NIST Information Security and Privacy Advisory Board

April 8, 2010

Chris Greer

Assistant Director for Information Technology R&D

White House Office of Science & Technology Policy

"Science is more essential for our prosperity, our security, our health, our environment, and our quality of life than it has ever been before."

President Obama, National Academy of Sciences, April 27, 2009

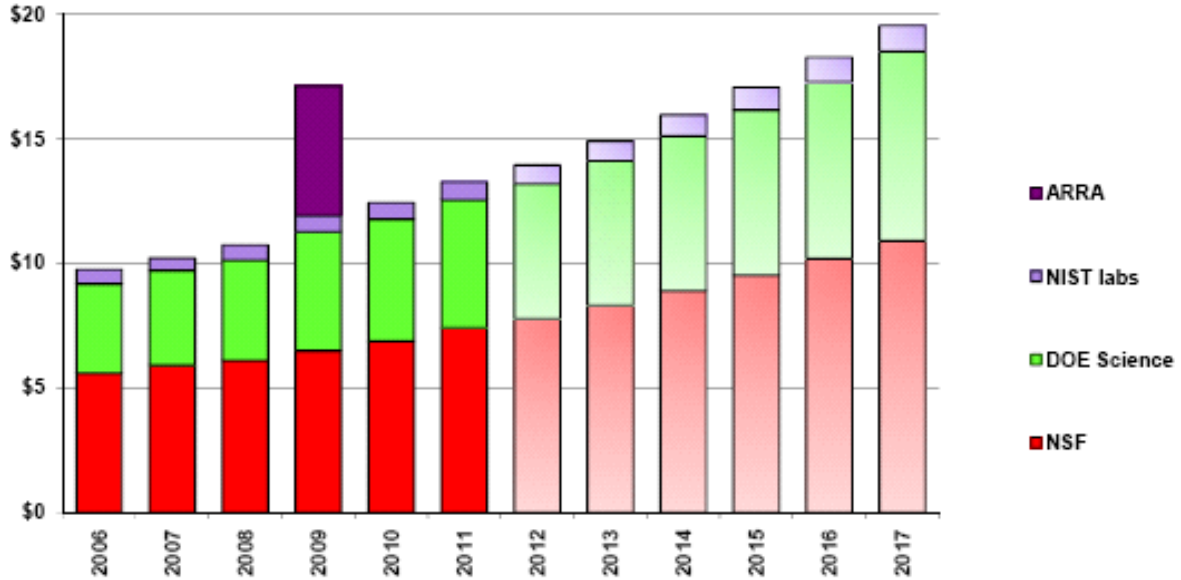
Office of Science and Technology Policy

Director: John Holdren

- Assistant to the President for Science and Technology
- Director, White House Office of Science and Technology Policy
- Co-Chair, President's Council of Advisors on Science and Technology (PCAST)

President's Plan for Science and Innovation, FY 2006-2017

(budget authority in billions of current dollars)



2006-2010 figures are enacted budget authority; 2012-2017 figures are projections in the 2011budget.
FEBRUARY '10 OSTP

"History should be our guide. The United States led the world's economies in the 20th century because we led the world in innovation. Today, the competition is keener; the challenge is tougher; and that is why innovation is more important than ever."

-President Obama, August 5, 2009

Aneesh Chopra
U.S. Chief Technology Officer

I am focused on harnessing the power and potential of technology and innovation to execute on the President's vision for a 21st Century economy – one where jobs are more plentiful, American firms more competitive, communications more affordable, broadband more abundant, families more connected, and Americans more safe and secure.

President's Strategy for American Innovation

Innovation for Sustainable Growth and Quality Jobs

Catalyze Breakthroughs for National Priorities

- Unleash a clean energy revolution
- Support advanced vehicle technology
- Drive breakthroughs in health IT
- Address the "grand challenges" of the 21st century

Spur Productive Entrepreneurship and Promote Efficiency

- Promote American exports
- Support open capital markets that allocate resources to the most promising ideas
- Encourage high-growth and innovation-based entrepreneurship
- Improve public sector innovation and support community innovation

Invest in the Building Blocks of American Innovation

- Restore American leadership in fundamental research
- Educate the next generation with 21st century knowledge and skills while creating a world-class workforce
- Build a leading physical infrastructure
- Develop an advanced information technology ecosystem

Source: www.whitehouse.gov

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America's economic prosperity in the 21st century will depend on cybersecurity

- President Obama, May 2009

Innovation Component:

Develop an advanced information technology ecosystem

- Support research for next-generation information and communications technologies

- Ensure cyberspace is sufficiently resilient and trustworthy to support U.S. goals of economic growth, civil liberties, privacy protections, national security, and the continued advancement of democratic institutions

Comprehensive National Cybersecurity Initiative

- January 2008
- National Security Presidential Directive 54
- Homeland Security Presidential Directive 23

Initiative #4: Coordinate and redirect research and development efforts

Initiative #9: Define and develop enduring leap-ahead technology, strategies, and programs

President's Cyberspace Policy Review

May 2009

Themes:

- Lead from the top
- Build capacity for a digital nation
- Share responsibility for cybersecurity
- Create effective information sharing and incident response
- Encourage Innovation

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Encourage Innovation

Provide a framework for research and development strategies that focus on game-changing technologies that will help meet infrastructure objectives, building on the existing NITRD strategies …

National Cyber Leap Year

Phase 1: Request for Information (RFI)

- November 2008
- January 2009
- March 2009

Phase 2: National Cyber Leap Year Summit

- August 2009
- Themes:
  - Moving Target Defense
  - Hardware-Enabled Trust
  - Cyber Economics
  - Digital Provenance
  - Nature-Inspired Cyber Health

Moving Target Defense

Attacker currently has the advantage

Static systems

- Investments in reconnaisance and development pay off
- Ability to lie in wait
- Ability to conduct useful experiments

Homogenous targets

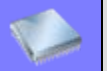
- One successful attack strategy works in many places
- Attacks can be easily coordinated

Seizing the Advantage

By establishing controlled movement across multiple system dimensions, shift the advantage to the defender by increasing the:

- degrees of uncertainty for the attacker;
- apparent complexity;
- apparent diversity across any set of targets;
- costs to an attacker in time and resources;
- range of defense strategies available to the defender; and
- resilience of the target through redundant paths, resources, and configurations

Moving Target Layers

Hierarchical Dimensions	Dimension Aspects
Moving Target Management	Interaction Between Layers, Movement patterns and schedules, Movement dimensions
Policies	Software and platform policies, Security configurations
Systems of Systems	Cloud Computing, Data chunking and encryption
Networks 	Networking Devices, Networking Protocols, Virtual Networks
Systems 	Diversity in OS, Instruction sets, cache and port configuration
Software 	Software versioning, Just-in-time compilers
Hardware 	Chip Sets, Physical Memory, I/O Devices

Moving Target Research Challenges

Hierarchical Dimensions

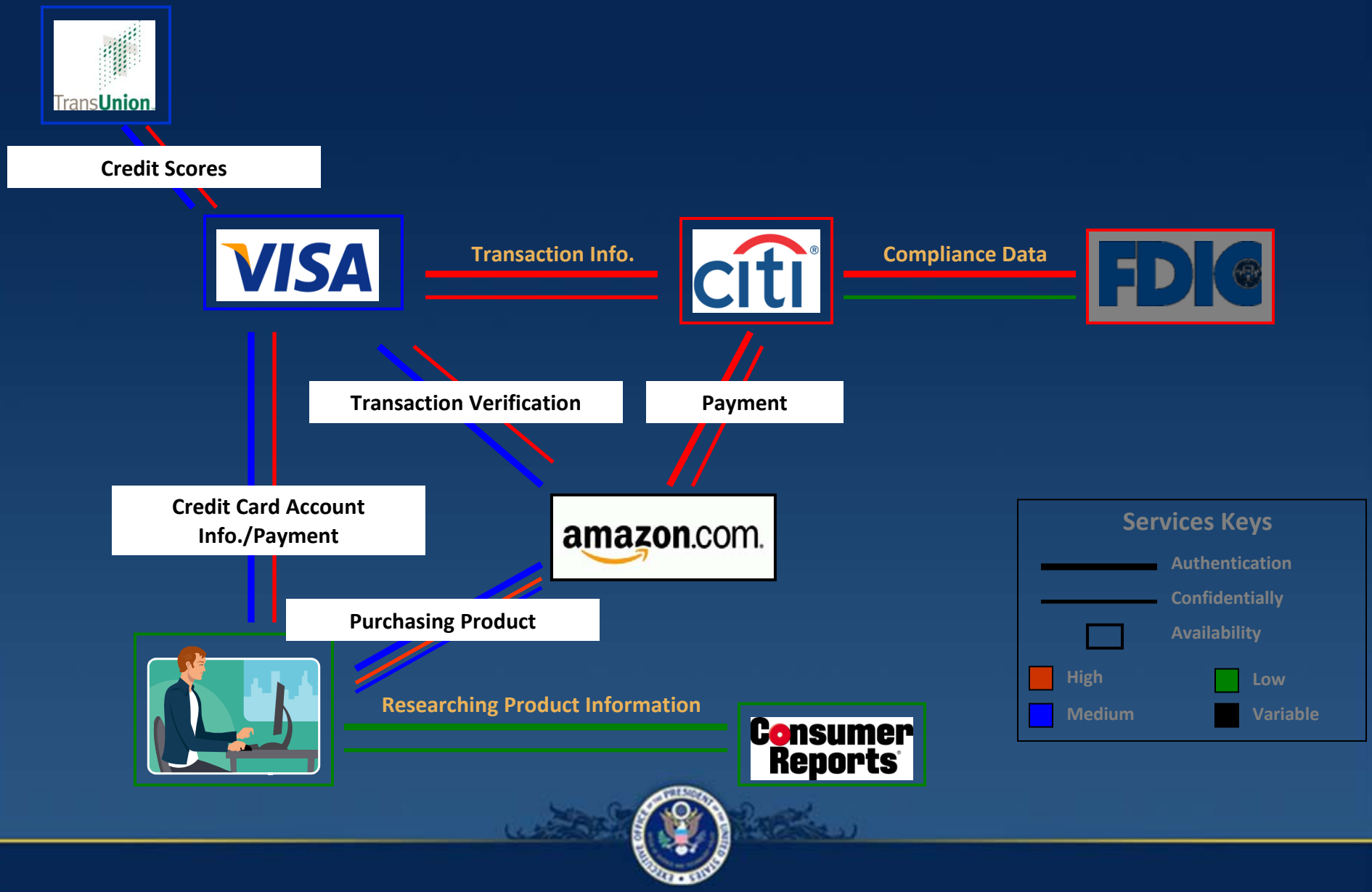
Moving Target Management
Policies
Systems of Systems
Interaction of Systems 
Systems 
Software 
Hardware 

Research Questions:

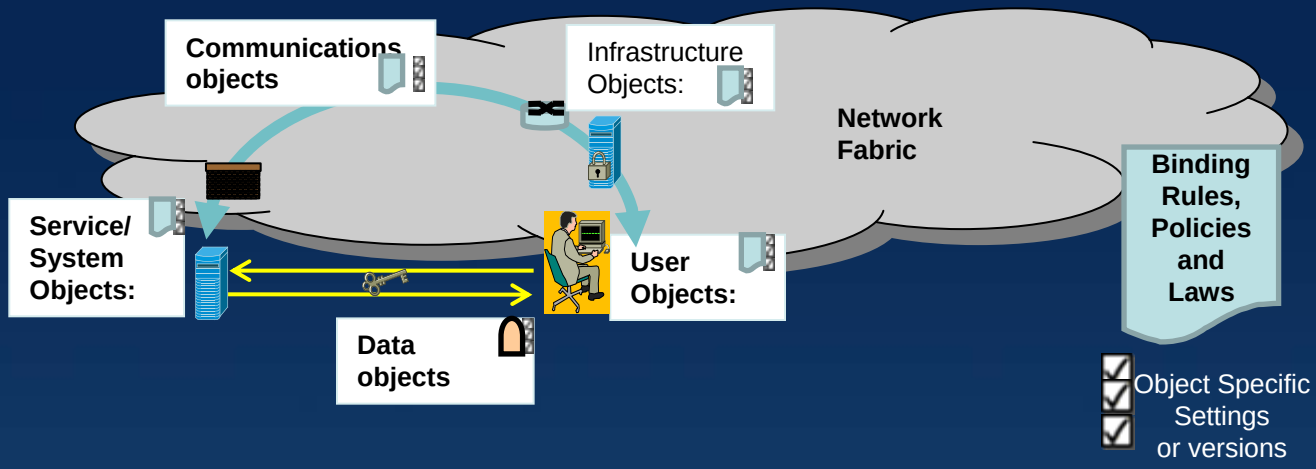
- What movement strategies will create systems that are internally manageable, transparent to the user, and chaotic to the attacker
- What are the relationships between layers?
- How does altering one layer affect the performance of another layer?
- How do we alter the interactions between the layers?
- How do we seal layers from one another?

Tailored Trustworthy Spaces

EXAMPLE: Notional Sub-spaces in Cyberspace



Framework



A Tailored Space is :

- A group of physical and logical objects that exist within the larger cyber space.
- The required working settings or status of all applicable characteristics of each object.
- The allowed interactions, rules, procedures and applicable legal framework for the participating objects .

Tailored Trustworthy Spaces

Examples of Research Challenges:

- Dynamically identify all objects within a tailored space, determine current status, and calculate security
- Dynamically adjust and enforce rules, policies, and processes to modulate security
- Prevent leakage between spaces

Cyber Economic Incentives

Cybersecurity incentives are currently misaligned:

Cyber crime pays while incentives for good cybersecurity by organizations and individuals are missing.

Cyber Economic Incentives

- Framework of cyber economics theory to support informed planning and implementation (including policy and regulation)
- Cyber insurance as a market force to:
  - promote good security practices,
  - encourage the development of enforcement/penalty frameworks for bad actors,
  - establish frameworks for cyber-incident recovery
  - promote data sharing
- Implementation projects that demonstrate value and establish feasibility for adoption of cyber security innovations

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