

**High Confidence
Transportation Cyber-Physical Systems:
Automotive, Aviation, and Rail**

November 20, 2008

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Director, US National Coordination Office
Networking and Information Technology Research and Development Program

Acronyms:

NITRD

Networking and Information Technology Research and
Development Program

NCO

National Coordination Office

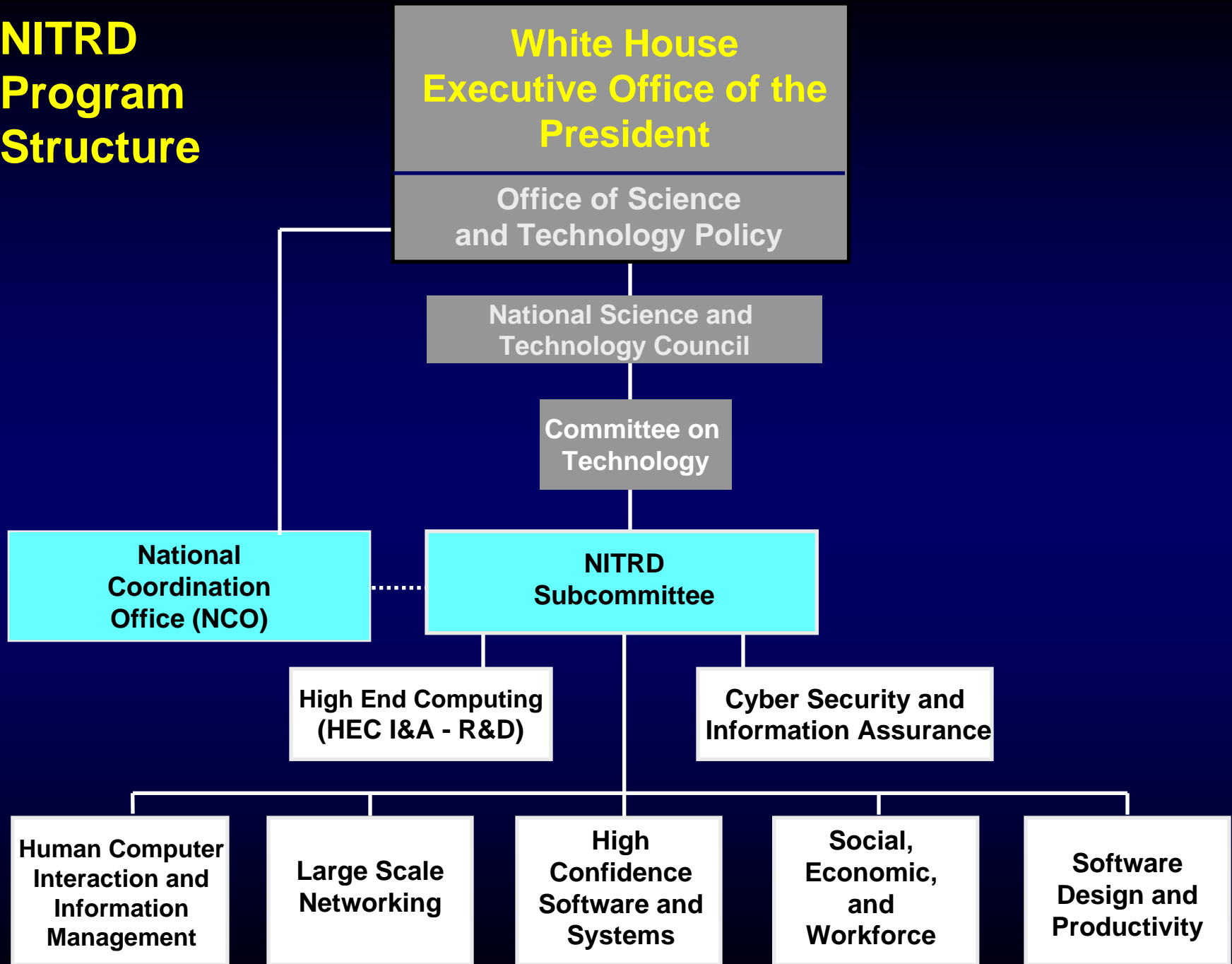
HCSS

High Confidence Software and Systems
Coordinating Group

NITRD Program Legislation

- The High-Performance Computing Act of 1991 (Public Law 102-194), as amended by the
- Next Generation Internet Research Act of 1998 (P.L. 105-305), and the
- America COMPETES Act of 2007 (P.L 110-69)

NITRD Program Structure





AHRQ Agency for Healthcare Research and Quality



DARPA Defense Advanced Research Projects Agency



DOE/NNSA Department of Energy - National Nuclear Security Agency



DOE/SC Department of Energy - Mathematical, Information, and Computational Science Division



EPA Environmental Protection Agency



NARA National Archives and Records Administration



NASA National Aeronautics and Space Administration



NIH National Institutes of Health



NIST National Institute of Standards and Technology



NOAA National Oceanic and Atmospheric Administration



NSA National Security Agency



NSF National Science Foundation



OSD and DoD Service research organizations

FY 2009 Supplement to the President's Budget for the NITRD Program



FY 2009



NETWORKING AND INFORMATION TECHNOLOGY RESEARCH AND DEVELOPMENT

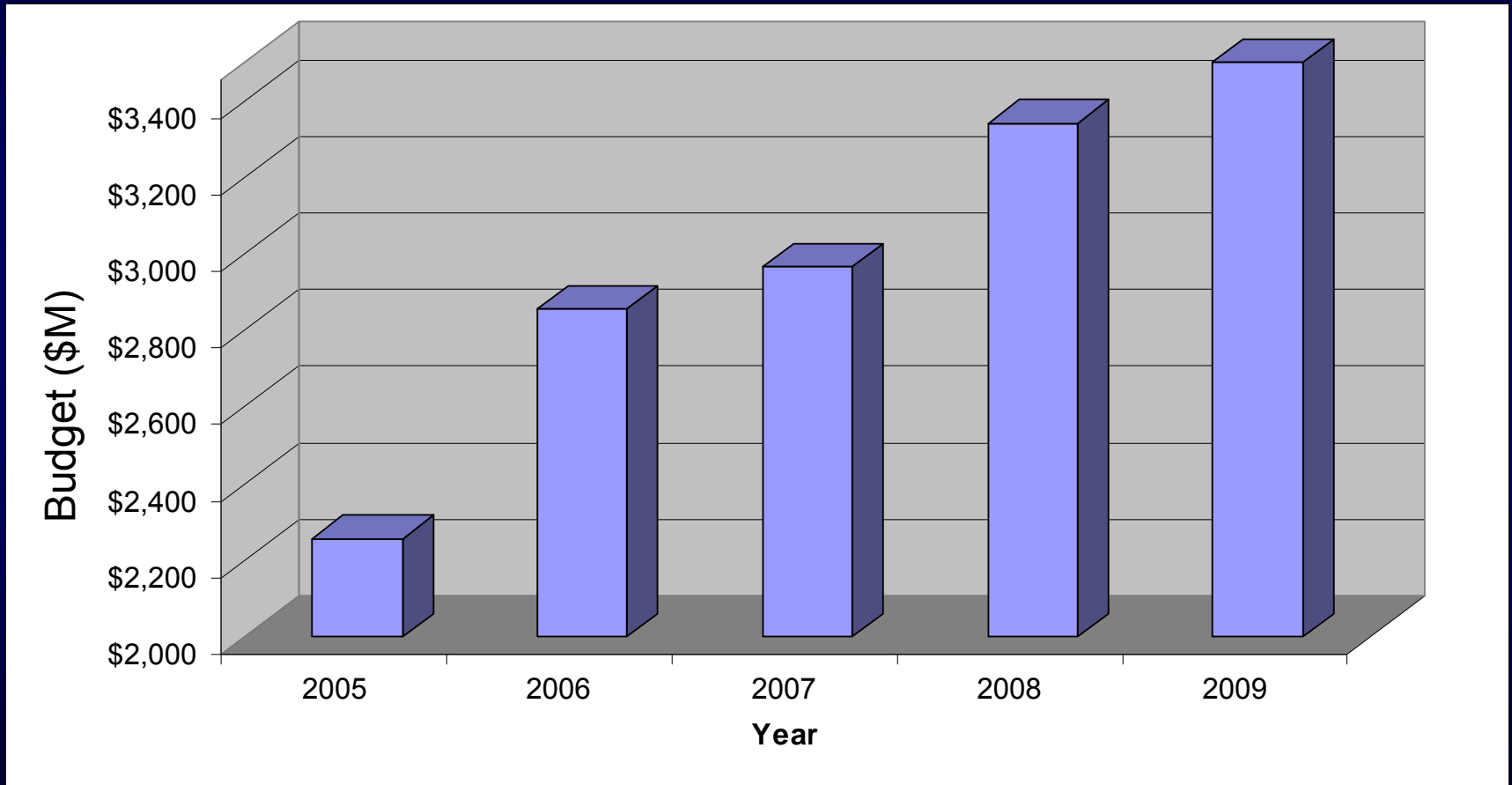
SUPPLEMENT TO THE PRESIDENT'S BUDGET

February 2008

Agency		High End Computing Infrastructure & Applications (HEC I&A)	High End Computing Research & Development (HEC R&D)	Cyber Security & Information Assurance (CSIA)	Human-Computer Interaction & Information Management (HCI &IM)	Large Scale Networking (LSN)	High Confidence Software & Systems (HCSS)	Social, Economic, & Workforce Implications of IT (SEW)	Software Design & Productivity (SDP)	Total ¹
NSF	2008 Estimate	257.4	78.6	68.1	234.8	82.6	56.6	98.6	54.8	931.5
	2009 Request	298.4	91.5	87.6	266.5	95.8	67.6	112.0	70.8	1,090.3
DARPA			92.0	124.4	205.3	109.0				530.7
			142.6	106.8	184.9	135.9				570.2
OSD and DoD Service research orgs. ²		247.6	18.1	38.6	109.6	136.1	25.6		6.7	582.3
		249.6	15.6	40.7	92.9	114.1	26.9		7.8	547.5
NIH		159.4	76.4	1.1	182.7	68.1	7.7	10.8	4.6	510.7
		159.4	76.3	1.1	181.7	68.0	7.7	10.8	4.6	509.6
DOE/SC/NE/FE ³		282.0	73.1			47.6		5.0		407.6
		334.6	73.1			52.2		5.0		465.0
NSA			93.5	15.5		2.9	25.2			137.1
			72.6	17.8		1.8	27.2			119.3
NASA		59.4		0.3	6.5	1.3	4.8			72.3
		60.1		0.2	5.5	0.7	4.3			70.7
		10.7	2.4	20.8	11.8	5.8	4.9		5.6	62.0
	10.7	2.4	25.8	11.8	5.8	4.9		5.6	67.0	
AHRQ					39.8	5.0				44.8
					39.8	5.0				44.8
DOE/NNSA		8.4	14.3					4.3		28.3
		8.2	15.7					4.7		29.5
NOAA		15.9	1.9		0.5	2.9			1.6	22.8
		18.0	1.9		0.5	2.9				23.3
EPA		3.3			3.0					6.3
		3.3			3.0					6.3
NARA					4.5					4.5
					4.5					4.5
TOTAL (2008 Estimate) ¹		1,044.1	450.4	268.7	798.5	462.4	124.8	118.7	73.3	3,341
TOTAL (2009 Request) ¹		1,142.4	491.8	279.8	791.2	483.0	138.5	132.6	88.7	3,548

\$3.5B

Annual NITRD Budget Estimate



NITRD Responsibilities

- Improved security for computing and networking systems in Federal and other realms.
- Long-term basic and applied research on high-performance computing, networking systems, and related software.
- Access by the U.S. research community to high-performance computing and networking systems.
- NIT capabilities to address Grand Challenges, increased software availability, productivity, capability, security, portability, and reliability; and mathematical modeling and algorithms for all fields of science and engineering.
- Education and training in software engineering, computer science, cyber security, applied mathematics, library and information science, and computational science.

NITRD Responsibilities

- Long-term basic and applied research in networking and information technologies

NITRD Responsibilities

- **NIT capabilities to:**
 - address grand challenges;
 - increase software availability, productivity, capability, security, portability, and reliability; and
 - mathematical modeling and algorithms for all fields of science and engineering.

NITRD Responsibilities

- Education and training in software engineering, computer science, cyber security, applied mathematics, library and information science, and computational science.

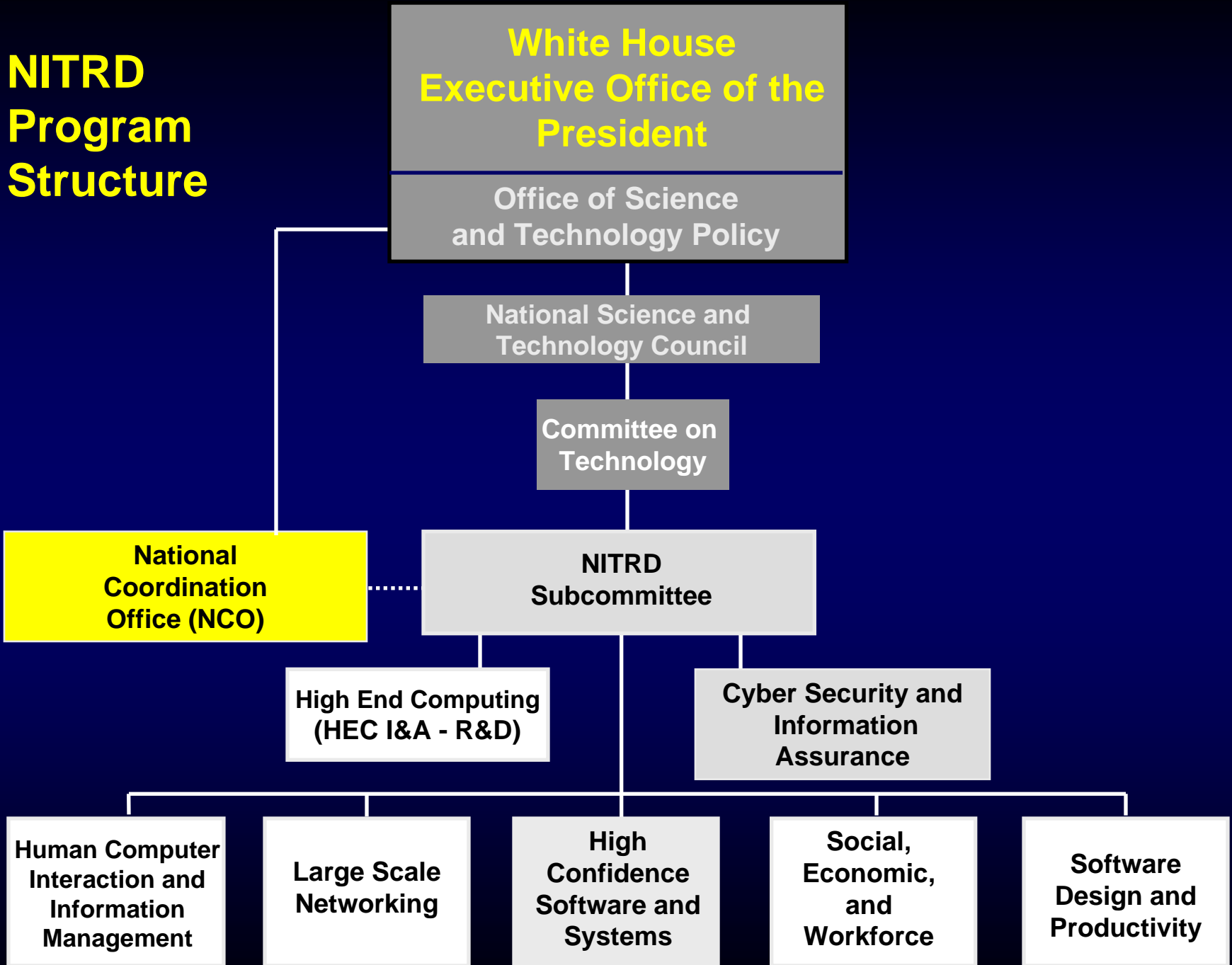
NITRD Strategic Planning

- ◆ HPC Act: Requires Director, OSTP to establish goals and priorities for Federal NIT R&D
- ◆ NITRD Charter: Prepare coordinated long-range plans for the Federal NITRD Program
- ◆ New Administration: 2009
- ◆ Previous Strategic Plan: 2002
- ◆ PCAST Assessment (August 2007): Develop, maintain, and implement a strategic plan for the NITRD Program

NITRD Strategic Planning Timeline



NITRD Program Structure



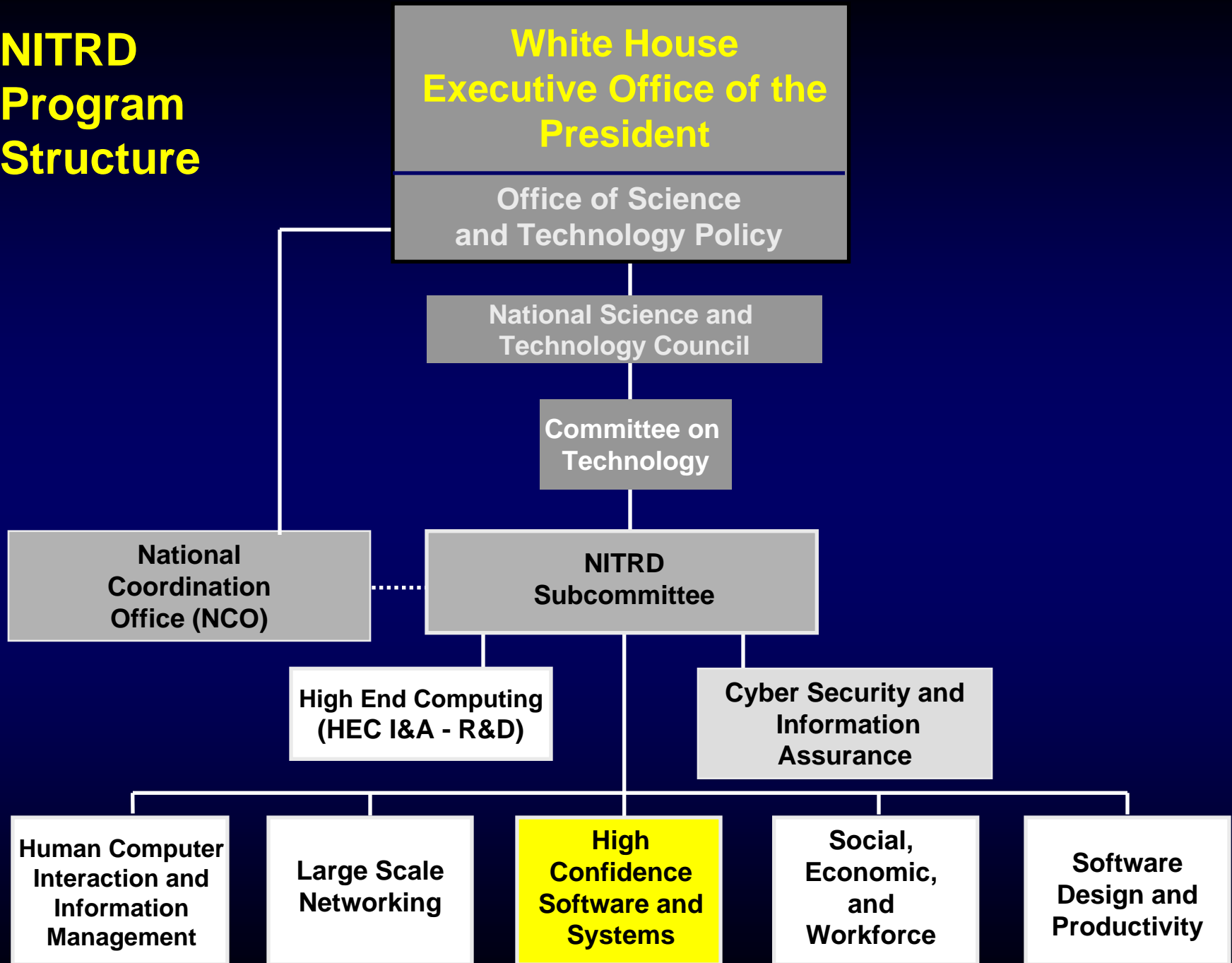
NCO Objectives

- To serve as the Federal focal point for interagency technical and budget planning, and coordination
- To support NITRD-related policy making in the White House Office of Science and Technology Policy (OSTP)
- To serve as a source of timely, high-quality, information on the NITRD Program
- To augment the impact of information technology R&D as a transforming force for societal and economic good

NCO Support for NITRD Coordination

- Technical support for workshops, meetings, studies, industrial interactions
- Production of major Federal reports
 - President's annual budget supplement
 - Research Needs Reports
 - Reports derived from HCSS national workshops
 - Special reports (e.g., NITRD Grand Challenges)
 - Federal Plans
 - PITAC and PCAST reports

NITRD Program Structure



NITRD Program Participating Agencies

- Department of State
- Department of Treasury
- DISA Defense Information Systems Agency
- DOE/OE Dept. Energy/Office Elec. Delivery & Energy Reliab.
- DOT Department of Transportation
- FAA Federal Aviation Administration
- FBI Federal Bureau of Investigation
- FDA Food and Drug Administration
- GSA General Services Administration
- TSWG Dept. Defense Technical Support Working Group
- USGS United States Geological Survey
- IARPA Intelligence Advanced Research Projects Activity

HCSS APPROACH to IT R&D (1)

- Foundational R&D applicable across multiple critical domains. Initial domains targeted:
 - Aviation Systems
 - Medical Devices
 - SCADA Systems
- Future domains
 - Automotive and Rail Systems
 - Future Energy Systems
 - Manufacturing

HCSS APPROACH to IT R&D (2)

- A multidisciplinary approach toward achieving high-confidence CPS, e.g.:
 - Computer and Information Sciences
 - Engineering
 - Biological, Environmental, and Physical Sciences and Mathematics

HCSS APPROACH to IT R&D (3)

- Draw from a wide range of expertise in other NITRD areas, including:
 - High End Computing:
 - Cybersecurity and Information Assurance
 - Human-Computer Interaction & Information Management
 - Large Scale Networking
 - Social, Economic, and Workforce Implications
 - Software Design and Productivity

Transportation CPS Workshop

- Identify NITRD challenges that underlie the dependability, reliability, safety, survivability, and trustworthiness of our Nation's critical infrastructures
 - Complex, dynamic systems theory
 - Interacting, aggregated systems
 - Human in the loop
 - Evidence based design
 - Certifiably dependable behavior
 - Quantitative dependability metrics

For questions or more information:

Visit www.nitrd.gov

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