Funded projects are already relevant
 - Determine who gets to participate
 - Challenges of relevance have been met by simple searches over NSF award database



The Big Challenge: Data Sharing/Data Mining

- Relevant datasets are needed to drive research
 - Credit card fraud, telecommunications fraud, insurance fraud, and identity theft are good domain examples
 - Those data contain protected personal information and are private assets to companies
- Artificial, simulated data is being proposed
 - Artificial data can be created in huge amounts (billions of transactions)
 - Scrubbing data is very expensive
 - Isn't "dirty" enough
- Data need to be coupled with evaluation, as in DARPA human language technology programs

COUNCIL ON FOREIGN RELATIONS



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Videos of past meetings on
America's Response to Terrorism

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Paper

Red-Teaming the Data Gap

By [Jan M. Lodal](#) , [James J. Shinn](#)

A product of the Independent Task Force [Independent Task Force on America's Response to Terrorism](#) (October 1, 2001 - April 1, 2002) ; directed by [Charles G. Boyd](#) ; chaired by [Carla A. Hills](#) , [Richard C. Holbrooke](#) .

Executive Summary

This paper outlines the information technology requirements of an effective Homeland Defense strategy against further al Qaeda terror strikes within the United States. It highlights the wide gap between these defensive information technology (IT) requirements and the current fragmented, "stove-piped", IT capabilities of the Federal agencies involved. The failure of these agencies to share information with each other or to tap into widely available civilian databases leaves the U.S. public dangerously exposed to the next wave of terror incidents.

The Homeland Security IT failure and the dangers it poses to Americans at large can be patched quickly and at very little cost. The paper describes how commercially available techniques from the private sector, including database merge-and-search methods now used in many Internet applications, can be deployed quickly and cheaply to plug the counter-terror IT gap, using a fast-turn "Red Team" approach. This is not rocket-science programming: these database sharing and data-mining technologies have been widely deployed by credit agencies and retailers, among others.

Policy Experts

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TERRORISM RESOURCE CENTER

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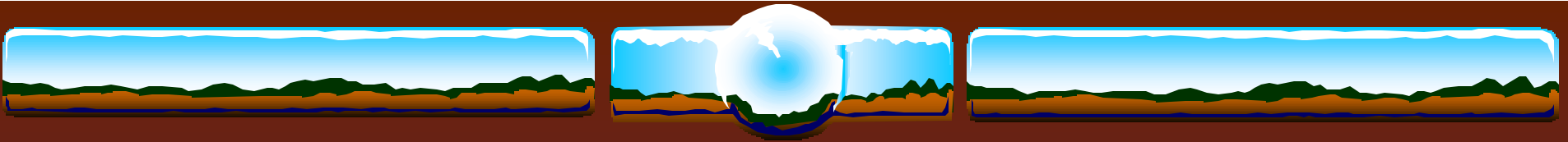
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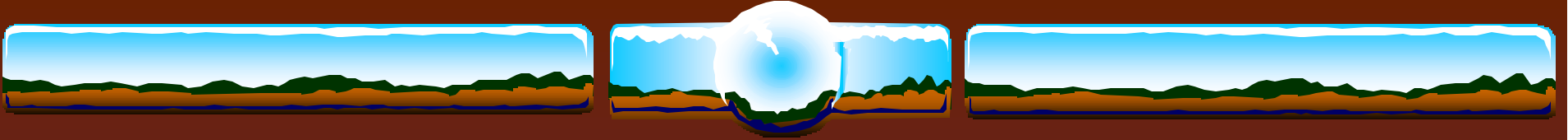
Pattern base concept

- ❖ The man-made fog of deliberate deception militates against pattern learning from data
 - ❖ Alternative strategy is to “think the unthinkable”.
 - ❖ Terrorists act like Darwinian species, seeking unexploited niches.
 - ❖ Need skill for breaking out of tacit knowledge
 - ❖ Similar to those of cultural anthropology, where World-views are not a given.
 - ❖ People can be trained to be skeptics, open to understanding other World-views.
 - ❖ Need baseline databases, such as for diseases, “normal behavior”, etc.
- ❖ Need a pattern base
 - ❖ A new effort at both vulnerabilities estimation
 - ❖ Also pre-emptive strategies for countering them.
 - ❖ The patterns developed by analysts need to include those that will change a client’s mind.
 - ❖ There is a significant patternbase management problem.
- ❖ There are patterns that can be discovered only if one takes time into account
 - ❖ Could be missed if information across collections is not integrated.
 - ❖ An example of such a type of pattern is cause-effect detection, when the channel is not yet discovered or still opaque.
 - ❖ NIMA and NSF are planning a workshop on time representation and research – please get in touch if you are interested.
- ❖ West Nile Virus example suggests real pattern crosses stovepipes, for example, human and animal diseases.
 - ❖ It took months for these two lines to discover each other and resolve the true nature of the zoonosis.
 - ❖ Issues such as agro-terrorism, or infrastructure attacks may be even more complicated.



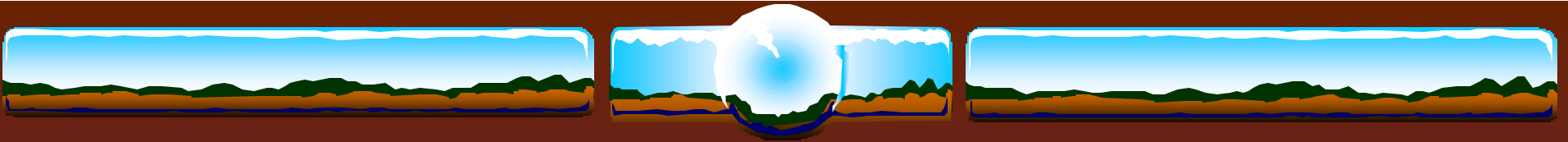
Data forensics

- ❖ Need to find out how to frame questions, or create search patterns, that would help an analyst.
 - ❖ If the right questions aren't posed, the analyst may head down a path with no conclusions.
 - ❖ Information literacy
 - ❖ assumes a knowledge of the kinds of queries one can pose on existing data
 - ❖ and how to decompose needs into such queries.
 - ❖ Spanning set of questions (sample that covers the set of all types) at different stages in analysis?
 - ❖ Could help focus the analyst as well as help the system identify where the analyst is going?
 - ❖ These could be derived from a meta-analysis study.



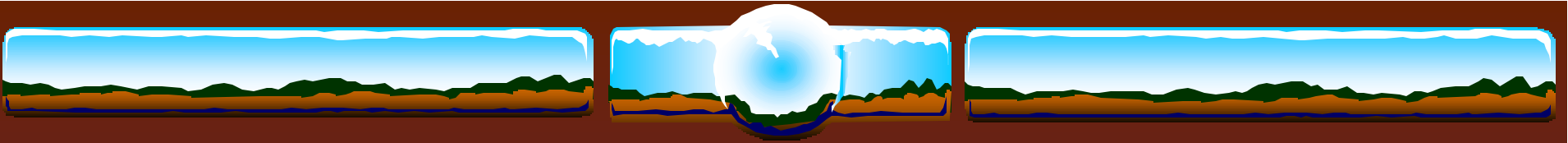
Real data, real problems driver suggests new infrastructure

- ❖ Data needs
 - ❖ Extremely large size of one or more sets
 - ❖ Stream data
 - ❖ Unstructured data
 - ❖ Related, heterogeneous data sets
 - ❖ Multimodal data
 - ❖ “Dirty” data
 - ❖ Open to research community
 - ❖ Homogeneous in many characteristics to classified data/problems
- ❖ Closer relationship between users and researchers
 - ❖ Better understanding of the problem
 - ❖ Possible faculty center on database, information retrieval intersection



Other Research Domains in Planning Stage

- Pattern Recognition/Characterization of People, Places and Things
- Spatio-Temporal Information Systems
- Biological Warfare Defense
- Sense-making/Augmented Cognition
- Signal Processing
- Global Change Detection
- Measurements and Signatures Intelligence
- Computational Social Systems
- Management of Knowledge-Intensive Organizations



Summary

- Agencies of Federal Government that didn't talk much are collaborating once again at a very deep level
- The Nation's best science is being called up to serve and wants to serve
- There are new processes being invented for addressing the needs
- The solutions are likely to be a combination of technology and policy