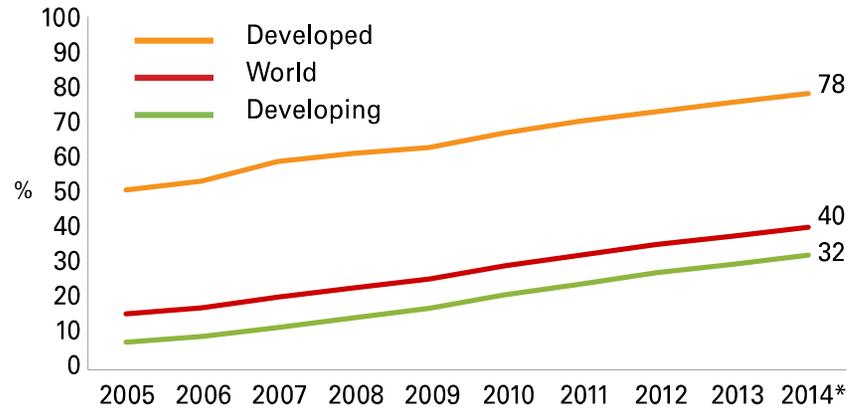




# The Impact of 70 Years of NIT Research and Development

## Nearly 80% of the Developed World is Online

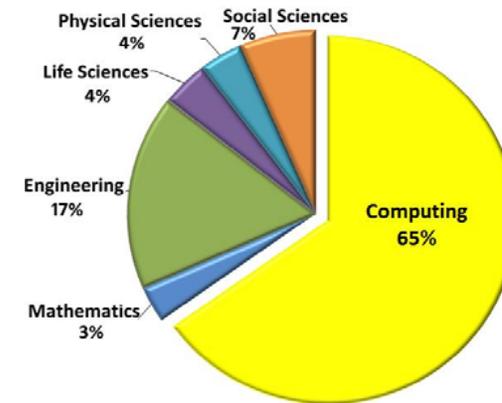


Note: \* Estimate

Source: ITU World Telecommunication/ICT Indicators database

## New Job Opportunities

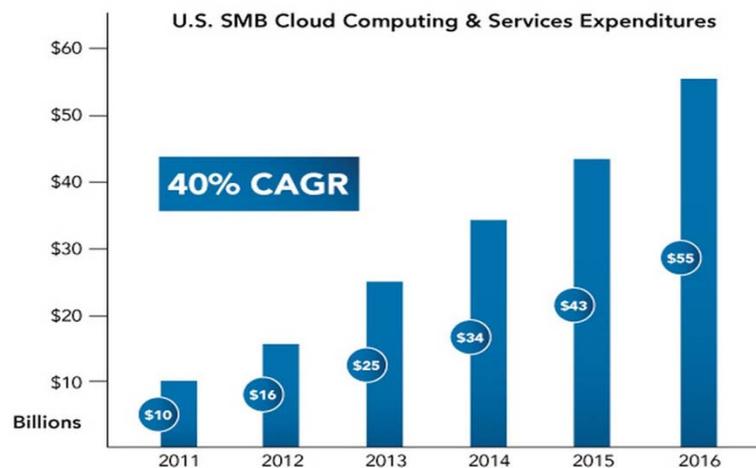
Projected Annual Growth of **NEWLY CREATED** STEM Job Openings 2012-2022



Source: Jobs data are calculated from the Bureau of Labor Statistics (BLS), Employment Projections 2012-2022, available at <http://www.bls.gov/emp/>. Courtesy of Association for Computing Machinery (acm.org).

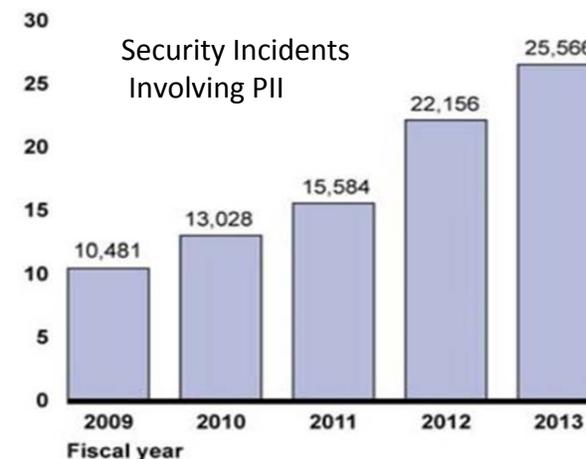
Computing Research Association – cra.org

## Entirely New Economic Sectors



Source: Compass Intelligence

## New Societal Challenges



Source: GAO analysis of US-CERT data for fiscal years 2009-2013.

# The 2015 NITRD Review

Follows the 2010  
and 2013 PCAST  
reports on NITRD

**Assess** response to recommendations

**Review** state of the field and NITRD

**Identify** emerging challenges

**Make** new recommendations

## Working Group

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### *Study Co-Chairs*

- Susan Graham
- Greg Hager (Johns Hopkins)

### *PCAST Members*

- Michael McQuade
- Eric Schmidt

### *Working Group Members*

- Sara Kiesler (CMU)
  - Bill Dally (Nvidia)
  - Eric Horvitz (Microsoft)
- 

## Timeline - 2015

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Recurring Weekly Team Meetings Starting Tuesday, January 20



Weekly teleconferences

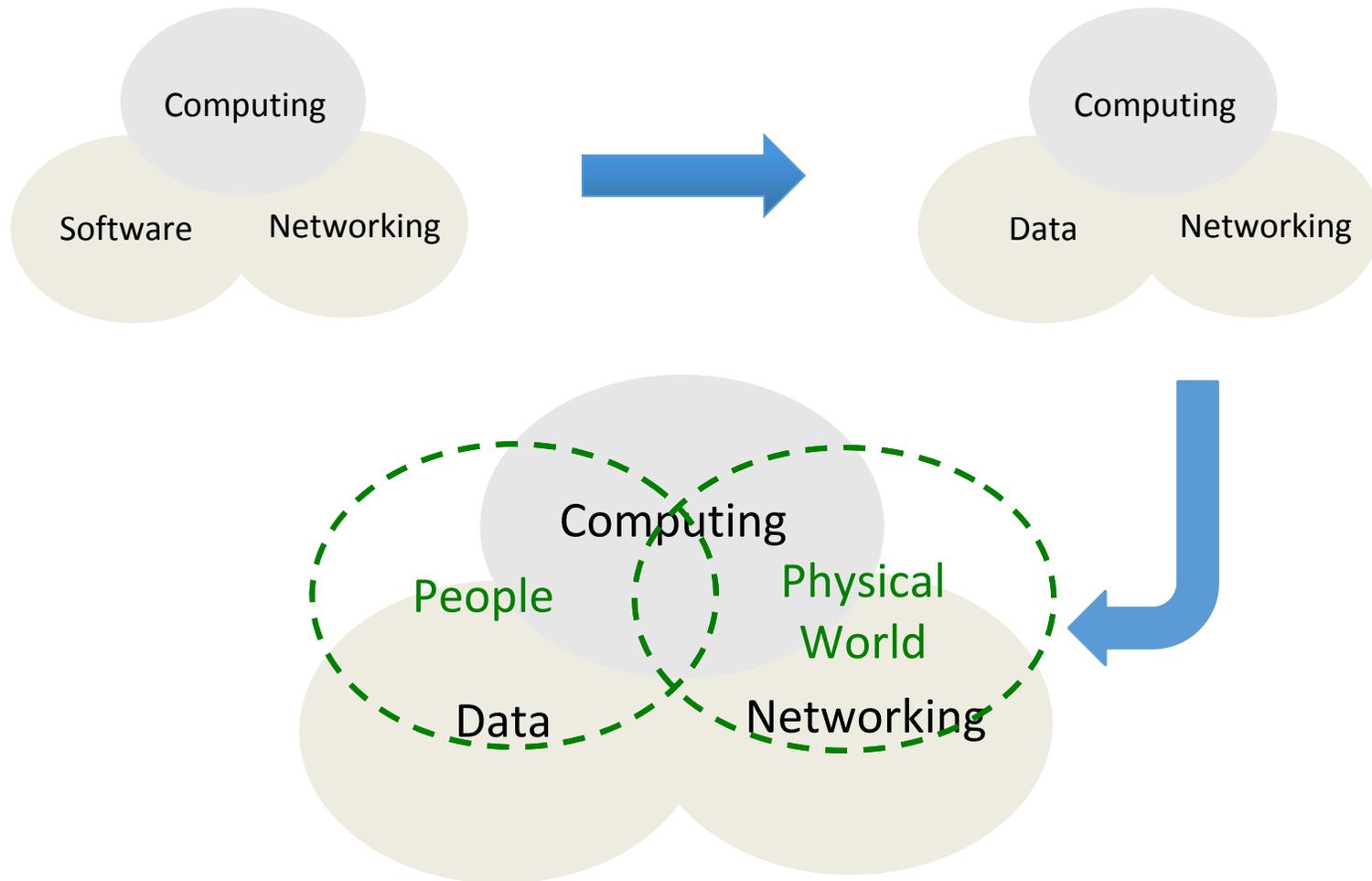
Consultations with multiple experts from government, private sector, and academia

Committee interviews and reading/review

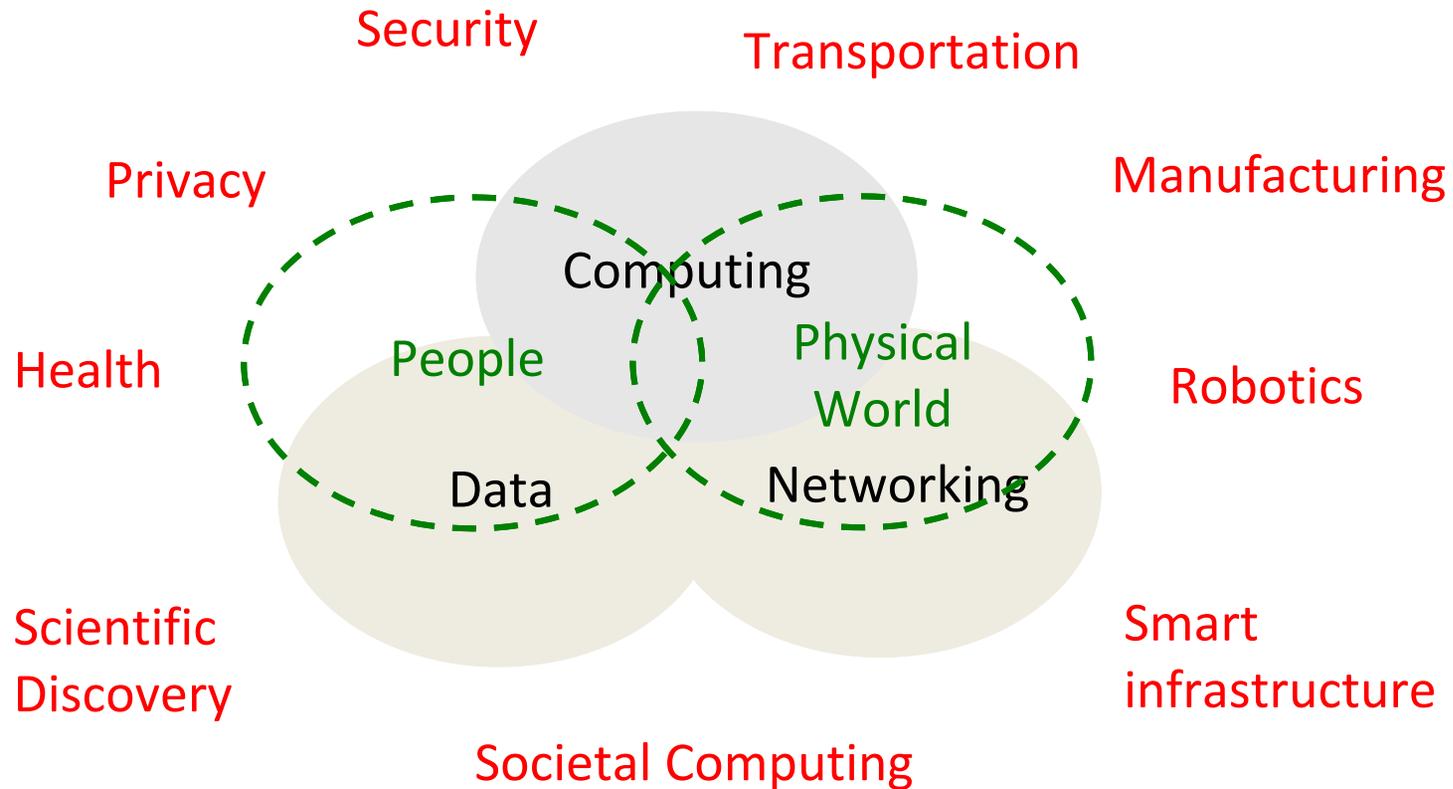
# General Observations on NIT

- Strong contributor to our national economic and societal well-being.
- Under stress due to growth of field, need for trained workers, relatively flat federal research funding.
- Emerging convergences of historically separate research areas points to growing need for multidisciplinary research.
- Continued need for coordination to maximize impact of federal investments in NIT R&D

# Evolution of NIT 1991-2015



# Evolution of NIT 1991-2015



***This evolution has not diminished, but rather has increased the relevance and role of NITRD in coordinating federal investments in NIT research.***

NIT R&D  
is essential to  
many  
National  
Priorities

**Cybersecurity** - research on cybersecurity by design, defense against attack, systems resilience, implementation support, better and faster attack attribution methods.

**Health** - research on treatment and outcomes, disease and wellness, mobile and biometric technologies for monitoring and care, actionable decision support, regulatory compliance.

***These areas remain critical – multi-agency coordination is essential to promote collaboration, public-private partnerships, and to create paths for translation into practice.***

Government  
Initiatives  
Catalyze  
NIT R&D

**Big Data and Data Intensive Computing** -  
*research on automated large-scale analysis, causality, confidence and errors, active learning, understanding deep learning, interactive data visualization and exploration.*

**NIT Interaction with the Physical World** -  
*robotics, cyber-physical systems, Internet of Things. Research on robust autonomy, cyber-human effects, realtime multi-modal sensing, intelligent systems components.*

***Both need multi-agency and multi-disciplinary collaboration and foundational research coupled with effective means of deployment and testing.***

R&D that  
Integrates  
People  
and NIT

**Privacy** - a science of privacy based on NIT is needed to inform policy decisions and to enable appropriate use of personal data while protecting its source.

**Cyber-human systems** – computational systems that support communication and coordination of individuals, groups, and organizations, computational systems and methods supported by people and socially-intelligent devices and systems.

***Results from cyber-human systems are increasingly used to address important societal problems. Advances in both domains require broad, multidisciplinary research.***

## The Technology Base

**Foundational NIT Research** – long-term research that advances understanding and discovery and provides the base for future innovation and disruptive advances in the use of NIT

**High-capability computing** – need a substantial and sustained program of long-term, fundamental research on architectures, algorithms and software for high-capability compute-intensive and data-intensive computing systems.

***Long-term research in NIT is essential for the application areas that build on it, and for the future of our robust NIT industry.***

***High-capability systems are platforms for current and future advances in science, commerce, and defense.***

## Developing the Workforce

*The demand for skilled IT workers necessitates new approaches to identify and train students and to retain them in the educational pipeline as they progress from the K-12 level to college and beyond.*

*Diversity in computing-related fields continues to be a significant issue. This reduces our ability to fulfill the demand of the IT industry and limits the economic opportunities for those populations.*

***Programs are needed to grow the pipeline by attracting and retaining students at all levels, and by enhancing diversity.***

***Principled approaches for training and retraining of workers are needed to address immediate needs and opportunities to grow the IT workforce.***

Effectiveness of  
NITRD  
coordination

*Multi-agency budget reporting and coordination of networking and information technology R&D continues to be important.*

*The model of coordination and management instantiated through the NITRD Subcommittee, the NCO and the NITRD Groups is appropriate and beneficial.*

***Previous recommendations to modernize the budget reporting and coordination structure have not been followed.***

Revise the  
NITRD  
Budget  
PCAs

*Tracking of government investment in NIT R&D is inhibited by outdated Program Component Areas (PCAs).*

PCAST recommends that OSTP, NCO, and the NITRD Subcommittee, in collaboration with OMB,

- create a process for periodic review and revision.
- revise the PCAs for the 2017 Budget cycle to reflect both the current nature of NIT and the major national priorities in which NIT plays a major role.

***The report proposes a new list of PCAs.***

## Update the NITRD Coordination Groups

*The coordination process lacks transparency and process regarding the creation and operation of coordinating groups*

PCAST recommends that

- The NITRD Subcommittee, in collaboration with NSTC and OSTP, establish specific language specifying what the purpose of each *type* of Group is and what mechanisms should be used to establish, monitor and terminate a Group.
- The NITRD Subcommittee, in collaboration with NCO and OSTP define a process for periodic review of each Group, with a recommendation for continuation, modification or sunset.
- Each Senior Steering Group periodically publish and publicly discuss a research and coordination plan for its area of interest.

***The report suggests some changes to the Groups.***

